DISSERTATION

SECONDARY TEACHERS' ATTITUDES ABOUT CHANGES IN THE PUBLIC VOCATIONAL INDUSTRIAL HIGH SCHOOLS IN TAIWAN

Submitted by

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School of Education

In partial fulfillment of the requirements

For the Degree of Doctor of Philosophy

Colorado State University

Fort Collins, Colorado

Spring 2006

COLORADO STATE UNIVERSITY

September 1, 2005

WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY CHING-CHIECH HO ENTITLED SECONDARY TEACHERS' ATTITUDES ABOUT CHANGES IN THE PUBLIC VOCATIONAL INDUSTRIAL HIGH SCHOOLS IN TAIWAN BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

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ABSTRACT OF DISSERTATION

SECONDARY TEACHERS' ATTITUDES ABOUT CHANGES IN THE PUBLIC VOCATIONAL INDUSTRIAL HIGH SCHOOLS IN TAIWAN

This study investigated: (a) teachers' attitudes about their vocational school teaching environment, especially changes involving new technologies, (b) teachers' current and preferred roles in decision making, and (c) teachers' attitudes about their teaching assignments. The study also explored possible effects of the predictor variables (age, whether or not the teacher had an administrative position, educational level, and the respondent's specialty area) on the three dependent variables

Questionnaires were sent to 960 teachers at 24 public vocational industrial high schools in Taiwan. A 77.50% response rate was achieved (744 respondents). Among the 690 useable returned questionnaires, 275 were general teachers (38% male, 62% female); and 415 were vocational teachers (93% male, 7% female).

Six of the items for attitudes about the teaching environment were significantly different between general and vocational teachers. For teachers' attitudes in regard to their current and preferred roles in decision-making, vocational teachers had significantly more involvement on both current instructional and managerial scales. For both general teachers and vocational teachers, preferred involvement was significantly higher than current involvements on the instructional and managerial scales.

Age had a significant but low relationship with the dependent variables, teachers' attitudes toward technological changes. It appeared that older vocational teachers seemed to feel less comfortable with technological changes. For current involvement in instructional decisions, the youngest vocational teachers had less involvement in decision-making than the older ones. There were some differences among the departments of the vocational teachers in regard to their attitudes about the vocational teaching environment. For the item "90% of the vocational high schools should be abolished", the IT teachers disagreed less than the other five groups. For "I feel stress to learn new technology", the automotive and architecture groups of teachers disagree more than the other four groups. For "Vocational high schools will be more competitive in recruiting new students if they become comprehensive high schools", the chemical teachers agreed more than the mechanical group. There was no difference among the different departments on the current or preferred roles in decision-making.

Recommendations are presented which may be beneficial for both the Ministry of Education decision-makers and secondary teachers in Taiwanese vocational education.

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CHAPTER 1

INTRODUCTION

Taiwan is located in the West Pacific Ocean facing mainland China. It is north of the Philippines and south of Japan. About 300 years ago, Taiwan was called "Formosa" by foreigners; "Formosa" means "Beautiful Island". In Chinese, "Tai" means "Terrace"; while "Wan" means "Bay". Surrounded by the ocean, like Hawaii, Taiwan has many beautiful terraces and bays. Taiwan is about 1/8 the size of Colorado, but the population is 22 million, about 5 times the number of people in Colorado. Because of limited natural resources, the smallness of the island, and density of the population, industrialization and export trade are of major importance for improving Taiwan living.

In order to make Taiwan more prosperous, the government has focused on developing manpower and upgrading the educational level, thereby stepping up the economic structure during the last forty years. According to Ashton, Green, James, and Sung (1999), "By 1995 government expenditures on education had reached 19.4 percent of public spending (9.93 percent in 1951)"(p. 81). Most of the educational expenditures went to business, science and technology development programs that increased capital-intensive and skill-intensive industrialization. Therefore, Taiwan was transformed from an agrarian society in the early 1950s' into a developed economy. According to the Council of Economic Planning and Development (CEPD, 1995), Taiwan had a per capita income of only $186 U.S. dollars in 1952, but increasing to $12,435 U.S. dollars in 1995. On the other hand, according to Ashton et al. (1999), the economic surplus allows

households in Taiwan to devote some of that surplus to education, which makes the next generation wealthier and more competitive. Education paves the way to advancement.

The school system in Taiwan is different from that in America. See Fig 1.1, School System Chart in Taiwan (Ministry of Education, 2001). The students' ages in kindergarten are between four to six years old, and they are between six to twelve years old in elementary school. Then students go to junior high school for three years between the ages 12 to 15. There are nine years of compulsory education from elementary through junior high. After graduating from junior high school, the students face a major turning point in their educational careers. Based upon two entrance examination scores, many students (mostly with higher scores) attend general senior high schools. Other individuals attend senior vocational high schools. In addition, a small percent enter 5-year junior colleges in which the first three years are similar to vocational high schools, so the researcher will discuss vocational high schools and 5-year junior colleges together.

There were not comprehensive high schools in Taiwan before 1996. A recent study indicated that 18 comprehensive secondary schools (CSS) were derived from vocational schools in 1996; by 2000, there were 124 CSS in Taiwan (Wu & Chen, 2000). Juan (2000) interviewed the ex-director of the Department of Technological and Vocational Education, Juen-Chieh Huang, who indicated that CSS contributed to the expansion of general higher education. By 2001, Huang estimated that the first year students' enrollment ratio between general and vocational schools will reach 50:50. This means the Ministry of Education (MOE) intends to reduce students in the vocational system and put them in general high schools. In the near future, the MOE wants to manipulate the entire general high school and vocational high school students' ratio to

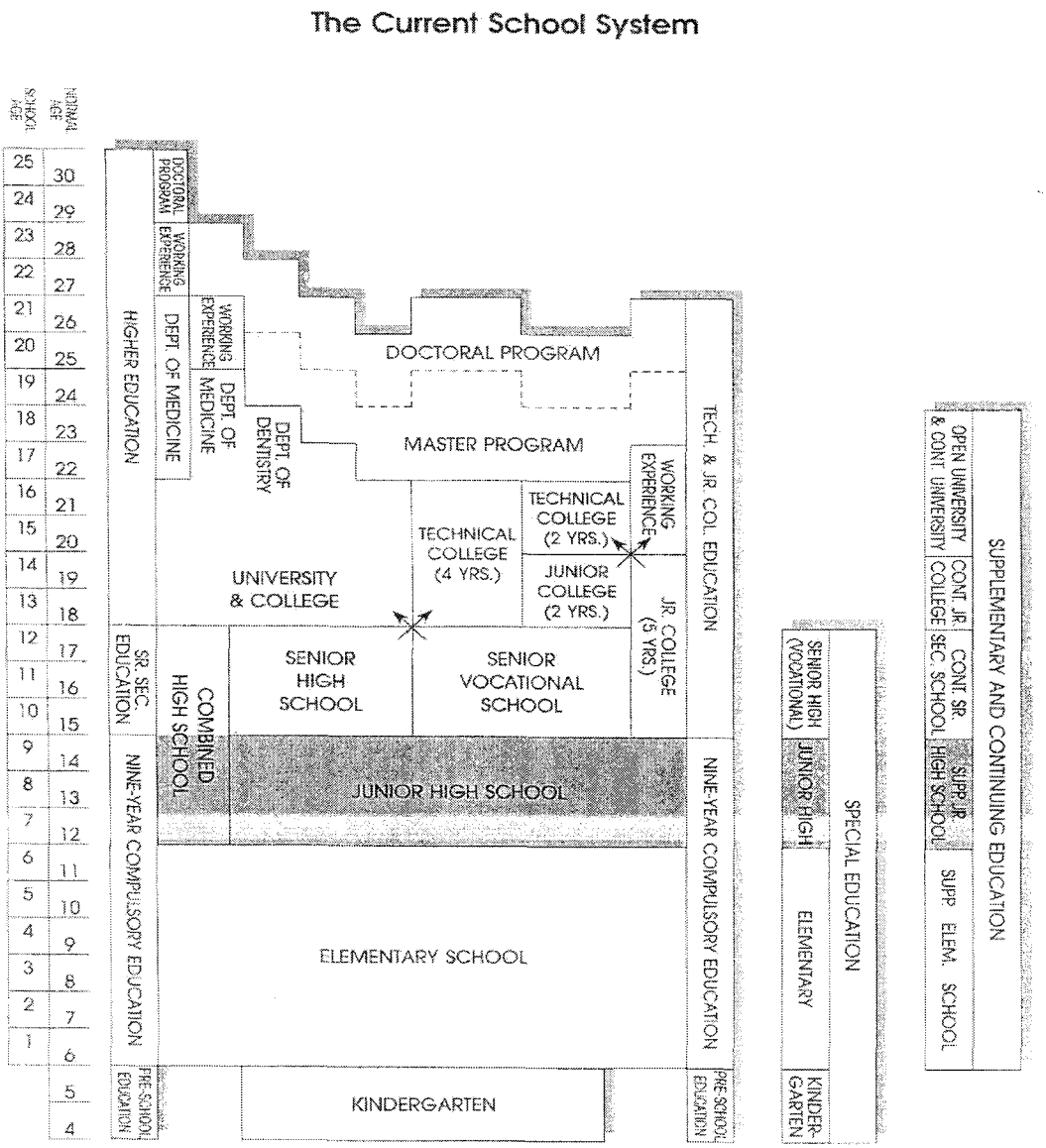

Figure 1.1 Taiwan's School System (the Ministry Of Education, 2001)

50:50. According to Huang's (2001) study, there were 414 secondary schools (218 general, 196 vocational) in Taiwan.

Problems for Taiwan Vocational Teachers Due to Societal Changes

Social, political, economic, educational, and technological changes have influenced Taiwan dramatically in the last decade. Educational policy and curriculum changes affect Taiwanese vocational high schools. Vocational high schools could not recruit enough students in the last few years, and the problem will become more serious hereafter. Also, shop/laboratory hours were reduced, and some other related courses were curtailed. Some teachers in the public vocational high schools are forced to teach in a different field or transfer to other vocational schools.

At the advent of the information-based economy in the 21st Century, the MOE of Taiwan required vocational schools to add more course hours, such as foreign languages (mostly English and Japanese) and computer and science subjects. This required a reduction in course hours regarding profession-related subjects. It takes time to teach students about profound professional skills, as well as trade automation. Computer literacy is significant for both students and instructors. Some courses regarding computer application in technology lack enough competent teachers. The retraining of teachers or getting teachers to teach a second specialization in another field such as Chinese, English, math, chemistry, and social science become important issues for vocational-related teachers. Otherwise, they might become underqualified teachers and be relieved of their duties. That is a serious matter.

Technology makes the whole world more accessible. On the information superhighway, every country becomes a part of a global village that has instant good or bad influences. Owing to the depression of the global economy and transition of domestic political turmoil, Taiwan is now facing a difficult time. Many companies are downsizing;

some have even closed and moved to other countries searching for cheaper labor and land and the so-called brighter future. Therefore, many people have lost their jobs in Taiwan and the crime rate is going up because of the lack of profitable avenues for acquiring food and shelter. The unemployment rate reached 5.5% in the first quarter of 2002, up from 1.79 % in 1995 (Chang, 2002). Government funds for education are shrinking dramatically, too. Many teachers feel uncertain about a future educational policy that is far beyond their prediction and control. Chen (2001) points out that the change of the working environment and new curricula challenges are two major reasons for teachers to apply for an early retirement. Lin (1995) indicated that most of the vocational education changes were top-down processes and the authorities of the Taiwan government seldom considered teachers' attitudes about educational changes. Therefore, many middle-aged teachers, who are afraid of getting smaller pensions if they wait, are applying for an early retirement at the age of 50 or 55. This seldom happened ten years or even five years ago. Ritchie (1971) and Patchen (1970) reported that increased participation in organizational decision making was associated with greater job satisfaction. The problem of not enough access to decision making in educational policy and curriculum reforms may result in low organizational morale and job satisfaction.

Research Problem

This study used a quantitative approach, after some initial informal discussions and testing with teachers and administrators in Taiwan who are knowledgeable about vocational high schools. A questionnaire was used to collect data from Taiwanese vocational high school teachers about (a) teachers' concerns about changes in the

vocational school teaching environment, (b) teachers' desires for more participation in decision making, and (c) teachers' concerns about assignments to teach new technology. Note that these three attitudinal constructs are defined conceptually in the Definitions section and are defined operational in the Methodology chapter.

Research Questions:

1. How concerned are teachers about changes in their vocational school teaching environment, especially changes involving new technologies?
2. How much participation in decision-making do teachers perceive they have now?
3. How concerned are vocational teachers about their assignments to teach new technologies?
4. Are there differences between general subject teachers and vocational-related teachers' attitudes about changes in (a) the vocational teaching environment, (b) their current roles in decision-making, and (c) their preferred role?
5. Are there differences between the current and preferred roles in decision-making for (a) the vocational-related teachers, and (b) the general teachers?
6. Are there relationships between teachers' age and their attitudes in regard to (a) changes in the vocational school teaching environment, (b) their roles in decision-making, and (c) their teaching assignments?

7. Are there differences among the areas/departments of the vocational teachers in regard to their attitudes about (a) changes in the vocational teaching environment, (b) their roles in decision-making, and (c) their teaching assignments?

Study Delimitations and Limitations

Delimitations. This study will be narrowed to teachers at public vocational industrial secondary schools in central Taiwan. Consequently, results of the study may be generalized only to the population studied in these schools.

Limitations. Some teachers might not answer questions honestly. Carelessness in answering questions may also be a problem. Thus some findings may not be meaningful even if they are statistically significant.

Definition of Terms

Academic Universities. These universities focus on the arts and sciences. The period of study for most undergraduate students is four years. The academic university students mostly come from general high schools.

Attitude. It is defined as a persistent disposition to act either positively or negatively toward a person, group, object, situation, or value. It also includes feelings, moods, or convictions.

Attitudes about Changes in Teaching Environment. They can be defined as the teachers' feelings or opinions about changes in policies, curricula, and teaching environment.

Attitudes about Role in Decision Making. They refer to the manner and the degree in which the teachers would like to participate in making or influencing the decisions within their schools.

Attitudes about Teaching Assignments. In this study, they are defined as the teachers' feelings or opinions about the courses assigned or misassigned to them by administrators.

CEPD. "Council for Economic Planning and Development." this body was organized in Taiwan, 1978.

Commerce Major. It is one of the seven categories in secondary vocational schools. Along with general subjects, it provides specialized and practical courses, such as: Introduction to Commerce, Accounting, Economics, Word and Document Processing, Introduction to Civil Code, Cost Accounting, Computer Application, Introduction to Management, Tax Laws and Regulations (*Ministry of Education*, 2001).

Computer Technology. Devices that are controlled by computers. Technology in this study is defined as "computer terminals, personal computers, printers (hardware), and the programs and operating systems (software) which are installed on them" (Baker, 1991, P. 38). It includes interactive laser discs, robotics, and telecommunications, etc.

CSS. "Comprehensive Secondary Schools." They were derived from vocational schools in 1996.

FMP. "The First Manpower Plan." The first manpower plan, which was integrated with economic plans, followed shortly in 1966.

General High Schools. they are in secondary education, which provide three-year academic education for entering academic college.

General Subject Teachers. They teach common requirement courses, such as Chinese, English, Math, Physics, Chemistry, Social Science, Physical Education, Music, Arts, etc.

Junior Colleges. They are divided into two programs. One admits junior high school graduates for a five-year study program. The other admits senior secondary school graduates for a two or three-year study program.

MOE. "Ministry of Education." It is an organization that takes overall charge of the matters of education in Taiwan.

PDLREP. "Preliminary Draft of the Long Range Education Plan." It emphasized the development of science and technological education and accord with the development of the economy.

Private Secondary Schools. They include private general high schools and private vocational high schools. According to the MOE (1997), there were 109 private general high schools and 106 private vocational high schools in Taiwan.

Taiwan. It is a country, which is located in East Asia, 90 miles off South East Mainland China.

Teachers' Attitudes. In this study, they are defined as teachers' positive or negative feelings, mood, or opinions about situations.

Technological Colleges. They include two-year junior colleges and four-year colleges, which provide the advanced occupational knowledge and skills training for vocational high school graduates.

Vocational-related Subject Teachers. They include workshop/lab teachers and practice-related course teachers in the seven areas listed under vocational schools.

Vocational Schools. They are in senior secondary education and have seven categories: industry, commerce, agriculture, marine products, nursing and midwifery, home economics, and opera & arts.

Researcher's Perspective

I was born in Taichung City and attended National Taichung First Senior High School. Then I got my Bachelor of Science degree of Industrial Education in National Kaoshiung Teachers University, Kaoshiung City, 1977. After graduating from the college, I have been teaching at the Department of Mechanics in the National Tung-Shih Vocational Industrial High School for 25 years. Courses which I have taught include Industrial English, Chemistry, Mechanical Electricity, Applied Mechanics, Graphics, Welding Practice, Jigs and Fixtures Design, Mechanical Manufacturing Process, and the courses that are directly related to the machine shop equipment (lathes, vertical and horizontal milling machines, bench work). There are many diverse courses even in one single department. Some courses disappeared as time went by; other courses have changed dramatically. It is the most difficult challenge for the vocational educators and trainers to keep up with the technological changes. Not only I, but also my co-workers, are struggling with some courses assigned to us, with which we are not familiar. We spend most of our time preparing for the course(s) we do not know well, which also diminish the teaching quality of our specialty courses.

I have experienced curriculum changes from Unit-Trade Training (1954-85), Cluster Curriculum (1986-97), and the Vocational Revised Curriculum (1998-now). Being a teacher, I need to adjust myself to educational policy and curriculum changes. I

believe that teachers' participation in decision-making of school affairs will benefit school and students in the long run. The ideology of sharing common responsibilities makes our teaching school a positive and progressive learning organization, which makes teaching and learning more pleasant and effective.

Fortunately, I was sponsored twice by the Taiwan Government. I received my Master of Science of Technical Education in 1988 and Educational Specialist in 1998 at Pittsburg State University, Kansas. Since 1999, I have been working on my doctoral program at Colorado State University. I hope to collect enough representative data and propose some practical suggestions for both the MOE related decision-makers and secondary teachers to apply to changes in Taiwan.

CHAPTER 2

LITERATURE REVIEW

The purpose of this chapter is to review published studies and literature related to the study. This chapter contains sections which focus on the following areas: (1) history of the Taiwanese vocational school system; (2) current and future student shortage in the vocational school; (3) vocational school teachers' attitudes about teaching and knowledge of general education subjects (e.g., mathematics and science) and computer technology; (4) retraining vocational teachers to prepare vocational teachers to teach general or workshop related courses; (5) changes in vocational education during the 20th century; (6) high school tech education in the USA; (7) readiness to change; (8) teachers' participation in decision making; (9) summary.

History of the Taiwanese Vocational School System

Taiwan was occupied by Japan for nearly fifty years (1895-1944). The first vocational education system of Taiwan was, indeed, established by the Japanese in 1919 (Ministry of Education, 1957). During the period of occupation, Japan provided elementary schools for the Taiwanese, while Japanese children in Taiwan studied in separate elementary schools. As far as secondary and higher education was concerned, Taiwanese children were encouraged to enroll in the vocational and technical training programs (Jeng, 1980). Even during the end of the period of Japanese occupation, 1944, *Statistics of Executive Yuan* (1975) showed that, among those 117 vocational institutions (32,718 students altogether), only 27 of them were conventional schools. The remaining

90 schools were continuing vocational training institutes, which offered short duration programs for drop-outs.

Jeng (1980) also pointed out that nine conventional vocational-industrial secondary schools were established during the period of World War II for the purpose of training workers for weapons production and military services. These schools were:

1. Taichung Vocational-Industrial School, founded in 1938.
2. Taichung Municipal Industrial School, founded in 1938.
3. Tainan Vocational-Industrial School, founded in 1940.
4. Hualien Vocational-Industrial School, founded in 1940.
5. Taipei Municipal Commercial and Industrial School, founded in 1940. The school changed its title to "Taipei Municipal Industrial School" when the commercial curriculum was deleted in September 1944.
6. Kaoshiung Vocational-Industrial School, founded in 1942. It was expanded by merging with the Kaoshiung Polytechnic School in January 1945.
7. Hsinchu Vocational-Industrial School, founded in 1944.
8. Changhua Vocational-Industrial School, founded in 1944.
9. Chiayi Vocational-Industrial School. It was established by altering the programs of the former Chiayi Commercial School in April 1944 in order to train military technicians.

Then World War II was over; Japan surrendered, unconditionally. Taiwan was transferred to the Republic of China in September 1945. Simultaneously, the Nationalist Government (KMT) was trapped into civil war with the Communist Party on the Chinese mainland. Therefore, according to George (1965), Taiwan was placed under military rule with General Chen Yi, representing the Nationalist Party, as its governor and highest

commanding officer. The objective of General Chen's administration was not to reconstruct the island but to support the civil war in mainland China.

At the advent of transfer, Chen Yi's administration faced a difficult time in educational rehabilitation, such as short supply of educational funds, a language barrier (from Japanese/Taiwanese to Mandarin), lack of appropriate textbooks, and qualified teachers. Therefore, schools were in chaos. Jeng (1980) states that real progress in education, however, was not made until the Nationalist moved to Taiwan in 1950. Thereafter, schools were reconstructed and incompetent teachers were gradually replaced with qualified and better-trained teachers.

In the 1950's, Taiwan's economy was based on agriculture. Therefore, agriculture programs in vocational schools attracted more students than commercial and industrial programs. According to the Taiwan *Statistical Data Book* (1978), in the Academic School Year of 1952-53, there were a total of 40,092 vocational students; 14,735 students (36.75%) were Agricultural majors; 12,877 students (32.12%) were Commercial majors; and 8,868 students (22.12%) were Industrial majors. Simultaneously, as *Educational Statistics* (1954) indicates, there were 92,946 students in 129 general secondary schools (compared to 40,092 students in 77 vocational secondary schools). The percentage of vocational students was about 30% of the total.

Raper, Chuan and Chen (1954) pointed out that the reforms in education, begun in June 1952, marked a new era of development in education. The reforms included an industrial teacher training program at Taiwan Provincial Teachers College (the title changed to National Taiwan Normal University later), which received financial aid from the United States and was recommended by the Pennsylvania State University. On the

other hand, the revised industrial curricula in secondary vocational schools were divided into five main technical departments: mechanical technology, electrical technology, mining and metallurgical technology, civil technology, and chemical technology. Jeng (1980) stated that the revised curricula were engineering-oriented, which provided students with both a wide range and cluster knowledge of technical theories and skill training.

Because of the higher unemployment rate of the vocational-industrial graduates, the engineering-oriented curricula proved to be too theoretical and broad. In 1955, the engineering-oriented curricula were replaced by a unit-trade program with emphasis on shop skills and competencies. Koo (1964) indicated that the newly set program was taught thirty-nine hours a week, in which fifteen hours of shop work, and twelve hours of general subjects were included. With more funds from the Nationalist government and U.S. aid to remodel school shops and to get new equipment, the *Chinese Education Yearbook* (1957) indicated that nine trades were taught in the eight pilot schools: machinery, electronics, sheet metal working, auto mechanics, carpentry, foundry work, pattern making, plumbing, and printing.

In order to assess the efficiency between the two types of curricula, an investigation was made by Po-Yen Koo, Head of the Department of Industrial Education of Taiwan Normal University in 1966. By comparing graduates' employment rates (see Table 2.1), Koo (1966) pointed out that the employment rate of the graduates who had completed unit-trade training was, on an average, 2.25 times the rate of whose who had finished engineering-oriented programs.

Table 2.1

Employment Rates of Students in Unit-Trade Training and Engineering-Oriented Curricula From 1962 to 1965

	Percentage of Students	
Year	Unit-Trade Training	Engineering-Oriented Curricula
1962	66.78	29.22
1963	65.43	28.38
1964	60.04	28.76
1965	64.26	27.39
Average	64.13	28.44

Ashton, Green, James, and Sung (1999) indicated that educational planning in Taiwan started in 1964 through the 'Preliminary Draft of the Long Range Education Plan (PDLREP) 1964-1982', which was drafted by the Ministry of Education aided by the United Nations. The First Manpower Plan (FMP), which was integrated with economic plans, followed shortly in 1966. Since that time, as the Council for Economic Planning and Development, CEPD (1991) indicated, with a large population, limited natural resources and production mostly dependent on the international market, Taiwan should aim at more comprehensive manpower planning. At that time, there was a shortage of skilled workers in Taiwan, but Confucian philosophy still dominated people's thoughts. Well-educated and white-collar people were more respected than farmers and skilled workers, who were regarded as second-class and of lower social status. According to the Ashton et al. (1999) study, during the 1950s and 1960s, Taiwan's higher education system was skewed towards the arts and humanities.

Both PDLAREP and FMP focused on the development of science and technological education in accordance with the development of the economy. Obviously, both plans enhanced vocational education rather than general (academic) high schools. In reference to Table 2.2, in 1960 only 40% of secondary school students were in vocational schools, which was too low to fulfill the expected employment market's needs for skilled workers. The Ashton et al. (1999) study pointed out that, in order to increase the pool of skilled workers, limits were put on the expansion of general schools while vocational schools were opened. Tseng (1989) also indicated that in 1969 the government began adjusting to the ratio (3:7) of general education schools to vocational schools to meet Taiwan's changing economic needs, which in turn changed the outlook of Taiwan's economy.

Table 2.2

Distribution of Senior High School Students in Taiwan

	1960	1970	1990	1995	2000
General	60	43	28	30	40
Vocational	40	57	72	70	60

As Table 2.2 shows, by 1970 the proportion of students in vocational high had risen rapidly to 57%. The Ashton et al. (1999) stated, "This emphasis on vocational schooling was high by most standards and later become even more pronounced." The major goal of vocational high graduates is to go into the work force, where their career development needs have been neglected for years. By 1980, the entrance rate of colleges for vocational high graduates was only about 15%, and most of these colleges were 2-year private community colleges. According to Huang's (2001) study, in 2000 the

entrance rate was still less than 30%, while general high graduates had over a 60% chance of attending academic colleges. The demand for general schooling is high. Therefore, many reports about general high school and academic college entrance examinations are shown in the press and television news, but very few concerning vocational schooling. However, Ashton et al. (1999) indicated that the state was able to insulate itself against public pressure and limit access to academic education. Ch'ang (1994) also stated the fact was that the manipulation of the ratio between academic and vocational high school members was entirely in the hands of the Ministry of Education.

Current and Future Student Changes and Shortage in the Vocational School

Students are the most important factors to manage a school. Without sufficient students, the school is facing the dilemma of survival, not to mention schooling quality. According to Huang's (2001) study, in 2000 there was a great deal of difference between allowed total quota (153,210) and the actual recruited students (112,459) in vocational high schools in Taiwan, a 40,751 pupil shortage (36,993 pupil shortage in 1999). The shortage rate was 26.6% (19.49% the previous year). In some regions, the shortage rates were more than 40%, such as Shing-Chu at 49.10%, Kaohsiung County at 41.99%.

Student shortages in vocational high schools have become a very serious problem during the last few years, especially for private vocational schools where tuition fees are twice or three times higher than those of public facilities. If the problem worsens, some schools might go bankrupt, which will cause many educational and social problems.

The main reason for students' shortage in vocational schooling is due to the reduction of junior high graduates in the last decade. Educational statistics of the MOE

(1977) pointed out that there are 235,151 new students enrolled in all secondary schools in 1967-68; 354,187 students enrolled in 1970-71; 423,962 students enrolled in 1973-74; and 478,426 students enrolled in 1976-77. Yeung (1990) stated that in 1987, there were 653,437 total high students of which 447,328 students were enrolled in the vocational senior high and 5-year community colleges (68.5% of the total); 206,109 students were enrolled in general senior high schools (31.5%). Feeding and educating kids are very time, money, and energy consuming, so from the1970s educated parents have decided only to have one or two children in Taiwan. Huang's (2001) study indicated that there were about 373,900 junior high graduates in 1993, but only 342,102 graduates in 1999, and 309,294 graduates in 2000. If the rate is the same as in previous years, about 293,000 students (94.73% of all graduates will go to senior high schools in 2000. Excluding 35,000 in 5-year community colleges, there are about 258,000 students enrolled in secondary schools. There are 452 vocational and general high schools; therefore, on average every school accepts about 570 students.

Unfortunately, not every school can attract 570 new students. According to the statistics of the MOE (2000), "*The first year students' number of secondary schools in Taiwan, 1999*", one vocational school enrolled over 3,500 new students. There were 16 schools between 1,500-2499; 43 schools between 1,000-1,499; 169 schools between 500-999; and 113 schools between 300-499. Those schools that had a total of 900 students in three years should not have any problem in surviving. However, there were 63 schools with a total of new students in the first year between 50-299. Eleven schools had fewer than 49 new students. Among those 74 schools with fewer than 299 students, 34 were general high, and 40 were vocational schools. The schools with good reputations always

attract a large number of outstanding students. On the contrary, endangered schools that make the future uncertain make it hard to keep good teachers and attract even less-competitive students. Wu (1998) pointed out that vocational education became second-level education owing to the hindrance of vocational students' development. That was very true in accordance with the reports of the MOE (2001).

Table 2.3 shows that the number of general high school increased from 1989 to 1999 while the number of vocational highs declined. The table also indicates that the percentages of general high school graduates enrolling in academic universities has increased dramatically during this time, but enrollment of vocational students in college remains low.

Table 2.3

Comparison of Secondary School Changes and Enrollment Rates for College and Changes From 1989 to 1999

Academic Year	Number of General High Schools	Enrollment Rate to Academic Universities	Number of Vocational High Schools	Enrollment Rate Technological Colleges
1989	168	34.27%	214	27.45%
1994	196	44.38%	206	27.56%
1999	253	59.83%	199	31.26%
89-99 change	+85	+25.56%	-15	+3.81%

It is frustrating for those vocational system students who have fewer opportunities for their advanced development. Chou and Wang (2001) indicated that there were only two technology universities (Taiwan Technology University and Taipei Technology

University) from the vocational system among the top twenty favorite colleges from which the owners of 1,000 big enterprises in Taiwan preferred to hire their college graduates. The other 18 universities were from the academic systems. This survey was conducted by Teng Sha Journal from 1995 through 2000. Compared to the general/academic educational system, the vocational system has too many private schools. According to the MOE (1997), the ratio of public to private general high schools was 108:109 (the students ratio 71:29); the ratio of public to private academic colleges was 37:30 (the students ratio 41:59); the ratio of public to private vocational high schools was 98:106 (the students ratio 36:64); the number of public and private junior and technological colleges were 14:56 (the students ratio 15:85). Table 2.4 also shows that there were a total of 270,000 students in general high schools; 520,000 students in vocational high schools; 410,000 students in junior and technological colleges, and 340,000 students in academic colleges.

Table 2.4

Public & Private Schools and Students, MOE (1997).

	General High	Vocational High	Academic Colleges	Vocational Colleges
Number of Public Schools	108	98	37	14
Number of Private Schools	109	106	30	56
Students in Public Schools	71%	36%	41%	15%
Students in Private Schools	29%	64%	59%	85%
Total Students	270,000	520,000	340,000	410,000

Liao and Ho (2000) indicated that the vocational system's students had greater opportunities to enter private schools and paid more (twice or three times) tuition fees than those of the academic system's students. It also stated that private schools had insufficient equipment and teachers, and private school students were mostly from medium-low level and lowest income families that were unable to provide their children with advanced studies.

Because the MOE in Taiwan wants to manipulate the entire general high school and vocational high school students' ratios to 50:50 in the near future, the future student shortage in the vocational schools will become more serious year after year. Huang (2001) pointed out that more public schools are being added to the general high schools system, which attracts more junior high school graduates than vocational high schools.

Vocational School Teachers' Attitudes about Teaching and Knowledge of General Education Subjects (e.g., mathematics and science) and Computer Technology

Based upon two entrance examination scores, as the researcher mentioned before, most junior high graduates with lower scores attend vocational schools. Being in vocational schools, most of them are still struggling with general subjects (e.g., math, English and science), which are regarded by vocational students as less important than vocational related subjects and skill training. In the December 5, 2002, *China News,* Yuan-Cho Li, Dean of the Academia Sinica, stated that the graduates of the vocational schools should enter the work force upon their graduation. However, Li indicated that 90% of the graduates want to enter junior and technological colleges. While in the vocational schools, many students do not perform well in general subjects and skill

performance. As long as they are college students, they need to enhance their abilities in basic subjects in order to catch up with the studies. Especially in the information technology field, the graduates of the vocational system fall far short of meeting the needs of the employment market. Li advocated that only ten percent of elite vocational schools be kept while ninety percent of the vocational schools should be abolished and transformed into either comprehensive high or general high schools. On the contrary, in the December 5, 2002, *China News,* there were different opinions from vocational schools. Chin-Chin Chen, Principal of National Taichung Vocational Industrial School, indicated that nothing was wrong with Li's advocacy, but Li mistook Taiwan for America. Chen stated that the United States of America does not require its own manufacturing industries, which account for 30% of all trades in Taiwan (20% of all trades in Japan). If the vocational schools are abolished, where will the basic labor force be supplied? Hsueh-Tsai Wang, Principal of the Private Ling-Tung Comprehensive High School, stated that most junior high graduates do not recognize comprehensive high schools as a valid choice; therefore, Wang did not plan to enroll more students in the next few years. I-Nueng Chan, Dean of the Private Ming-To Comprehensive High School, indicated that the school's vocational-related curricula are similar to those of vocational schools, but the school focuses on enhancing students' abilities in Chinese, English and Mathematics, which dramatically increase the number of graduates that enter junior and technological colleges.

All of the above arguments point out the fact that vocational schools need to make some changes for the sake of survival in the information-based era. However, to abolish

90% of the vocational high schools without careful planning would be a disaster, which will create turmoil rather than benefits.

Retraining Vocational Teachers to Prepare Vocational Teachers to Teach General or Workshop Related Courses

The workplace of the 21st century will be greatly different from that of the past. As the world changes, every individual needs to keep pace with the changes. Mndebele (1997) stated that jobs in the future will be less secure and confidence in lifetime employment with one organization is almost nonexistent. Therefore, jobs in the future will require diverse skills. Farmer (1997) also indicated that western European managers understand that teamwork, problem-solving, decision-making, computer literacy and language skills are the keys to enhancing productivity.

Due to the rapid changes of workplace, training and retraining for vocational educators and trainers becomes badly needed. According to Norton (1982), some of the developments and trends in trainer training were found to be: (1) use of performance-based teacher education; (2) distance education (outreach) training programs; (3) adoption of competence-based certification standards; (4) changing roles of the instructor. This research focused on technological updating and identification of new trainer competencies.

On the other hand, in Taiwan student shortages and course hour reductions regarding profession-related subjects in the vocational high schools have made an oversupply of vocational-related teachers. A small proportion of teachers might retire

; however, the rest of them might not. Therefore, the retraining of teachers or getting teachers to teach a second specialization in another field become important issues. According to the assessment for the vocational and comprehensive high schools in Taiwan, Chang (2000) points out that almost all the public vocational-related subject teachers are qualified, but only a few of them have a second specialization. On the contrary, vocation-related subject teachers in private schools are usually under qualified and there is a low ratio of a second specialization, which makes teaching assignments difficult and teaching quality poor.

Although it is common for many secondary school teachers to teach some classes in other fields or departments, it is very difficult for most teachers to teach well what they do not know well. Unlike traditional professions, Ingersoll (1999) stated that teachers have little say over which courses they are assigned, or misassigned, to teach. The allocation of teaching assignments is usually the prerogative of school principals (Carey & Farris, 1994; Ingersoll, 1993).

Changes in Vocational Education during the 20th Century

Over the past 100 years formal technology education in western societies has experienced three different movements: manual arts, industrial arts, and technology education. The phrase manual arts education was used during the early twentieth; technology education was common the last two decades of the twentieth century; while industrial arts education was the dominant term most of the twentieth century. Cajas (2001) pointed out these three movements are related to the different perceptions of

technology as artifact (manual arts), knowledge (industrial arts) and social practice (technology education).

The model for Taiwan's vocational education is based on the American system. However, industrialization in Taiwan was about 20 to 30 years behind the United States of America. In other words, some educational problems that occurred in the U.S.A. 20 years ago probably are revealed in Taiwan at present.

In the 1950's, Taiwan's economy was based on agriculture According to Hsu (2004), in the 1960's, industry became prosperous. The manufacturing industry produced many products for other countries, and transportation became very profitable, too. At the same period of time, international trade and insurance for merchandise brought about the development of business. Hsu (2004) indicated that the gross amount of business products and services in the 1980's passed industry production for the first time since 1900. Thereafter, the proportion of industry in all trades went down year after year.

In the 1990's, due to rising labor costs and tense competition in Taiwan, many manufacturing industries moved to Mainland China and other Asian countries. Hsu (2004) pointed out, among all trades in 2004, industry trade was only 30%, business and service trade was up to 67%. This dramatic reduction of society's needs for industrial graduates becomes the harshest challenge for technological education. Because more students are choosing college oriented high schools, there has been a decline in the number of students in the vocational high schools and a surplus of vocational teachers at the high school level in Taiwan.

On the other hand, the exponential growth of technology over the past 20 years has changed western society and the educational environment dramatically. From a

historical perspective, De Miranda and Folkestad (1998) stated, " a majority of today's teachers and leaders in Technology Education were educated and trained in programs that emphasized Industrial Arts, Vocational Education, Industrial Technology, or Trade and Industrial Education" (p. 1). However, Cajas (2001) indicated that the manual and industrial arts movements focus on developing artifacts and practical knowledge, while technology education teaches more "abstract" knowledge. Will yesterday's technology education teachers have enough abilities to teach today's and tomorrow's students? Cajas (2001) pointed out that neither the manual nor industrial arts movement was concerned with understanding how technologies affect society. In addition, they were separated from science education.

Many teachers' experience in the vocational schools in Taiwan is that the mathematic level of most students is very low. If the teacher asked, "Haven't you learned this formula in the junior high school?" The student often would reply, "If my mathematics is good, I will not come to the vocational school." In regard to science and abstract concepts, the students' performance is not good. Students think that the vocational school is the place to learn practical skills and knowledge. Teachers think that the science courses in vocational schools are much easier than in general high schools. The consequence is obvious; the performance of the vocational schools' graduates can not meet the workplace needs. Jobs in the late 20 century and 21st century require diverse skills, which have more science/technology interaction, more problem-solving techniques, and more communication skills.

Martin (2003) stated that learning is a lifelong process. Everyone needs to learn new things in order to keep up with the fast social changes. Being a holistic person,

however, liberal education is as important as natural science education. Wu (2002) pointed out that education in Taiwan over the past few decades has focused on teaching practical skills and knowledge, which leads students to be profit oriented. In Wu's argument, technological education should also possess educational function, which teaches students to be a holistic person. Of course, it is very important for the vocational high schools to enhance their students' basic science and language abilities, which enable students to explore their potential and improve their career development. The three major problems of the present vocational high schools are probably departmental planning, curricula design, and orienting students too early to an occupation. Vocational schools have too many departments; the curricula of each department are too narrow to meet the demands of work force; and students are too young to orient to a specific field. According to Hsen and Yang (2003), early orientation deprives vocational school students of opportunities for broader career selections. General high school graduates can choose any college department to study. Therefore, probably cluster curricula are better for the vocational schools in Taiwan, and vocational schools probably could change to technological high schools, alongside with general/academic high schools, and comprehensive high schools.

Li (2004) indicated that Ministry of Education in Taiwan started curriculum guide planning for vocational schools in 1998 and has developed 17 occupational-family programs to replace present industrial, agricultural, commercial, and medical, etc, categories. Those 17 categories are: mechanical engineering, power mechanical engineering, electrical and electronic engineering, chemical engineering, civil engineering and construction, business and management, agriculture, home economics,

hotel management and food service, ocean management, marine and fishery, medical and pharmacy, nursery and child care, arts, design, food products, and foreign languages. In 2000, the Ministry of Education composed 18 development committees for the occupational families (17 for the occupational families and one for general subjects) to set up curriculum standards, frameworks, and new curricula plans to be carried out in September 2006 for newly recruited students.

Because more students are choosing college oriented high schools, there is a declining number of students in the vocational high schools and a surplus of vocational teachers at the high school level. Therefore, Knug and Chao (2003) recommended that the Ministry of Education in Taiwan should let some vocational schools with good reputations become public 2-year junior/community colleges and still keep the system of 3-year vocational high schools. This would enable some qualified vocational teachers to transfer to the junior college. On the other hand, the Ministry of Education should let junior colleges with good reputations become technological colleges and still keep the system of the junior colleges. This would provide more opportunities for vocational students to enter colleges and graduate schools, which will upgrade the quality of the skilled manpower.

High School Technology Education in the USA

High school curricula in technology education in the United States are: communication, construction, manufacturing, transportation, and associated technologies (Liedtke, 1995). Communications includes: graphic design, commercial design, publishing, cartooning, telecommunications, and satellite. Construction includes:

estimating, materials, costs, etc; structural analysis; money needs; environment; security. Manufacturing includes: computer integrated, CIM (computer integrated manufacturing), robotics, CAD (computer aided design), and computer aided drafting. Transportation includes: vehicle control (braking, drive train, environment, lighting, navigation. Associated technologies are service industry/business and bio-related. Service industry/business includes: electronic mail; booking, i.e. credit, transactions (checking and deposits); stock market; accounting, word processing, payroll; code scanning; demographic studies. Bio-related includes: athletics; medicine (diagnostic and prescriptive); diet/food selection; agriculture; ergonomics (comfort design); electronic vision.

The Technology Education Advisory Council (1988) described high school technology education as providing "an in-depth foundation for career preparation at the secondary and post secondary levels" while producing outcomes related to scientific principles, engineering concepts and technological systems" (p. 19). Komacek (1995) also stated that a key feature of high school technology offerings is diversity. High schools provide many diverse courses for students' career exploration.

De Miranda and Folkestad (2000) indicated that technology education at the high school level is in a state of transition, which focuses on curriculum integration. They also point out that the first of the fundamental changes in technology education programs is the movement from declarative knowledge or learning facts to emphasizing concept learning leading toward application and critical analysis. A second fundamental change is that the curriculum design focuses on process learning.

Usually, procedures of learning are more important than results. Learning assessment should be focused more on process (Sanders, 2003). If students are afraid of making mistakes, they do not learn well. However, the researcher thinks that failure is part of life. Therefore, students can learn from failure. American Association for the Advancement of Science (1989) reported that all technological designs may fail, but some steps can be taken to reduce the likelihood of failure.

Many researchers in industrial arts/technology education have also identified various benefits of integrating technological content with other subject areas over the past three decades (Childress, 1996; Korwin & Jones, 1990; Laporte & Sanders, 1995; Logan, 1973).

According to Komacek (1995), "At the high school level, students' needs begin to change as planning for college, postsecondary technical training, the work force, or military duty" (p. 360).

Maley (1992) indicated that context-based instruction is inherently problem-based. Robust and meaningful problems are multidisciplinary, and ideally require interdisciplinary instruction. In regard to the multidisciplinary approaches, it is probably a key issue to integrate technology, science, and mathematics education. In order to solve educational problems, students need to work cooperatively through the multidisciplinary approaches. Johnson (1989) clarified the inseparability of science, mathematics, and technology, "the sciences and mathematics are important to the understanding of the processes and meaning of technology" (p. 3).

The board of directors of the National Council of Teachers of Mathematics established the Commission on Standards for School Mathematics in 1986. The

commission produced curriculum and evaluation standards for school mathematics (National Council of Teachers of Mathematics, 1989). The first four curriculum standards for grades K-4, 5-8, and 9-12 were the same. They were mathematics as problem solving, mathematics as communication, mathematics as reasoning, and mathematics as connections.

LaPorte and Sanders (1995) indicated that science is a study of the natural world whereas technology is a study of the human-made world. However, both studies focus on problem solving. In science education, the students use scientific laws and principles to solve problems. In technology education, as LaPorte and Sanders (1995) stated, students are engaged in solve practical problems.

Research has shown that hands-on activities of high school students play significant roles on activities in science, mathematics, and technology educations. For example, Balka (1983) pointed out that mathematics manipulative improved the computational skills of slow learns, motivated students, and resulted in increased class discussion. Likewise, many related research findings have shown that hands-on activities in science education enhance the learning process (Brooks, 1988; Cotton & Savard, 1992; Glasson, 1989; Mattheis & Nakayama, 1988; Roth, 1991, 1992, and 1993).

LaPorte and Sanders (1995) also indicated that hand-on learning is the hallmark of technology education, which is integrated into science and mathematics to improve students' motivation and achievement. Roth (1993) implied that the technological problem-solving activities were a perfect metaphor for the study of science and mathematics principles. It is not easy for children to understand abstract concepts. Therefore, concrete examples are particularly helpful to them. Langbort and Thompson

(1985) articulated, "Children learn science and mathematics more effectively when they can concretely connect experiences with principles they are studying in various subjects" (p. 8).

Preparing teachers for TSM (technology, science, and mathematics) integration faces many challenges at the high school level. Teachers in a particular program often have little idea about what the students learn in other departments. In addition, according to LaPorte and Sanders (1995), the content of the courses students take varies significantly across different sections of the same course and from one semester to another. Therefore, careful planning in regard to several courses and teachers involved is the key to successful implementation of multidisciplinary teaching. In addition, having administrative support is also very important. Sanders (2003) indicated that success of TSM integration would depend largely on the commitment of all teachers involved.

Readiness to Change

Wright (1995) stated that change is to alter an existing situation, structure, or mode of behavior. People prefer to stay in a state of stability and do not welcome change. March (1992) wrote, "People look to the future with hope, but they prefer the way things were done in the past" (p. 20). Change, in one way or another, means that people need to learn new knowledge and expertise in order to survive in the new environment. However, living in the old way makes people feel safer, more comfortable, and under control. Senge, Kleiner, Roberts, Ross, Roth, and Smith (1999) indicated that the challenge of fear and anxiety in people is the most frequently faced challenge in sustaining profound

change and the most difficult to overcome. As long as changes exceed people's capacities to cope, many people give up and resist changes.

Reinsel (2001) stated that teachers' experience under school reform had five stages of grief: (1) denial and isolation; (2) anger; (3) bargaining; (4) depression; and (5) acceptance. Kozak and Robb (1991) wrote, "Knowledge and skills that have provided employment for a generation or longer are being made useless by exponential technological growth and are being replaced with new jobs that require new knowledge and new skills" (p. 29). Technology is a man-made world, which makes modern humans live in a computational, chemical, biomedical, electromechanical, and digital society. People use technology to create many new opportunities as well as problems.

Kozak and Robb (1991) indicated that technology in today's society is centralized, specialized, autocratic, threatening, and intimidating. In some plants, robots replace many workers' jobs. Massive unemployment accompanies technological innovations. Therefore, frequent unemployment and job changing become nightmares of modern humans. Modern humans need to learn how to cope with stress along with societal changes, how to enhance their capabilities, and how to deal with other team members in their organization.

Actually, the teaching environment is a family or team, which contains the students, parents, teachers, school administrators, and community. The members of the team are interdependent and require cooperation to carry out an educational reform. Wright (1995) argued, "The team can only make progress when each member recognizes that he or she is part of both the problem and the solution" (p. 401). Therefore, before

implementing a collaborative change, a team needs to create a shared vision, a mutual goal (Wright, 1995; De Miranda; 2002; Sanders, 2003).

Murray and Wood (1999) indicated that educational reforms include plan development, changing school structures, involving students and the community, and consolidation of change. Many reforms have neglected to consider that students are the leading actors/actresses. The students should play a role in directing their own education.

De Miranda (2003) also wrote,

> A similar collaborative change model for technology education would permit all participants to communicate and identify problems that require change and share solutions, foster broad participation in the change effort, spark innovation and creative thinking to deal with the problem, and encourage collaboration among diverse groups and ensure implementation by providing people with the freedom to take action. (p. 7)

Ely (1999) identified eight conditions that appeared to facilitate the implementation of education technology innovations: (1) dissatisfaction with the status quo; (2) existence of knowledge and skills; (3) availability of resources; (4) availability of time;(5) rewards or incentives exist; (6) participation; (7) commitment; and (8) leadership.

An educational reform is very time, money, and effort consuming. It needs to have a lot of people involved. At the beginning of the reform, it often encounters many obstacles. Therefore, good communication between the reform enforcement agency and affected participants (teachers, students, and parents) becomes very significant.

Teachers' Participation in Decision Making

Kumar and Scuderi (2000) pointed out that teachers possess firsthand knowledge of classroom teaching and learning, and their feedback and insights in curriculum decisions give rise to effective instruction. However, teachers rarely participate in the decision-making process, which is often considered a privilege and guarded by those in authority, such as school board members and administrators.

In the United States, according to the National Center for Educational Statistics (cited in Nelson 1994), only 39 percent of the teachers believed that they had significant influence over discipline policy, content of in-service training (33 percent), grouping of students (29 percent), or establishing curriculum (37 percent). Teachers often spend many hours at work or bring work home. They also attend in-service workshops and undergo annual evaluations. They interface directly with students. Unfortunately, their participation falls far short on policy matters. Imber (1980) indicated that, from an ethical argument, teachers, due to workplace democracy, have the right to participate in decisions that affect their work. In other words, teachers are part of their organization; they desire to express their ideas about pertinent issues and obtain respect from others.

Klein (1999) also stated that, if teachers are given an opportunity to be a part of the decision-making processes that affect their practice, they may be more inclined to implement the policies in their classrooms. On the contrary, there were some studies that proposed different arguments about teachers' participation in decision-making. Schaffarzick (1976) indicates that participation by teachers was generally superficial and higher authorities usually made major decisions. Flynn (1975) also stated that some teachers did not have sufficient professional competence to make contributions to

decision making processes. Therefore, teachers' participation in decision-making might be time consuming and inefficient. However, Shields and Michael (1997) pointed out that two-thirds of school-based reform efforts were initiated at the state and district levels, but the most successful ones were designed and coordinated on a day-to-day basis by school staff. Similarly, Kumar and Scuderi (2000) indicated, equipping teachers to participate in the decision-making process not only prepares teachers to make better policy decisions that strengthen school reform. By means of participating in the decision-making processes, teachers feel more professional and have raised morale.

Many studies pointed out that increased teachers' participation in decision making could possibly produce a feeling of job satisfaction (Burke, 1988; Miller, 1984; Thierback, 1980; Davis, 1978). Furthermore, Duke, Showers, and Michael (1980) stated that participation in decision making "contributes to an individual's feeling of being part of a collective enterprise and adds confidence in teachers' ability to control their environment" (p. 99). Lack of job control in the teaching environment is very threatening for teachers, which creates stress and generates a critical health risk.

Miskel, Defrain, and Wilcox (1980) revealed that job satisfaction is one of the important aspects in organizational life. When an organization becomes more rewarding and less threatening, teachers enjoy working there and make instruction more effective.

Rinehart and Short (1993) stated that creating school settings where participants experience greater empowerment may result in perceptions of greater job satisfaction. They also pointed out that increased jobs satisfaction may enhance teacher performance, quality of working life, organizational effectiveness, and student performance. However, allowing teachers more decision making is seldom empowering or effective. According

to Showalter (2002) teachers often find themselves either asking for permission or just using their conference time to follow procedures, rather than make decisions. Many principals and administrators are afraid that once teachers have more involvement in decision making, they will be unable to control and leader teachers. On the contrary, Shreeve (1984) indicated that principals who foster participatory management systems will markedly increase the job satisfaction levels of teachers and still retain a position of leadership with the school structure.

Tseng's (1989) study revealed that teachers' actual participation in decision making was found to have a positive correlation with their job satisfaction. As a matter of fact, teachers' job satisfaction is beneficial to the students, teachers themselves, and teaching environment. Therefore, administrators should render teachers more opportunities to be involved in the decision making process.

Summary

The literature has shown that there have been many changes over the last century in the proportion of students in vocational high schools and in the types of programs provided to them. These changes seem to be accelerating recently as the Ministry of Education has promoted a shift away from vocational education, which threatens the existence of a number of vocational high school and their teachers. Teachers' attitudes about these changes and their roles in decision making were also discussed.

CHAPTER 3

METHODOLOGY

This chapter contains information about: (a) the sampling and the data collection procedures; (b) characteristics of the participants; (c) the instrument; (d) the variables. The chapter also includes information about reliability and validity, and (e) data analysis.

Sampling and Data Collection

Sampling

A convenience sample of teachers at vocational high schools, both vocational related and general subject teachers were given the opportunity to participate in this survey. Teachers at 24 vocational schools around Taiwan, where the researcher knew a teacher who was willing to distribute the questionnaire, were asked to answer the questionnaire. This resulted in an over sampling of schools in central and southern Taiwan as shown in Table 3.1.

Table 3.1

Sampling Schools of the Survey Questionnaires

Region	No. Voc H.S.	No. Distributed
Northern	2	110
Central	13	545
Southern	8	275
Eastern	1	30
Total	24	960

Data Collection Procedure

The first step of the data collection was to acquire the list of the numbers of teachers at each school to be sampled from *the Summary of Senior High Schools in Taiwan* (2002), which had detailed information but not a list of teachers' names at each school. Therefore, the second step was to enter the website of Central Taiwan Bureau of Education and the websites of the vocational high schools, in which teachers' names were shown by vocational departments or by general courses. The list of the teachers' names was public information. Then, a Chinese version of the self-developed questionnaire was mailed to a teacher who distributed the questionnaires to the participants. Each person's packet contained the survey and a cover letter addressed to the subjects that explained the purpose of this study. The respondents were asked to return the completed instrument within two weeks of receipt to the researcher in a sealed return envelope to ensure the response was confidential and voluntary. Two weeks after the initial mailing, a follow-up postcard was sent to all respondents with appreciation for their participations and a

reminder for those non-respondents to send back the questionnaire. The postcard also said that if the questionnaire was lost, please call the researcher to send an additional copy of the instrument.

Response Rate

Table 3.1 and 3.2 shows that 960 (545 to vocational, and 415 to general teachers) survey questionnaires were sent to 24 public vocational industrial high schools in Taiwan. The researcher knew at least one teacher per school who distributed the questionnaires and encouraged their co-workers to voluntarily fill out the survey. A 77.50 % response rate was achieved (744 respondents out of 960 sampled). Among those 744 respondents, 690 were useable, including 415 vocational-related course teacher and 275 general subject teachers. Unusable questionnaires included those where a participant omitted all of one of the four parts (sections) of the questionnaire, did not identify themselves as either a vocational or general teacher, and missed half of the questions in Part B (either "Now "or" Like to have" more decision making involvement). A few participants who skipped one or a few questions on their questionnaires were used in the analyses. For the summated dependent variable scales computed from Parts B and D of the questionnaire, if one or two items on a scale had been omitted, the mean of the answered item was used for that person's scale score.

Table 3.2

Response Rate of the Survey Questionnaires

	Sent	Returned	Return Rate	Useable
General	415	294	70.84%	275
Vocational	545	450	82.57%	415
Total	960	744	77.50%	690

Participants

In cases where participants omitted the answers to one or a few, of the following characteristics questions, they are shown as "missing" in the following tables. Next, the demographic characteristics of the sample will be described. For each characteristic, the sample will be separated into vocational and general teachers.

Gender

Of the 415 vocational-related teachers shown to Table 3.3, 93% were male. Among the 275 general courses teachers in Table 3.3, 38 % were male. Thus the vocational teachers were almost all men but the majority of general teachers were women.

Table 3.3

Frequency Distribution of Gender for Vocational Teachers and General Teachers

	Vocational Teachers		General Teachers	
Gender	Number	Percent	Number	Percent
Male	387	93.2	105	38.2
Female	28	6.8	170	61.8
Total	415	100.0	275	100.0

Age

Table 3.4 shows the age of the respondents ranged between 20 and 60 and over. Of the vocational-related teachers, 35% were between 20-39, 64% were between 40-59, and only .5% were 60 and over. So most were middle aged. Of the general teachers, about half were between 20-39, and half were between 40-59. The general teachers seem to be somewhat younger than the vocational teachers.

Table 3.4

Frequency Distribution of Age for Vocational Teachers and General Teachers

	Vocational Teachers		General Teachers	
Age	Number	Percent	Number	Percent
20-29	37	8.9	35	12.8
30-39	110	26.5	98	35.8
40-49	204	49.2	103	37.6
50-59	62	14.9	37	13.5
60 and over	2	.5	1	.4
Missing	0	—	1	—
Total	415	100.0	275	100.0

Classroom Teacher with Administrative Position

Of the vocational-related teachers, 68% were classroom teachers without administrative positions, 32 % had an administrative as well teaching position (refer to Table 3.5). Of the general teachers, 83 % were classroom teachers without administrative positions, 17% had an administrative as well teaching position (refer to Table 3.5). Thus, the vocational teachers seemed to be somewhat more likely than the general teachers to have a partly administrative position.

Table 3.5

Frequency Distribution of Teachers' Position for Vocational Teachers and General Teachers

	Vocational Teachers		General Teachers	
Gender	Number	Percent	Number	Percent
Without Administrative Position	282	67.9	229	83.2
With Administrative Position	133	32.1	46	16.8
Missing	1	—	2	—
Total	414	100.0	275	100.0

Educational Level

Of the vocational-related teachers, 1.9% possessed only a high school or junior college diploma, 26.1% possessed a bachelor's degree from teacher or general college, 72% possessed a master's or doctorate degree (refer to Table 3.5). Of the general teachers, none possessed less than a college diploma, 42.2% possessed a bachelor's degree from teacher or general college, and 57.8% possessed a master or doctorate's degree. Vocational teachers seem more likely to have both less and more than a bachelor's degree than general teachers.

Table 3.6

Frequency Distribution of the Educational Level for Vocational Teachers and General Teachers

	Vocational Teachers		General Teachers	
Gender	Number	Percent	Number	Percent
High school diploma	5	1.2	0	.0
Junior college	3	.7	0	.0
BS degree with Teacher College	69	16.7	56	20.4
BS degree with general college	39	9.4	60	21.8
Master's or Equivalent	292	70.7	156	56.7
Doctorate degree	5	1.2	3	1.1
Missing	2	—	—	—
Total	415	100.0	275	100.0

The Respondent's Specialty Area

The frequency distribution of the respondents' specialty areas is reported in Table 3.7 and 3.8. Table 3.7 and 3.8 show that among the vocational-related teachers, 60.5% were from electronic/electrical and mechanical engineering departments, 10.8% were untitled. Among the general teachers, 67.6% were from English, Chinese, mathematics and computer concept subjects.

Table 3.7

Frequency Distribution of the Respondent's Specialty Area for Vocational Teachers

Specialty Area	Number	Percent
1. Electronic/Electrical	124	29.9
2. Mechanical	127	30.6
3. Automobile Mechanists	42	10.1
4. Chemical Engineering	20	4.8
5. Information Technology	25	6.0
6. Architecture Cluster	32	7.7
7. Untitled	45	10.8
Total	415	100.0

Table 3.8

Frequency Distribution of the Respondent's Specialty Area for General Teachers

Gender	Number	Percent
1. English	54	19.6
2. Chinese	72	26.2
3. Music, Arts, PE & History	13	4.7
4. Social Science & Geometry	38	13.8
5. Math & Computer Concept	60	21.8
6. Science	22	8.0
7. Untitled	16	5.8
Total	275	100.0

Instrument

A draft questionnaire was developed to collect data on several variables concerning vocational industrial secondary school teachers in Taiwan. Part A was used to measure several aspects of the dependent variable, teachers' attitudes about the teaching environment related to policy, curriculum, and technology in the teachers' teaching specialty areas. There were ten questions and for each the response format was a 6-point Likert scale from 1 for strongly disagree to 6 for strongly agree (see Appendix A).

Part B was used to measure another dependent variable, attitudes about roles in decision-making. There were nine questions, and for each the response format employed a 4-point Likert scale from 1 for no involvement to 4 for great involvement. Teachers rated both their current involvement and their preferred involvement.

Part C collected demographic information, most to be used as the independent variables. It included six questions about gender, age, position in school, education level, and teaching specialty area.

Part D was used to measure another dependent variable, concerns about teaching new technological courses. There were five questions, and for each the response format employed a 6- point Likert scale from 1 for strongly disagree to 6 for strongly agree. These last questions were intended for the vocational teachers only because they focused on technological courses.

Reliability and Validity of Thiebach and Lin Questionnaires

In Part B (Attitudes about Roles in Decision Making) of the questionnaire, eight out of nine questions (except Question 9) were adapted from the questionnaire of

Thierback (1980). Thierback used the Cronbach alpha reliability coefficient to establish the reliability of the "Decision Involvement Analysis." Thierback reported that the reliability coefficient for all 20 of his decision involvement questions was .86.

All five questions in Part D (Attitudes about Teaching Technologies), and five out of ten questions (except Question 3 and 7-10) in Part A (Teachers' Attitudes about the Teaching Environment), were adapted from the questionnaire by Lin (1995). Lin indicates "the content validity and face validity of the instrument in this study was established by a panel of experts, the dissertation committee, and five Chinese Ph. D. students of The Ohio State University, who had teaching experience in Taiwan" (p. 124). From Lin's pilot-test and a field test, the Cronbach reliability coefficient for "Teachers' Attitudes Toward Technological Change was .83. Alpha was based on 28 items about curriculum, teaching assignments, and updating equipment.

According to Gliner and Morgan (2000), "A reliability coefficient of .70 or higher is usually considered necessary for a measure to have acceptable reliability" (p. 388). The reliability coefficients for the instruments by Thierback and Lin were higher than .70, but for many (20 and 28) items; alpha is known to increase as the number of items increases.

Reliability and Validity of Questionnaire Used in this Study

After the proposal was approved, the researcher translated the questionnaire into Chinese. Then the researcher found someone very good at both English and Chinese to do the back translation so the back translation could be compared with the original English version to see if there are any major differences. Fortunately, there were not any major differences, so no revisions needed to be made.

Content validity of the survey questions was done by identifying four Taiwanese professors and/or teachers who were knowledgeable about vocational education in Taiwan. They, as well the Ph. D committee, were asked to review the questionnaire for clarity and completeness.

Principal components (factor) analysis on each of the three sets of dependent variable scales was computed to see if there was more than one meaningful factor for each scale. Cronbach alpha was computed for each meaningful component or subset of questions.

For Part A, the principal components analysis did not produce meaningful factors, partly because correlations among the several items were low. The Cronbach alpha for the ten items was .49, which was not judged to be acceptable to make an overall attitude about the teaching environment summated scale score. Furthermore, the Lin study (1995) treated each of these items separately, so item A1 to A10 were analyzed separately.

For Part B, the current and preferred participation in decision-making generally produced two factors, instructional and managerial. Tseng (1989) also divided his instrument into instruction-related and managerial-related items. Table 3.12 shows the results of the two principal component analyses: one for the preferred roles and one for the teachers' current roles. Note with the exception of item 7 for the current role, the factor analysis was quite clear. Therefore, I constructed two summated scales from the decision-making items: managerial and instructional. The researcher's Cronbach alpha for the instructional (now) scale was .58; for the instructional (like) scale was .74; for the managerial (now) scale was .85; for the managerial (like) scale was .85.The low alpha (.58) for instructional now scale is due to the fact that item 7 did not fit as well

statistically in the current instructional involvement scale as it did in the preferred instructional involvement scale. Also, with only four items, it is harder to get a high alpha than with many items. Nevertheless, item B7 was included in the current instructional scale so that the two instructional scales would have the same four items.

Table 3.9

Principal Components Analysis of Teachers' Current and Preferred Participation in Decision-Making Items (n=690)

	Preferred		Current	
	Manage	Instruct	Manage	Instruct
Managerial				
B4 Set & revise school's goals.	.84	----	.86	----
B2 Establish disciplinary policies.	.82	----	.82	----
B5 Determine procedures for teachers' evaluation.	.76	----	.83	----
B3 Plan student advisory programs.	.75	----	.75	----
B8 Hire a new faculty member.	.54	.49	.62	.49
Instructional				
B6 Select textbooks &other instructional materials.	----	.86	----	.86
B1 Develop procedures for assessing students achievement.	----	.70	----	.70
B7 Allocate materials & equipment.	.43	.65	.65	.52
B9 Determine teaching assignment.	----	.62	----	.62

Note. Principal components analysis with varimax rotation. These two factors account for 63% and 58%, respectively, of the variance in the preferred and current analysis. Loadings less than .40 are shown with dashes.

For Part D, the five items, with item 1 reversed, were moderately correlated; and the Cronbach alpha was .75. However, the five items were analyzed separately and with a MANOVA for research question 6 and 7.

Variables

Thus, there are three sets of dependent variables (DVs) in this study. Teachers' attitudes about (a) the vocational teaching environment, (b) their roles in decision-making (both current and preferred), and (c) their concern about teaching new technologies are the three sets of dependent variables. Whether the participant was (a) a vocational or general teacher, (b) difference between current and preferred roles in decision-making, (c) age, and (d) vocational department are the four main independent variables in the research questions. Other potential independent variables (teaching only vs. teach and administer, gender, and education level of the teacher) were measured, but only were used for supplemental analysis.

Data Analysis

There were seven research questions. Question 1, 2, and 3 are descriptive questions about each of the three sets of dependent variables, separately for vocational and general teachers . Therefore, means, standard deviations, and percentages were computed for each question.

Composite scores for Part B (based the principal components analysis) were computed. These composite scale scores were used to answer parts of questions 4-7. For the *t* test used for questions 4 and 5, the equality of the variance assumption was tested

with the Levene test. If the assumption was violated, the adjusted *t* (equal variances not assumed) was used.

Question 4 had one IV (general subject or vocational-related subject teachers) which had two levels; and two sets of DVs: ten attitudes about the vocational teaching environment and the current and preferred roles in instructional and managerial decision-making. Independent samples *t* tests were used to analyze teachers' attitude differences.

Question 5 again had one IV (general or vocational teacher) and four sets of DVs (current and preferred instructional decisions, and managerial decisions) and four paired *t* tests.

Research questions 6 and 7 plus the supplemental statistics were for vocational teachers only.

Question 6 had one IV (Independent Variable), age, which had five ordered levels, and three sets of DVs (Dependent Variables), which were (a) attitudes about the vocational teaching environment, (b) roles in decision-making (current and preferred), and (c) teaching assignments, each with many ordered levels. For (a) one-way MANOVA and 10 univariate ANOVAs were used to analyze vocational teachers' attitudes about the environment and age. For (b) one-way ANOVAs compared the five age groups on the instructional and managerial decision-making scales. For (c) above, MANOVA as well as five univariate *Fs* were used to compare the age groups.

Question 7 had one IV, kinds (or departments) of the vocational-related subject teachers, which had six nominal levels, and three sets of DVs: attitudes about the vocational teaching environment, roles in decision-making and teaching assignments, which had many levels. The same types of analyses were used as for question 6.

Although not formally research questions, the researcher also looked at differences for the vocational teachers between their levels of education. The researcher also examined whether or not they had a partial administrative role on each of the dependent variables.

CHAPTER 4

RESULTS

This chapter contains information about the results to each of the research questions. Supplemental analyses will be made about differences for vocational teachers between those with partially administrative positions and those who were full-time teachers. In addition, the researcher will comment on education differences for vocational teachers.

Research Question 1

What are teachers' attitudes about their vocational school teaching environment, especially changes involving new technologies?

Table 4.1 and 4.2 show that more than half of both vocational and general teachers moderately or strongly agree with those four statements: A9 (Main focus of vocational high school is to enhance English, mathematics and science), A6 (New technology increases teaching effectiveness), A2 (Basic curricula are more important than high tech), and A8 (Having a second major field makes one's job more secure), which for both groups rank in the top four. On the other hand, most teachers from both general and vocational fields at least slightly disagree with A3 (90% of the vocational high should be abolished), A4 (I feel stress to learn new technology), and A5 (Lecture teaching methods are as effective as high-tech ones). Especially on item A3, 90% vocational high should be abolished, 55% general teachers and 79% vocational teachers moderately or strongly disagree it.

Table 4.1

Vocational Teachers' Attitudes about Their Teaching Environment

No. (Rank)	Items	%SD+MD	%MA+SA	*M*
A9 (1)	Main focus of voc high is to enhance English, math and science.	4.3%	62.8 %	4.74
A6 (2)	New tech increased teaching effectiveness.	3.7	60.4	4.63
A2 (3)	Basic curricula more important than high tech.	6.1	59.6	4.55
A8 (4)	Having a second field major, job more secure.	6.5	53.7	4.50
A7 (5)	Changes dampen teaching enthusiasm.	13.1	43.5	4.13
A1 (6)	Current curricula adequate to catch up with tech change.	20.7	23.8	3.53
A5 (7)	Lecture teaching methods are as effective as high-tech ones	27.3	18.3	3.28
A10 (8)	Voc high more competitive in recruiting students if become comprehensive high.	33.3	22.4	3.27
A4 (9)	Feel stress to learn new tech.	39.9	12.1	2.98
A3 (10)	90% voc high be abolished.	78.8	7.2	1.81

Table 4.2

General Teachers' Attitudes about Their Teaching Environment

No. (Rank)	Items	%SD+MD	%MA+SA	*M*
A9 (1)	Main focus of voc high is to enhance English, math and science.	3.3%	74.9 %	5.04
A6 (2)	New tech increased teaching effectiveness.	3.3	60.6	4.65
A8 (3)	Having a second major field makes one's job more secure.	4.7	58.5	4.65
A2 (4)	Basic curricula are more important than high tech.	6.2	51.5	4.46
A10 (5)	Voc high will be more competitive in recruiting students if they become comprehensive high.	16.0	40.7	3.99
A7 (6)	Changes dampen teaching enthusiasm.	16.5	36.2	3.91
A5 (7)	Lecture teaching methods are as effective as high-tech ones.	25.4	16.9	3.27
A4 (8)	I feel stress to learn new tech.	31.0	13.1	3.19
A1 (9)	Current curricula are adequate to catch up with tech change.	28.7	13.5	3.16
A3 (10)	90% voc high should be abolished.	54.9	13.1	2.50

Research Question 2

How much participation in decision-making do teachers perceive they have now?

Table 4.3

Vocational Teachers' Current Participation in Decision Making

No. (Rank)	Items	%NI+LI	%SI+GI	*M*
	Managerial.			
B2 (7)	Establish disciplinary policies.	56.5%	43.5%	2.31
B3 (5)	Plan student advisory programs.	49.0	51.0	2.47
B4 (8)	Set & revise school's goals.	61.0	39.0	2.23
B5 (9)	Determine procedures for teachers' evaluation.	67.3	32.7	2.08
B8 (6)	Hire a new faculty member. to teach.	50.1	49.9	2.42
	Instructional			
B1 (2)	Develop procedures for assessing students' achievement.	14.8	85.2	3.29
B6 (1)	Select textbooks & other instructional materials.	7.6	92.4	3.52
B7 (3)	Allocate materials & equipment.	30.1	69.9	2.93
B9 (4)	Determine teaching assignments.	31.8	68.2	2.90

Table 4.3 and 4.4 show that more than half of the teachers have some or great involvement in decision-making in regard to four current instructional decisions, B6 (Select textbooks and other instructional materials), B1 (Develop procedures for assessing students' achievement), B7 (Allocate materials and equipment), and B9 (Determine teaching assignment). For vocational teachers, these decisions and the percentage having some or great current involvement were: selecting textbooks and other instructional materials (92%), developing procedures for assessing students achievement

(85%), allocate materials and equipment (70%), and determine teaching assignment (68%). On the other hand, both vocational and general teachers have the least participation in three managerial decisions: B2 (Establish disciplinary policies), B4 (Set and revise school's goals), and B5 (Determine procedures for teachers' evaluation). For vocational teachers, these three decisions and the percentage with no and little involvements were 57%, 61%, and 67%, respectively.

Table 4.4

General Teachers' Current Participation in Decision Making

No. (Rank)	Items	%NI+LI	%SI+GI	*M*
	Managerial			
B2 (7)	Establish disciplinary policies.	75.0%	25.0%	1.93
B3 (6)	Plan student advisory programs.	60.1	39.9	2.27
B4 (8)	Set & revise school's goals.	74.9	25.1	1.86
B5 (9)	Determine procedures for teachers' evaluation.	74.9	25.1	1.84
B8 (5)	Hire a new faculty member. to teach.	50.4	49.6	2.42
	Instructional.			
B1 (2)	Develop procedures for assessing students' achievement.	16.0%	84.0 %	3.37
B6 (1)	Select textbooks & other instructional materials.	6.2	93.8	3.66
B7 (4)	Allocate materials & equipment.	44.0	56.0	2.55
B9 (3)	Determine teaching assignment.	45.2	54.8	2.56

Research Question 3

How concerned are vocational teachers about their assignments to teach new technologies?

Table 4.5 shows that D1 was a reverse statement compared to other four statements. Only 5% of the respondents moderately or strongly agree that they are not satisfied with teaching technology courses. About 23% of the respondents moderately or strongly agree with D4 (I feel stress when assigned to teach new technologies), and the mean of 3.62 indicated that these ratings were close to 4 so slightly agree on average. However, only 10-12% of the vocational-related teachers moderately or strongly disagree with D3 (Not have an adequate background in some teaching courses), D2 (Not like to teach computer-related courses for their fast changes), and D5 (Teaching new technological courses makes me burn out). These three means (2.69, 2.70 and 2.88) were all close to slightly disagree.

Table 4.5

Vocational Teachers' Concerns about Their Assignments to Teach New Technologies

No. (Rank)	Items	*%SD+MD*	*%MA+SA*	*M*
D1R (1)	Feel satisfied with teaching tech-related courses.	65.9	4.6	2.27
D3 (2)	Not have an adequate background in some teaching courses.	50.3	9.7	2.69
D2 (3)	Not like to teach computer-related courses for their fast changes.	48.5	11.8	2.70
D5 (4)	Teaching new tech courses makes me burn out.	38.6	10.6	2.88
D4 (5)	I feel stress when assigned to teach new tech.	21.0	23.2	3.62

Research Question 4

Are there differences between general subject teachers and vocational-related teachers' attitudes about a) the vocational teaching environment, b) their current roles in decision-making, and c) their preferred roles?

Table 4.6

Differences Between General and Vocational Teachers' Attitudes About the Teaching Environment

	General (N= 275)		Voc (N= 415)				
Items	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
1. Current curricula adequate to catch up with tech change.	3.16	1.16	3.53	1.27	-3.97	<.001	.30
2. Basic curricula more important than high tech.	4.46	1.16	4.55	1.15	-.97	.330	.08
3. 90% voc high be abolished.	2.50	1.44	1.81	1.27	6.40	<.001	.51
4. Feel stress to learn new tech.	3.19	1.29	2.98	1.31	2.00	.045	.16
5. Lecture teaching methods are as effective as high-tech ones	3.27	1.20	3.28	1.26	-.10	.918	.01
6. New tech increased teaching effectiveness	4.65	.98	4.63	1.01	.22	.825	.02
7. Changes dampen teaching enthusiasm.	3.91	1.33	4.13	1.29	-2.13	.034	.17
8. Having a second field major, job more secure.	4.65	1.13	4.50	1.07	1.73	.085	.14
9. Main focus of voc high is to enhance Eng, math and science.	5.04	1.11	4.74	1.09	3.50	<.001	.27
10. Voc high more competitive in recruiting students if become comprehensive high.	3.99	1.42	3.27	1.51	6.29	<.001	.49

RQ 4a. According to Cohen (1988), who provided rules for interpreting effect sizes, d=.2 was a small effect; d=.5 was a medium effect; d=.8 was a large effect. Although six of the items shown on Table 4.6 were significant, sizes of effect were not large. The effect size for A1 (Current curricula are adequate to catch up with tech change)

was small to medium (d= .30) with vocational teachers more in agreement. A3 (90% of the vocational high should be abolished) had a medium effect (d=.51); and A4 (I feel stress to learn new technology) had a small effect (d=.16), both with general teachers disagree less. Vocational teachers were more in agreement with A7 (Changes dampen teaching enthusiasm), which had a small effect d=.17. However, general teachers agreed more with both A9 (Main focus of voc high is to enhance English, math, and science) which had a small effect (d=.27) and A10 (Voc high schools will be more competitive in recruiting students if they become comprehensive high schools) with a medium (d=.49) effect size.

RQ 4b. Table 4.7 indicates that differences on the current instructional and managerial scales between general and vocational teachers were significant; vocational teachers had more participation than general teachers. The effect sizes were d=.23 (small) for instructional and d=.31 (small to medium) for managerial.

Table 4.7

General and Vocational Teachers' Current Roles in Decision-Making

	General	Vocational			
Issues	n=275	n=415			
	M	*M*	*t*	*p*	*d*
Instructional scale	3.03	3.16	-2.90	.004	.23
Managerial scale	2.07	2.30	-4.07	<.001	.31

RQ 4c. Table 4.8 shows that for both the preferred instructional and managerial scales, the differences between general and vocational teachers were not significant.

Table 4.8

General and Vocational Teachers' Preferred Roles in Decision-Making

	General	Vocational		
Issues	*n=275*	*n=415*		
	M	*M*	*t*	*p*
Instructional scale	3.47	3.43	1.08	.283
Managerial scale	2.89	2.92	-.48	.632

Research Question 5

Are there differences between the current and preferred roles in decision-making for (a) vocational-related teachers, and (b) general teachers?

RQ 5a. Table 4.9 represents that for both the instructional scale and the managerial scale the differences were significant; that is, the vocational teachers had higher preferred than current scales. The effect size was medium for instructional and large for managerial. They wanted more participation than they currently have, especially in the managerial area.

RQ 5b. The paired *t* tests also show significantly more preferred than current involvement for both the instructional scale and the managerial scale for the general

teachers in Table 4.10. The effect size for instructional was large and for managerial was very large. That might be because only 16.8% (versus 32.1% for vocational teachers) general teachers had an administrative as well as teaching position.

Table 4.9

Differences Between the Current and Preferred Roles in Decision-Making for Vocational Teachers

	Current		Preferred		Paired		
Issues	*n*= 415		*n*= 415				
	M	*SD*	*M*	*SD*	*t*	*p*	*d*
Instructional scale	3.16	.57	3.43	.55	10.54	<.001	.52
Managerial scale	2.31	.78	2.92	.69	16.15	<.001	.79

Table 4.10

Differences Between the Current and Preferred Roles in Decision-Making for General Teachers

Issues	Current		Preferred		Paired		
	n= 275		*n*=275				
	M	*SD*	*M*	*SD*	*t*	*p*	*d*
Instructional scale	3.03	.58	3.47	.55	12.83	<.001	.77
Managerial scale	2.07	.73	2.89	.69	16.15	<.001	.02

Research Question 6

For vocational teachers, are there relationships between teachers' age and their attitudes in regard to (a) the vocational school teaching environment, (b) their roles in decision-making, and (c) their teaching assignments?

RQ 6a. Table 4.11 shows that, overall, there are age differences; i.e., the MANOVA is significant. In addition, half of the overall univariate *F*s for the ten items were significant. The significant univariate *F*s, indicating some differences among the four age groups, were: A1 (Current curricula are adequate to catch up with technological change), A2 (Basic curricula are more important than high technology), A3 (90% of the vocational high schools should be abolished), A4 (I feel stress to learn new technology), and A10 (Vocational high schools will be more competitive in recruiting new students if they become comprehensive high).

Table 4.11

Relationships Between Vocational Teachers' Age and Their Attitudes in Regard to Their Teaching Environment

	Age					
	20-29	30-39	40-49	50+		
Issues	*n*=34	108	199	63		
	M	*M*	*M*	*M*	*F*	*p*
MANOVA	----	----	----	----	2.32	<.001
1. Current curricula adequate to catch up with tech change.	2.85a	3.56b	3.64b	3.44b	3.91	.009
2. Basic curricula more important than high tech.	4.03a	4.62b	4.66b	4.44ab	3.30	.021
3. 90% voc high be abolished.	1.76a	1.50a	1.78a	2.37b	6.57	<.001
4. Feel stress to learn new tech.	2.82a	2.60a	3.05ab	3.57c	7.95	<.001
5. Lecture teaching methods are as effective as high-tech ones	2.97	3.31	3.30	3.35	.77	.510
6. New tech increased teaching effectiveness	4.71	4.63	4.66	4.49	.53	.664
7. Changes dampen teaching enthusiasm.	4.03	4.06	4.27	3.86	1.89	.130
8.Having a second field major, job more secure.	4.50	4.31	4.56	4.57	1.34	.262
9. Main focus of voc high is to enhance Eng, math and science.	4.85	4.62	4.74	4.89	.94	.423
10. Voc high more competitive in recruiting students if become comprehensive high.	3.03a	3.19a	3.22a	3.76b	2.72	.044

Note. 11 subjects missing age. Means in the same row that do not share subscripts differ at $p < .05$.

Means in the same row that do not share subscripts differ at $p < .05$. Thus, for A1 (Current curricula are adequate to catch up with technological change) the youngest age group (20-29) disagreed more than the three older groups with this statement. For A2 (Basic curricula are more important than high technology) the middle age groups (30-49) agreed more with this statement than the youngest group (20-29). For A3 (90% of the vocational high schools should be abolished) the age 50+ group agreed more with this statement than the other three groups. For A4 (I feel stress to learn new technology) the age 50+ group also agreed more with this statement than the other three groups. For A10 (Vocational high schools will be more competitive in recruiting new students if they become comprehensive high schools) the age 50+ group agreed more with this statement than the other three groups.

RQ 6b. Table 4.12 represents that both the current instructional and current managerial decision scales were significant. Therefore, there were some relationships between teachers' age and their attitudes in regard to their current roles in decision-making, but no difference for the preferred scales. For instructional current, the mean of the 20-29 age group was lower than for the other three groups, which means that the young vocational teachers had less involvement than the older ones. For managerial current, the mean of the age 50+ group average was higher than the other three groups, which means that they had more involvement than the younger ones.

Table 4.12

Relationships Between Vocational Teachers' Age and Their Attitudes in Regard to Their Current and Preferred Roles in Decision-Making

	Age					
	20-29	30-39	40-49	50+		
Issues	*n*=37	105	197	62		
	M	*M*	*M*	*M*	*F*	*p*
Instructional current	2.94a	3.19b	3.15b	3.28b	2.90	.035
Managerial current	2.11a	2.21a	2.31a	2.55b	3.44	.017
Instructional preferred	3.34	3.50	3.41	3.38	1.17	.320
Managerial preferred	2.83	2.97	2.92	2.90	.38	.771

Note. 14 subjects missing. Means in the same row that do not share subscripts differ at $p < .05$.

RQ 6c. Overall, for the D items, there was no difference. Separately, only item D5 (Teaching new tech courses makes me burn out) was significant. In that case, the two youngest groups (20-39) disagreed more than the two older groups (40+).

Table 4.13

Relationships Between Vocational Teachers' Age and Their Attitudes in Regard to Their Teaching Assignments

	Age					
	20-29	30-39	40-49	50+		
	n=37	108	201	64		
Issues	*M*	*M*	*M*	*M*	*F*	*p*
MANOVA	----	----	----	----	1.30	.192
1. Feel satisfied with teaching tech-related course.	4.92	4.83	4.69	4.61	1.12	.341
2. Not like to teach computer-related courses for their fast changes.	2.38	2.63	2.74	2.87	1.18	.318
3. Not have an adequate back-ground in some teaching courses.	2.73	2.51	2.77	2.72	.91	.435
4. Feel stress when assigned to teach new tech.	3.78	3.49	3.66	3.61	.64	.589
5. Teaching new tech courses makes me burn out.	2.70a	2.61a	2.94b	3.16b	3.04	.029

Note. 5 subjects missing. Means in the same row that do not share subscripts differ at $p < .05$.

Research Question 7

Are there differences among the areas/departments of the vocational teachers in regard to their attitudes about a) the vocational teaching environment, b) their roles in decision-making, and c) their teaching assignments?

RQ7a. According to the MANOVA analysis (refer to Table 4.14), overall, there was significance for the A items. Separately, A3 (90% of the vocational high schools should be abolished), A4 (I feel stress to learn new technology), and A10 (Vocational high schools will be more competitive in recruiting new students if they become comprehensive high schools) had significant department differences. For item A3 (90% of the vocational high schools should be abolished), the IT group teachers agreed more than the other five groups. For A4 (I feel stress to learn new technology), the Auto group and architecture group teachers disagree more than the other four groups. For A10 (Vocational high schools will be more competitive in recruiting new students if they become comprehensive high schools), the chemical group teachers agreed more than the mechanical group teachers, and also agreed more than the architecture teachers.

Table 4.14

Differences Among the Areas/Departments of the Vocational Teachers in Regard to Their Attitudes about the Vocational Teaching Environment

	Department							
	EE	Mech	Auto	Chem	IT	Arch		
	n=120	120	41	20	25	32		
Issues	*M*	*M*	*M*	*M*	*M*	*M*	*F*	*p*
MANOVA	----	----	----	----	----	----	1.64	.004
1. Current curricula adequate to catch up with tech change.	3.61	3.32	3.66	3.45	3.56	3.66	.90	.479
2. Basic curricula more important than high tech.	4.66	4.35	4.59	4.65	4.80	4.69	1.31	.258
3. 90% voc high be abolished.	1.58a	1.71a	1.85a	1.65a	2.56b	1.47a	3.18	.008
4. Feel stress to learn new tech.	3.11a	3.07a	2.59b	2.90ab	3.12a	2.25b	3.14	.009
5. Lecture teaching methods are as effective as high-tech ones	3.34	3.07	2.95	3.40	3.52	3.44	1.53	.180
6. New tech increased teaching effectiveness	4.58	4.68	4.63	4.70	4.80	4.69	.26	.937
7. Changes dampen teaching enthusiasm.	4.16	4.07	4.46	3.95	3.72	4.34	1.39	.227
8.Having a second field major, job more secure.	4.57	4.52	4.12	4.85	4.48	4.41	1.64	.148
9. Main focus of voc high is to enhance Eng, math and science.	4.68	4.77	4.95	4.95	4.48	4.75	.79	.555
10. Voc high more competitive in recruiting students if become comprehensive high.	3.28abc	3.07a	3.20abc	3.85b	3.64abc	2 .91ac	1.70	.004

Note. 57 subjects missing or had a department that didn't fit these six categories. Means in the same row that do not share subscripts differ at $p < .05$.

RQ 7b. Table 4.15 shows that none of the overall *F*s was significant. Therefore, there was no difference between the different departments on the current or preferred roles in decision-making.

Table 4.15

Differences Among the Areas/Departments of the Vocational Teachers in Regard to Their Current and Preferred Roles in Decision-Making

	Department							
	EE	Mech	Auto	Chem	IT	Arch		
	n=124	127	42	20	25	32		
Issues	*M*	*M*	*M*	*M*	*M*	*M*	*F*	*p*
Instructional current	3.21	3.07	3.14	3.38	3.21	3.20	1.46	.203
Managerial current	2.25	2.20	2.40	2.39	2.32	2.22	.62	.683
Instructional preferred	3.43	3.44	3.49	3.63	3.23	3.44	1.37	.236
Managerial preferred	2.89	2.89	3.06	3.16	2.62	2.90	1.85	.102

Note. 45 subjects missing or had a department that didn't fit these categories.

RQ 7c. Overall, for the D items in Table 4.16, the MANOVA was not statistically significant. Separately, only item D1 (I feel satisfied with teaching tech-related courses) was significant. Electronics and automobile repairs teachers agreed more with this statement than mechanical and chemical teachers.

Table 4.16

Differences Among the Areas/Departments of the Vocational Teachers in Regard to Their Teaching Assignment

	Department							
	EE	Mech	Auto	Chem	IT	Arch		
	n=123	123	42	20	25	32		
Issues	*M*	*M*	*M*	*M*	*M*	*M*	*F*	*p*
MANOVA	----	----	----	----	----	----	1.33	.128
1. Feel satisfied with teaching tech-related course.	4.94a	4.63b	5.10	4.40b	4.72ab	4.84ab	2.74	.019
2. Not like to teach computer-related courses for their fast changes.	2.49	2.76	2.62	3.15	2.48	2.75	1.14	.341
3. Not have an adequate back-ground in some teaching courses.	2.54	2.78	2.45	2.45	2.60	2.56	.67	.649
4. Feel stress when assigned to teach new tech.	3.43	3.82	3.36	3.80	3.44	3.34	1.89	.095
5. Teaching new tech courses makes me burn out.	2.68	3.05	2.79	2.65	2.68	2.59	1.44	.209

Note. 50 subjects missing or had a department that didn't fit these six categories. Means in the same row that do not share subscripts differ at $p < .05$.

Supplemental Analyses

Although not a formal research question, the researcher summarized briefly the results of comparing vocational teachers who have some administrative duties and those

who do not. There was no overall difference between those groups on the Part A questions (attitudes about the teaching environment, especially related to new technologies and the future of vocational schools). As expected teachers with administrative duties have more involvement currently than teachers without administrative duties; both current instructional and managerial scales were significant. The preferred involvement managerial scale was also significant. That is to say, teachers with administrative duties would like more involvement in management than teachers without administrative duties. There was no overall difference between those groups on the Part D questions, attitudes about teaching new technologies.

The other potential independent variable that was examined briefly was that of vocational teachers' education level. There was no overall difference between the education groups on the Part A questions, attitudes about the teaching environment. However, for the Part B questions, teachers' attitude in regard to their current and preferred roles in decision-making, and for the Part D questions, attitudes about teaching new technologies, there were significant differences. For the current instructional scale, the master's and doctorate degree group had more involvement in decision-making than those with a BS from a teachers college. For the current managerial scale, those with a BS from a general college and those with a MS/PhD also had more involvement than those with BS from a teacher college. For the preferred instructional involvement scale, the MS/PhD and BS from a general college would like more involvement than BS from a teachers college group. For the Part D questions, attitudes about teaching new technologies, only D1 (I feel satisfied with teaching courses related to new technologies) was significant. The MS/PhD teachers felt more satisfied than the BS with general

college group. Overall, the teacher who was well educated was probably more likely to have administrative duties and, thus, more involvement, and also would like to have more involvement in decision-making.

Summary

Table 4.17 summarizes significant findings and effect sizes about RQ 4, which compared vocational and general teachers on Part A (attitudes about the teaching environment), and Part B (teachers' attitude in regard to their current and preferred roles in decision-making). It also compared, separately for the vocational and general teachers, whether they preferred more involvement in decision-making than they currently had.

Table 4.18 summarizes significant findings about RQ 6 and 7, which compared age groups and department groups of vocational teachers on Part A (attitudes about the teaching environment), Part B (teachers' attitude in regard to their current and preferred roles in decision-making), and Part D (attitudes about teaching new technologies). It presented the direction of significant differences (which age/department group is higher than which age/department group).

Table 4.17

Summary of the Statistically Significant Differences

Item	Direction of Differences	Effect Size
Agreement with the statement		
A1. Current curricula are adequate to catch up with tech change.	Voc > Gen	S-M
A3. 90% of the voc high should be abolished.	Gen > Voc	M
A4. I feel stress to learn new tech.	Gen > Voc	S
A7. Changes dampen teaching enthusiasm.	Voc > Gen	S
A9. Main focus of voc high is to enhance English, math and science.	Gen > Voc	S
A10. Voc high will be more competitive in recruiting students if they become comprehensive high.	Gen > Voc	M
Involvement in decision-making		
Current instructional scale	Voc > Gen	S
Current managerial scale	Voc > Gen	S-M
Instructional scale for Gen	Pref > Cur	M
Managerial scale for Gen	Pref > Cur	L
Instructional scale for Voc	Pref > Cur	L
Managerial scale for Voc	Pref > Cur	VL

Note. Voc: vocational teachers. Gen: general teachers. Pref: preferred. Cur: current. S: small. M: medium. S-M: small to medium. L: large. VL: very large.

Table 4.18

Summary of Significant Age and Department Differences for Vocational Teachers

Item	Direction Differences
Agreement with the statement	
A1. Current curricula are adequate to catch up with tech change.	30-50+ > 20-29
A2. Basic curricula are more important than high technology.	30-49 > 20-29
A3. 90% of the voc high should be abolished.	20-49 > 50+
A4. I feel stress to learn new tech.	50+ > 20-49
A10. Voc high will be more competitive in recruiting students if they become comprehensive high schools.	50+ > 20-49
Involvement in decision-making	
Instructional current	30-50+ > 20-29
Managerial current	50+ > 20-49
Agreement with the statement	
D5. Teaching new tech courses makes me burn out.	40-50+ > 20-39
A3. 90% of the voc high should be abolished.	IT > other five groups
A4. I feel stress to learn new tech.	IT, EE, Mech > Auto, Arch
A10. Voc high will be more competitive in recruiting students if they become comprehensive high schools.	Chem > Mech, Arch
D1. I feel satisfied with teaching tech-related courses.	Auto, EE > Mech, Chem

Note. IT: information technology. EE: electrical/electronic. Mech: mechanical. Chem: chemical. Arch: architecture. Auto: automobile repairs.

CHAPTER 5

SUMMARY, DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

This chapter presents a summary of the study and the findings concerning secondary teachers' attitudes about changes in the public vocational schools in Taiwan; the study focuses on analyzing and interpreting seven research questions. This chapter includes four parts. First, an overview of the study is provided. Second, a discussion of the findings of each of the seven research questions, including their relation to the literature is presented. Third, recommendations and suggestions are presented which may be beneficial for both the Ministry of Education decision-makers and secondary teachers to apply to changes in Taiwan. Fourth, conclusions are drawn based on the findings of the current study and on the literatures cited earlier.

Overview of the Study

Historical Background

This study was an investigation into three sets of dependent variables: (a) teachers' attitudes about their vocational school teaching environment, especially changes involving new technologies, (b) teachers' current and preferred roles in decision making, and (c) teachers' attitudes about their teaching assignments. The study also explored possible effects of the predictor variables (age, whether or not the teacher had an administrative position, educational level, and the respondent's specialty area) on the three dependent variables.

The first vocational education system of Taiwan was established by the Japanese in 1919 (Ministry of education, 1957) during the period of occupation. Taiwanese children were encouraged to enroll in agriculture programs (Jeng, 1980) in the secondary education system. Japan carried out an economic policy, which focused on industrialized Japan and agriculturized Taiwan.

During the period of World War II, for the purpose of training workers for weapons production and military service, nine industrial secondary schools were established (Jeng, 1980). When World War II was over, Japan surrendered and Taiwan was transferred to the Republic of China in September 1945. In the 1950's, Taiwan's economy was still based on agriculture. Raper, Chuan and Chen (1954) point out that reforms in education began in June 1952. The revised industrial curricula in secondary vocational schools were divided into five main technical departments: mechanical technology, electrical technology, mining and metallurgical technology, civil technology, and chemical technology. Jeng (1980) states that the revised curricula were engineering-oriented, which provided students with both a wide range and cluster knowledge of technical theories and skill training.

In 1955, the engineering–oriented curricula were replaced by a unit-trade program with emphasis on shop skills and competencies. *The Chinese Education Yearbook (1957)* indicates that nine trades were taught in the eight pilot schools. Koo (1966) pointed out that the employment rate of the graduates who had completed unit-trade training was, on an average, 2.25 times the rate of whose who had finished engineering-oriented programs.

Ashton, Green, James, and Sung (1999) indicated that educational planning in Taiwan started in 1964 with the *Preliminary Draft of the Long Range Education Plan* (PDLREP) for 1964-1982; which was drafted by the Ministry of Education aided by the United Nations. The First Manpower Plan (FMP), which was integrated with economic plans, followed shortly in 1966. Both plans enhanced vocational education rather than general (academic) high schools.

The ratio of students in general high schools to vocational high schools was 6:4 in 1960, 43:57 in 1970, 3:7 by 1995, 4:6 in 2000, and will be 5:5 by 2005. Ashton et al. (1999) stated, "This emphasis on vocational schools by 1970 was high by most standards and later become even more pronounced." (p. 88). The major goal of vocational high graduates is to go into the work force, where their career development needs have been neglected for years. Ch'ang (1994) also stated that the manipulation of the ratio between academic and vocational high school members was entirely in the hands of the Ministry of Education.

Tseng (1989) indicated that in 1969 the government of Taiwan began adjusting the ratio to a goal of 3:7 (general education schools to vocational schools) to meet Taiwan's changing economic needs, which in turn changed the outlook of Taiwan's economy. However, the vocational school teaching environment has changed rapidly in the last 15 years. In 1980, industrial trades were about equal to business and service trades. However, Hsu (2004) pointed out, among all trades in 2004, industrial trades were only 30%, business and service trades were up to 67%. This dramatic reduction of society's needs for industrial graduates becomes the harshest challenge for technological education. As a result, the total numbers of students wanting to attend vocational schools

declined dramatically. Thus, in recent years vocational schools were downsized, shop/lab hours were reduced, new technology courses were added, and some teachers were forced to teach in a different field or transfer to other vocational schools. Most of the vocational education changes in Taiwan were top-down processes, and the authorities of the Taiwan government seldom considered teachers' attitudes about educational changes (Lin, 1995). Therefore, teachers' current roles in decision making were limited, and they strongly preferred more involvement in decision making (Tseng, 1989). In regard to teachers' attitudes about their teaching assignments, it was common for many secondary school teachers to teach some classes in other fields or departments, but it is very difficult for teachers to teach well what they do not know well. Therefore, the retraining of teachers or getting teachers to teach a second specialization in another field become important issues (Liu & Yang, 2003).

Design of this Current Study

In the researcher's survey, 960 survey questionnaires were sent to teachers at 24 public vocational industrial high schools in Taiwan. A 77.50% response rate was achieved (744 respondents). Among the 690 useable returned questionnaires, 275 were general teachers (38% male and 62% female); and 415 were vocational teachers (93% male and 7% female). The majority of the general teachers were female while majority of the vocational teachers were male. From the results, general teachers were somewhat younger than the vocational teachers. On the contrary, vocational teachers were somewhat more likely than the general teachers to have a partly administrative position.

Concerning educational level, vocational teachers seemed more likely to have less than a bachelor's and also more likely to have a graduate degree than general teachers. Concerning the respondent's specialty area, 71% of the vocational teachers were from mechanical, electronic/electrical, and automobile mechanics. Among the general teachers, 68% taught Chinese, English, math, and computer concept subjects.

Discussion of the Findings from the Research Questions

Discussion of Research Question 1: What are teachers' attitudes about their vocational school teaching environment, especially changes involving new technologies?

The literature has shown that there have been many changes in education over the last century. Vocational high schools faced a difficult time recruiting sufficient students during the last decade. Not only did students with good academic grades choose academic instead of vocational high schools, but also the somewhat less qualified students chose comprehensive high schools rather than vocational schools. Because most students want to go to college, they choose comprehensive high schools, whose graduate enroll in colleges at a rate about 20% higher than the rates for vocational high school students (Liu & Yang, 2003). This was in accordance with survey question A10; general teachers agreed with the statement that vocational high schools will be more competitive in recruiting new students if they become comprehensive high schools. This is probably because comprehensive high schools require more course hours in English, math and science, which are needed to do well on college admissions tests.

In Part A, the researcher used five questions from Lin's (1995) questionnaires, which used the same 6-point Likert-type scale. For A1 (Current curricula are adequate to

catch up with technology change), the mean of vocational teachers in the researcher's survey was 3.53 while in Lin's was 3.78. The vocational teachers in the researcher's survey seemed to disagree a little more. However, both surveys almost showed the similar results, with the teachers in both surveys neutral on average. For A2 (Teaching students basic courses is more important than teaching them high technology courses), the mean in the researcher's survey was 4.55 while in Lin's was 2.42. In Lin's survey, most of the respondents moderately disagreed with this statement. The high standard deviation (SD= 1.1) also indicated that there was a great disagreement about the statement among the respondents. In the researcher's survey, vocational teachers moderately agree this statement. It is probably because times have changed. Present vocational teachers seem to perceive new technology to be less important than teachers eight years ago. In the information-based era, today's high-tech maybe becomes tomorrow's useless trash rapidly, but basic courses (math, science, computer, English) are still the fundamental principals for advanced studies.

For A4 (Feel stress to learn new technology), the mean of vocational teachers in the researcher's survey was 2.98 while in Lin's was 3.32. The vocational teachers in the researcher's survey seemed to disagree a little more. Probably today's teachers feel more comfortable to learn new technology. For A5 (lecture teaching methods are as effective as high-tech ones), the mean of vocational teachers in the researcher's survey was 3.28 (slightly negative) while in Lin's it was 4.38 (moderately positive). Probably today's high-tech teaching methods are more sophisticated, which makes teaching more attractive and effective for current teachers. For A6 (New technology can increase the effectiveness of teaching), the mean of vocational teachers in the researcher's survey was 4.63 while

in Lin's was 4.58. They were almost the same. Vocational teachers in both surveys moderately agree with this statement.

Discussion of Research Question 2: How much participation in decision-making do teachers perceive they have now?

Table 4.3 and 4.4 showed that half or more of both vocational and general teachers have some or great current involvement in decision-making in regard to the four instructional decisions. On the other hand, less than half of both vocational and general teachers have participation in four of five managerial decisions. The results inferred that many administrators still thought that the major job of teachers was teaching. Therefore, teachers had more involvement in regard to instructional decisions. However, managerial decisions were still under the authority of the top administrators.

Discussion of Research Question 3: How concerned are vocational teachers about their assignments to teach new technologies?

For Part D, the researcher used five questions from Lin's (1995) questionnaire with the same 6-point Likert-type scale. The sample (n=290) in Lin's survey consisted of Taiwan public secondary industrial vocational teachers in four teaching areas: machine shop, automobile mechanics, electronics, and electricity. For D1 (Do not feel satisfied with teaching tech-related courses), the mean of vocational teachers in the researcher's survey was 2.27 while in Lin's the mean for D1 was 2.92. The vocational teachers in the researcher's survey seemed to feel more satisfied (i.e., they agree with D1 less) than Lin's teachers. Vocational teachers in 1995 probably struggled with new technology

more than current teachers. For D2 (I do not like to teach computer-related courses because they change so fast), the mean in the researcher's survey was 2.70, while in Lin's it was 4.04. In the researcher's survey, vocational teachers disagree much more, probably because times have changed. Current vocational teachers seem to perceive technology changes much more positively than those of teachers in 1995.

For D3 (I do not have an adequate background in some teaching courses), the mean of vocational teachers in the researcher's survey was 2.69 while in Lin's was 3.21. Again, the vocational teachers in the researcher's survey seemed to disagree more. Probably current teachers have more background knowledge.

In Lin's survey, both Chinese and English versions, D4 and D5 were probably interpreted in very similar ways by the respondents. Lin's D4 stated as "I feel stress to teach new technology" while D5 was stated as "Teaching new technological courses makes me burn out." In the current researcher's survey, the researcher was concerned about the difference between before ("when assigned") and after (having actually taught new technological courses). Therefore, in the Chinese version, D4 was stated as "Upon hearing the *assignment* to teach new technological courses, *at that moment*, I feel stress" while D5 was stated as "*After having engaged in* teaching new technological courses, I feel burned out." For D4, the mean of vocational teachers in the researcher's survey was 3.62 while in Lin's it was 3.17. The vocational teachers in the researcher's survey seemed to agree more. Upon hearing that they were assigned to teach new technological courses, at that moment, probably vocational teachers feel stress. Because today's technology courses are more complex, most teachers would not choose to prepare to teach new ones if not assigned to do so. In contrast to the findings for D4, for D5, the mean of vocational

teachers in the researcher's survey was 2.88 while in Lin's it was 3.35. The vocational teachers in the researcher's survey seemed to disagree more. Probably current vocational teachers feel more confident about new technology after having engaged in teaching, and they may adjust themselves to the new courses easier than vocational teachers did in 1995.

Discussion of Research Question 4: Are there differences between general subject teachers and vocational-related teachers' attitudes about a) the vocational teaching environment, b) their current roles in decision-making, and c) their preferred roles?

In terms of teachers' attitudes about the teaching environment in vocational high schools, although the effect sizes from comparing general and vocational teachers were not large, six of the items were significant. Comparing the general and vocational teachers in the researcher's survey, for A1 (Current curricula are adequate to catch up with technological changes), general teachers disagree more than vocational teachers, who were neutral on average. Probably general teachers think the current curricula are simplified to fit students' lower academic level, and thus are not adequate to catch up with technological changes. In terms of A3 (90% of the vocational high schools should be abolished) vocational teachers strongly disagree while general teachers rated this between moderately disagree and slightly disagree. The effect size of the difference for A3 was medium (d = .51). The difference is probably because vocational teachers are afraid of losing their teaching jobs or at teaching in a different field while general teachers do not worry about this issue. If their vocational school is abolished and becomes a comprehensive high school, they will be needed to teach even more.

For example, with regard to question A4 (Feel stress when I try to learn new technology) the general teachers were higher. That was probably because general teachers need to teach the vocational students courses such as English, mathematics and science, which the students tend not to like and in which they have weak backgrounds. On the other hand, vocational teachers teach practical job operations that students like to learn. Thus, the general teachers felt much more stress, perhaps because of their students' low academic interest and performance. Most of the vocational teachers teach courses related to technology and are used to them, and so less stressed. In terms of A7 (Changes dampen teaching enthusiasm) vocational teachers agree more strongly, perhaps because technology changes rapidly while the general subjects probably remain little changed for years. In terms of A10 (Vocational high schools will be more competitive in recruiting students if they become comprehensive high schools) the effect size of the difference was medium. Vocational teachers are afraid that once their teaching school becomes a comprehensive high, the school will lose its traditional characteristics (Liu & Yang, 2003), which attract students, and the professional skills of students will go down dramatically. On the contrary, the general teachers may want to teach more competitive students to fulfill their job satisfaction.

Discussion of Research Question 5: Are there differences between the current and preferred roles in decision-making for (a) vocational-related teachers, and (b) general teachers?

Tseng's (1989) survey also pointed out that the mean score for desired participation (2.77) was significantly higher than the mean score for actual participation

(1.81). Similar results comparing current and desired participation were found in the researcher's 2003 survey for both instructional and managerial scales. For vocational teachers, the preferred involvement mean was 3.43 and current mean was 3.16 on the instructional scale while the preferred mean was 2.92 and current mean was 2.31 on the managerial scale.

For general teachers, the preferred mean was 3.47 and current mean was 3.03 on the instructional scale while the preferred mean was 2.89 and the current mean was 2.07 on the managerial scale. Because the means of the researcher's study are substantially higher than Tseng's (1989) study, it appears that for both types of teachers current and preferred involvement increased dramatically over the last 14 years period. Another interesting fact was that in the current study teachers were interested more in instructional matters rather than in managerial matters.

Discussion of Research Question 6: For vocational teachers, are there relationships between teachers' age and their attitudes in regard to (a) the vocational school teaching environment, (b) their roles in decision-making, and (c) their teaching assignments?

RQ 6a. In the Lin's (1995) survey, age had a significant but low relationship (r = -.199, $p < .01$) with the dependent variable, teachers' attitudes toward technological changes. It appeared that when vocational teachers grew older, they seemed to feel less comfortable with technological changes. In the researcher's survey, Table 4.11 shows that, overall, there were age differences because the MANOVA was significant. For A1 (Current curricula are adequate to catch up with technological change), the youngest age group (20-29) disagreed more than the three older groups with this statement. Probably

the youngest age group teachers grew up in the information-based era, which made them think the current curricula were already out of date. A similar result happened with A2 (Basic curricula are more important than high technology), the middle age group (30-49) agreed more with this statement than the youngest group. For A3 (90% of the vocational high schools should be abolished), the age 50+ groups agreed more with this statement than the other three groups. Probably the 50+ group of teachers thought they could retire if A3 becomes government policy in the future. The same result happened with A10 (Vocational high schools will be more competitive in recruiting new students if they become comprehensive high schools); the oldest group agreed while the three younger groups probably needed to think about their job security. For A4 (I feel stress to learn new technology), the age 50+ group agreed more with this statement than the other three groups. Probably lower interest hindered older teachers from learning new technology.

RQ 6b. For current involvement in instructional decisions, the mean of the 20-29 age group was lower than for the other three groups, which means that the young vocational teachers had less involvement in decision-making than the older ones. For current involvement in managerial decisions, the 50+ age group had more involvement than any of the three younger groups, probably because they had taught more years than the younger ones at the same schools, were more familiar with school matters, and were more likely to be part-time administrators.

With regard to desired participation in decision-making, Tseng's (1989) survey showed the same result as the researcher's. That is, Tseng found that "the teachers in the 31 to 40 age range had the highest desired participation in decision-making."(p. 96) But Tseng pointed out that the teachers in 21 to 30 age range had the second highest desired

participation, while in the researcher's survey they had the lowest desired participation. Probably times have changed; the current young generation seems to no longer want to bear more responsibilities. Most of them seem to enjoy having more leisure time and freedom. My observation is that many younger teachers are good at expressing their opinions and communicating with others through the internet instead of having direct contacts and participation. However, at both surveys, the teachers above 40 years of age tended to desire less participation as they grew older.

RQ 6c. Overall, for the Part D items, there was no difference. Separately, only item D5 (Teaching new tech courses makes me burn out) was significant. In that case, the two youngest groups (20-39) disagreed more than the two older groups (40+). Probably the youngest group teachers felt more comfortable about teaching new technological courses because of their stronger backgrounds in computer technology.

Discussion of Research Question 7: Are there differences among the areas/departments of the vocational teachers in regard to their attitudes about a) the vocational teaching environment, b) their roles in decision-making, and c) their teaching assignments?

RQ 7a. Tseng's survey (1989) only focused on vocational teachers and did not use areas/departments as an independent variable. Lin's survey (1995) used areas/departments as an independent variable, 1=machinery cluster, 0=electrical cluster. The correlation between departments and teacher's attitudes toward technological changes in Lin's survey was .039, not significant. In the researcher's survey, according to the MANOVA analysis (refer to Table 4.14), overall, there was significance for the Part

A items. In other words, there were some differences among the areas/departments of the vocational teachers in regard to their attitudes about the vocational teaching environment. For A3 (90% of the vocational high schools should be abolished), the IT group teachers disagreed less than the other five groups. It was very interesting that the result was in accordance with Li's (Dean of the Taiwanese Academia Sinica) comments. In the December 5, 2002, *China News*, Li stated especially in the information technology field, the graduates of the vocational system fell far short of meeting the needs of the employment market. Probably IT teachers are more likely than other vocational teachers to agree with Li and recognize the poor quality of the IT vocational students.

For A4 (I feel stress to learn new technology), the auto group and architecture group teachers disagree more than the other four groups. Probably these two groups of teachers did not feel a strong urgency to learn new technologies because most of their courses still have a traditional orientation, For A10 (Vocational high schools will be more competitive in recruiting new students if they become comprehensive high schools), the chemical group teachers ($M = 3.85$) agreed more than the other mechanical group ($M = 3.07$). Probably chemical courses require more calculation and more comprehensive concepts, so chemical teachers are more likely to recognize the need for being more competitive.

RQ 7b. Table 4.15 shows that there was no difference among the different departments on the current or preferred roles in decision-making. The same non significant result happened for the RQ 7c overall. Thus for the Part D items in Table 4.16, the MANOVA was not statistically significant. Only item D1 (I feel satisfied with

teaching technology-related courses) was significant. Electronics and automobile teachers agreed more with this statement than mechanical and chemical teachers.

Recommendations

Based in part on the findings of this study and the trends in vocational enrollment discussed in chapter 2 and here, the following personal recommendations are proposed by the researcher.

Recommendations for the Ministry of Education Decision-Makers

1. The Ministry of Education decision-makers should allow perhaps 1/3 of the public vocational schools to remain as is, but 2/3 of the public vocational schools should be transformed into comprehensive high schools.
2. The Ministry of Education decision-makers should develop a comprehensive plan to gradually downsize the vocational schools, merge vocational departments, and design new curricula.
3. Because more students are choosing college oriented high schools. There is a declining number of students in the vocational high schools and a surplus of vocational teachers at the high school level. Therefore, the Ministry of Education in Taiwan should let some vocational schools with good reputations become public 2-year junior/community colleges and still keep the system of 3-year vocational high schools as suggested by Kung and Chao (2003). This would enable some qualified vocational teachers to transfer to the junior college. On the other hand, the Ministry of Education should let junior

colleges with good reputations become technological colleges and still keep the system of the junior colleges. This would provide more opportunities for vocational students to enter colleges and graduate schools, which will upgrade the quality of the skilled manpower.

4. In order to solve the problem of the student shortage in vocational education, the Ministry of Education decision-makers should reduce the traditional class size from 40 to 30 and add instructional equipment, which hopefully will enhance the efficiency of students' learning as Kung and Chao (2003) have argued.
5. The Ministry of Education decision-makers should develop a plan to arrange suitable courses for vocational teachers and provide on-the-job training or access for under qualified teachers to get a specialization in a second field. There also should be a plan to solve the anticipated shortage of general teachers if curricula change and more vocational schools become comprehensive high schools.
6. The poor outcome of vocational students in basic abilities may be due to the shortage of basic scientific equipment as well as English media equipment. Therefore, the Ministry of Education decision-makers should reimburse vocational schools for such equipment.
7. School administrators should let teachers have more participation in instructional issues while managerial issues should be decided by the administrators.

8. In regard to curricula changes to begin in September 2006 in the vocational high school in Taiwan, the Ministry of Education should hold hearings or conferences in each education district as well as use academic, business networks, and TV programs. Through lots of discussion, critiques, and suggestions, the Ministry of Education in Taiwan could amend its program and carry out a successful reform.

Recommendations for the Secondary Teachers for Changes in Taiwan

1. Table 4.18 indicated that the youngest teachers, in the 20 to 29 age range, were less involved in instructional current than the teachers in the 30-50 age range. This finding suggests that the youngest teachers should become more involved in decision-making.
2. Teachers should cooperate to create a more rewarding and less threatening organization so that they become members of an organization, which permits all participants to communicate and identify problems that require change and share solutions (De Miranda, 2003). Teachers would get support from the organization as well as from the administrators.
3. In order to cope with changes in the teaching environment, both vocational and general teachers should get a specialization in a second field (Chuang, 2001).
4. Those vocational teachers who are qualified to retire probably should apply for early retirement.

Conclusions

The conclusions of this study are based on the findings of the current study and on the literatures cited earlier.

Both Lin's (1995) and the researcher's studies show that secondary vocational teachers have positive attitudes toward technological changes. On the other hand, both Tseng's (1989) and this researcher's surveys also show that current participation in decision-making of secondary vocational teachers was considerably less than what teachers prefer. Therefore, it is recommended that principals and administrators let teachers get more involvement in the decision making regarding school affairs because it will upgrade teachers' morale and increase their job satisfaction. Both studies also indicate that vocational teachers preferred more involvement in instructional matters rather than managerial matters, and the teachers above 40 years of age tended to desire less participation as they grew older. However, the means of the researcher's study are substantially higher than Tseng's (1989) study; it appears that, for vocational teachers, current and preferred involvement increased dramatically over the last 14 years.

This finding of increased desire for involvement in decision making by Taiwanese teachers has implications for their involvement in the planning of needed curriculum changes for the vocational secondary schools. For example, the integration of technology, science, and mathematics education is a key issue in order to carry out successful curriculum reforms, which depends largely on careful planning and commitment of all teachers involved (Sanders, 2003). Many surveys in America also revealed that before implementing a collaborative change, a team needs to create a shared

vision, a mutual goal (Wright, 1995; De Miranda, 2003; Sanders, 2003). The students also should play a role in directing their own education (Murray & Wood, 1999).

This study found a number of differences between general and vocational teachers' attitudes about the teaching environment. Two of them were medium sized effects. For the question, "90% of the vocational high schools should be abolished, "vocational teachers strongly disagree while general teachers rated this between moderately and slightly disagree. For the question, "Vocational high schools will be more competitive in recruiting students if they become comprehensive high schools," vocational teachers disagreed more than general teachers, Liu and Yang (2003) argued that vocational teachers are concerned that if their school becomes a comprehensive high, the school will lose their traditional characteristics, which attract students and the professional skills of students will go down dramatically. On the contrary, general teachers may think that if the vocational school becomes a comprehensive high school, the quality of students will increases. Both may be correct because such comprehensive schools may attract more students who plan to go to college but the students professional and technical skills may go down due to fewer technical courses.

Table 4.13 indicated that, for the Part D items, there were few age differences. Only item D5 (Teaching new tech courses makes me burn out) was significant. In that case, the two youngest groups (20-39) disagreed more than the two older groups (40+). Probably the youngest group teachers felt more comfortable about teaching new technological courses because of their stronger backgrounds in computer technology.

Educational changes sometimes turn sour, but without changes, the situation will not improve. Since current secondary vocational teachers have positive attitudes

toward technological changes, educational reforms probably could be carried out effectively and efficiently through a comprehensive plan by Taiwan Ministry of Education, good management and communication by the school administrators, and more involvement of all vocational and general teachers.

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Appendix A

The Questionnaire

Part A: Teachers' Concerns about Changes in the Teaching Environment

Direction: Please use the following response scale and circle the number to indicate your personal opinion about each statement.

Strongly Disagree (SD) 1
Moderately Disagree (MD)..... 2
Slightly Disagree (D) 3
Slightly Agree (A) 4
Moderately Agree (MA) 5
Strongly Agree (SA) 6

Example: I feel stress when I learn new technology ---------- 1 2 (3) 4 5 6

The respondent Slightly Disagrees with the statement.

	SD	MD	D	A	MA	SA
1. I think the current curricula in vocational high schools are adequate to catch up with technological change.	1	2	3	4	5	6
2. I think teaching the basic curriculum for students is more important than teaching high technology.....	1	2	3	4	5	6
3. I think ninety percent of the vocational high schools should be abolished, as Yuan-Cho Li suggested.	1	2	3	4	5	6
4. I feel stress when I try to learn new technology.	1	2	3	4	5	6
5. I think traditional lecture teaching methods are as effective as methods that use high-tech aids.....	1	2	3	4	5	6
6. New technology can increase the effectiveness of teaching.	1	2	3	4	5	6
7. I think changes in the current teaching environment reduces the warmth of teaching.	1	2	3	4	5	6
8. If I have a second teaching specialization, my job would be more secure. ----------	1	2	3	4	5	6

9. I think the main focus of vocational high schools should be to enhance students' English, math and science. ---------- 1 2 3 4 5 6

10. I think vocational high schools will be more competitive in recruiting new students if they become comprehensive high schools. ---------- 1 2 3 4 5 6

Part B: Your Role in Decision Making

Directions: Please mark the appropriate response for each of the 9 questions below.

How much participation in each of the following types of decision do you now have and would you like to have in the future? Please provide two ratings: one for now and one for like to have.

No Involvement (NI) 1
Little Involvement (LI) 2
Some Involvement (SI) 3
Great Involvement (GI) 4

Decisional Issues	Now				Like to Have			
	NI	LI	SI	GI	NI	LI	SI	GI
1. Developing procedures for assessing student achievement in your subjects or courses.....	1	2	3	4	1	2	3	4
2. Establishing disciplinary policies in your school.	1	2	3	4	1	2	3	4
3. Planning student advisory programs in your school.	1	2	3	4	1	2	3	4
4. Setting and revising the goals of your school.	1	2	3	4	1	2	3	4
5. Determining the procedures to be used for the evaluation of teachers.	1	2	3	4	1	2	3	4
6. Selecting textbooks and other instructional materials.....	1	2	3	4	1	2	3	4
7. Allocating materials and equipment for subject departments or teams	1	2	3	4	1	2	3	4
8. Hiring a new faculty member to teach in your subject department or instructional team	1	2	3	4	1	2	3	4
9. Determining teaching assignments	1	2	3	4	1	2	3	4

Part C: Demographic Information

Directions: Please provide your demographic information for each of the following questions by filling the blank provided or circling the best answer for you.

1. What is your gender?

   a. Male
   b. Female

2. What is your age?

   a. 20-29 b. 30-39 c. 40-49 d. 50-59 e. 60 and over

3. What is your current position in school? *(Please circle one)*

   a. classroom teacher
   b. classroom teacher with administrative position

4. What is your educational level?

   a. Vocational or academic high school diploma
   b. Junior college
   c. Bachelor's (graduated from normal or teacher college/university) degree
   d. Bachelor's (graduated from general college/university) degree
   e. Master's degree
   f. Doctorate degree

5. Do you mostly teach general courses or vocational-related courses?

   a. general courses
   b. vocational-related courses

   If you are a general subject teacher, please answer Question 6. If you are a vocational-related subject teacher, please answer Question 7 and Part D.

6. If you teach general subjects, what is your major teaching subject?

   _____. Thank you. You can skip Part D.

7. If you teach vocational-related subjects, which department are you in?

   _____ Department. **Please answer Part D.**

Vocational-related Subject Teachers please answer this page.

Part D: Concerns about Teaching Assignments

Direction: Please use the following response scale and circle the number to indicate your personal opinion about each statement.

Strongly Disagree (SD) 1
Moderately Disagree (MD) 2
Slightly Disagree (D) 3
Slightly Agree (A) 4
Moderately Agree (MA) 5
Strongly Agree (SA) 6

	SD	MD	D	A	MA	SA
1. I feel satisfied with teaching courses related to new technology	1	2	3	4	5	6
2. I do not like to teach computer-related courses because they change so fast.	1	2	3	4	5	6
3. I do not have an adequate background to teach some of the courses that I have been assigned to teach	1	2	3	4	5	6
4. I feel stress when assigned to ***teach*** new technologies.	1	2	3	4	5	6
5. Teaching new technological courses makes me burn out.	1	2	3	4	5	6

Appendix B

The Survey Letter in Chinese

敬愛的教師：

感謝您在百忙之中參與「台灣公立高工教師對職校轉型之態度」的研究，回答此份問卷。本研究的主要目的在搜集足夠數量具代表性的資料，並且提出一些具體的建議，給教育部的決策者和職校教師面對轉型的參考。本研究的結果將作為協同計畫主持人何清傑在美國科羅拉多州立大學教育研究所博士學位的畢業論文。本問卷包含四部份：教師對教學環境改變的意見，決策過程中您扮演的角色，個人資料，以及對教學科目安排的感受。請您依據說明，仔細回答每個問題。

本研究中，教師的態度定義為：教師對情境(狀況)產生之正面或負面的感覺、心情或意見。職校的轉型(變) 著重於探討因新課程實施而衍生的許多問題，不明確的職教政策所引起的衝擊，教師對參與學校決策的意識提高及高職邊緣化的問題。專業(職業)科目教師包含實習(驗)教師以及實習(驗)相關科目的教師；而一般科目教師教授共同必修科目，例如：國文、英文、數學、物理、化學、社會科學、體育、音樂、美術等等。

您的幫忙是純粹自願的，但是對我們卻非常重要，您的回答將幫助我們了解高職教師內心的真正感受。為了保護您的隱私，本問卷採不記名方式實施，約佔用您十五分鐘的時間；填妥後，請您放入回郵信封內並在六月三十日前寄回, 如果你有任何問題或建議, 請電(04)2531-2408, 與何清傑連絡；有關於問卷參與者的權益問題, 請電(970) 491-1563 (USA) 與 Celia S. Walker 直接連繫。

再次謝謝您的參與與幫忙。　　敬請

教安

喬治摩根 (George A .Morgan) 博士
計畫主持人，指導教授

何清傑 (Ching-Chiech Ho)
協同計畫主持人，博士候選人

Appendix C

The Questionnaire in Chinese

台灣公立高工教師對職校轉型之態度

敬愛的教師：您好！

這是一份關於「台灣公立高工教師對職校轉型之態度」的問卷調查。由於您對技職教育的貢獻良多，因此亟需借重您寶貴的經驗及意見。本問卷所收集之資料僅供論文統計分析之用，為了保護您的隱私，問卷以不記名方式實施，約占用您十五分鐘的時間；填妥後請給與貴校聯絡人寄回，謝謝您的支持與協助。敬祝

教安

美國科羅拉多州立大學教育系教授　喬治摩根

博士班研究生　何清傑　敬上

【A 部分】：教師對教學環境改變的意見

【填答說明】1、請使用下面的反應量表，圈選您對該題的看法，

每題共有六個選項，請只圈選一項作答。

2、本問卷之可信度乃基於您真誠的合作。

3、請憑直覺作答，不必多做考慮。

非常不同意----------1

中度不同意----------2

稍微不同意----------3

稍微 同意----------4

中度 同意----------5

非常 同意----------6

例子: 我對學習新科技覺得有壓力。-----1 2 ③ 4 5 6

如果您對此題的看法是稍微不同意，則勾選 3。　　**1 2 3 4 5 6**

1. 我認為目前高職的課程是恰當的，足以跟上科技的變遷。----------□ □ □ □ □ □
2. 我認為教導學生基礎課程比教導新科技課程更重要。----------□ □ □ □ □ □
3. 我認為九成的高職應當要廢除，一如李遠哲所建議的。----------□ □ □ □ □ □
4. 我對學習新科技覺得有壓力。----------□ □ □ □ □ □
5. 我認為傳統的講授教學法，與使用高科技教媒的教學法，具有相同的效果。----------□ □ □ □ □ □
6. 新科技能夠增進教學效果。----------□ □ □ □ □ □
7. 我認為目前教學環境的改變，降低教師的教學熱忱。----------□ □ □ □ □ □
8. 假如我有第二教學專長，我的工作會更有保障。----------□ □ □ □ □ □
9. 我認為高職的重點，要放在提升學生的英文、數學及科學能力。---□ □ □ □ □ □
10. 假如高職改為綜合高中，我認為在招生方面將更有競爭力。---------□ □ □ □ □ □

【B 部分】：在決策過程中您扮演的角色

【填答說明】在下面問卷中的九個問題，敬請圈選適當的答案。

例：在下列決策項目中，您目前參與的程度以及未來想要參與的程度為何？請您分別勾選出來。

完全不參與----------1

很 少 參與----------2

少部分參與----------3

大部分參與----------4

目前參與	未來想要
1 2 3 4	1 2 3 4

1. 對任教的科目，擬定評估學生學習成就的方式。----------□ □ □ □ □ □ □ □
2. 擬定學校的校規。----------□ □ □ □ □ □ □ □
3. 擬定貴校學生的輔導計畫。----------□ □ □ □ □ □ □ □
4. 擬定與修正學校的目標。----------□ □ □ □ □ □ □ □
5. 擬定教師評鑑辦法。----------□ □ □ □ □ □ □ □
6. 選擇教科書及其他教材。----------□ □ □ □ □ □ □ □
7. 為任教的科別或科目，分配教學資源與設備。----------□ □ □ □ □ □ □ □
8. 為任教的科別或科目，聘請新進教師。----------□ □ □ □ □ □ □ □
9. 決定任教的科目。----------□ □ □ □ □ □ □ □

【C 部分】：個人資料

【填答說明】請在所提供的選項或空格內，圈選最佳的答案或者填寫您的個人資料。

1. 您的性別？

   □a.男　□b.女

2. 您的年齡？

   □**a**.20~29 □**b**.30~39 □**c**.40~49 □**d**.50~59 □**e**.60 歲(含)以上

3. 您目前在貴效的職位？

   1. **a**.課堂教師(含導師) □**b**.課堂教師兼行政職務

4. 您的教育程度？

   □**a**.高中(工) □**b**.專科 □**c**.師大、師院畢業 □**d**.一般大學畢業(含技術學院及科技大)

   □**e**.碩士(含四十學分班結業) □**f**.博士

5. 您大部分教授一般學科或專業相關的學科？

   □**a**.一般學科　□**b**.專業學科

[註]假如您是一般學科教師，請回答第六題，假如您是專業學科的教師，請回答第七題及 D 部分。

6. 假如您教授一般學科，您的主要任教科目？

   _____謝謝您，您不必回答 D 部分。

7. 假如您教授專業學科，您任教科別？

   _____科。**請繼續回答 D 部分。**

[註]專業科目教師，請繼續回答以下頁問卷。

【D 部分】：對教學科目安排的感受

【填答說明】請使用下面的反應量表，勾選你對後題的看法，依不同的同意程度，以 1、2、3、4、5、6 代表之：

非常不同意---------1

中度不同意---------2

稍微不同意---------3

稍微 同意----------4

中度 同意----------5

非常 同意----------6 **1 2 3 4 5 6**

1. 教授與高科技有關的課程，我覺得很有成就感。----------□ □ □ □ □ □
2. 我不喜歡教跟電腦有關的課程，因為該領域變化太快了。----------□ □ □ □ □ □
3. 我缺乏適當的專業背景，來任教某些科目。----------□ □ □ □ □ □
4. 當被安排教授新科技時，我覺得很有壓力。----------□ □ □ □ □ □
5. 教授有關新科技的課程，使我覺得力不從心。----------□ □ □ □ □ □

Appendix D

Valid Analysis of the Questionnaire in Chinese

效度分析回應卷

答卷者姓名：_____ 答卷日期：_____

服務之單位：_____ 職　稱：_____

說明：

請您在閱讀每個問題之後，根據它的適當性予以評估，如果這個問題對此研究而言是適合的，請您在"適當"的欄位打勾；否則，請於"不適當"的欄位打勾，並解釋其原因或修改的建議〈原問卷格式請參考附件〉。

【A 部份】：教師對教學環境改變的意見

題號	問題	適當	不適當	建議
1	我認為目前高職的課程是恰當的，足以跟上科技的變遷。			
2	我認為教導學生基礎課程，比教導高科技課程重要。			
3	我認為高職應當要廢除，一如李遠哲所建議的。			
4	我對學習新科技覺得有壓力。			
5	我認為傳統的講授教學法，與使用高科技教媒的教學法，具有相同的效果。			
6	新科技能夠增進教學效果。			
7	我認為目前教學環境的改變，降低教師的教學熱忱。			
8	假如我有第二教學專長，我的工作			

	會更有保障。			
9	我認為高職的重點，要放在提升學生的英文、數學及科學能力。			
10	假如高職改為綜合高中，我認為在招生方面將更有競爭力。			

【B 部份】：在決策過程中您扮演的角色

題號	問題	適當	不適當	建議
1	對任教的科目，擬定評估學生學習成就的方式。			
2	擬定學校的校規。			
3	擬定貴校學生的輔導計畫。			
4	擬定與修正學校的目標。			
5	擬定教師評鑑辦法。			
6	選擇教科書及其他教材。			
7	為任教的科別或科目，分配教學資源與設備。			
8	為任教的科別或科目，聘請新進教師。			
9	決定任教的科目。			

【C部份】：個人資料

題號	問題	適當	不適當	建議
1	您的性別？ □a.男 □b.女			
2	您的年齡？ □**a**.20~29 □**b**.30~39 □**c**.40~49 □**d**.50~59 □**e**.60 歲(含)以上			
3	您目前在貴校的職位？ □**a**.課堂教師(含導師) □**b**.課堂教師兼行政職務			
4	您的教育程度？ □**a**.高中(工) □**b**.專科 □**c**.師大、師院畢業 □**d**.一般大學畢業(含技術學院及科技大學) □**e**.碩士(含四十學分班結業) □**f**.博士			
5	您大部分教授一般學科或專業相關的學科？ □**a**.一般學科 □**b**.專業學科			
6	假如您教授一般學科，您的主要任教科目？_____。			
7	假如您教授專業學科，您任教科別？ _____科。			

專業科目教師，請回答以下問卷。

【D 部分】：對教學科目安排的感受

題號	問題	適當	不適當	建議
1	教授與新科技有關的課程，我覺得很有成就感。			
2	我不喜歡教跟電腦有關的課程，因為該領域變化太快了。			
3	我缺乏適當的專業背景，來任教某些科目。			
4	當被安排教授新科技課程時，我覺得有壓力。			
5	教授有關新科技的課程，使我覺得力不從心。			

Appendix E

Protocol Information

Part C. Protocol Information

Objectives

1. Objectives of proposed research and background--- The purpose of this survey is to collect enough representative data and propose some practical suggestions for both the Ministry of Education related decision-makers and secondary teachers to apply to changes in Taiwan.

Human Participants Description

2. Source of participant population--- All secondary teachers in the public vocational industrial schools in Taiwan will be selected.

3. Number of participants--- A random sample of approximately 1,000 teachers will be selected from approximately 12 public secondary vocational industrial schools mostly in central Taiwan.

4. Characteristics of participants--- They are gender, age (from 20 to 60 and over), educational level, position, teaching specialty area (general subject or vocational-related subject), and vocational department.

5. Recruitment procedures--- Letters will be mailed to participants.

6. Recruiting materials--- Attached letters with the letterhead of CSU will be provided.

7. Criteria for including or excluding participants--- It is a random sample, which participants are fairly selected.

8. Rational for using "at-risk" populations--- Not applicable (N/A).

9. Original letters of HRC agreement/approval from assisting organizations--- Obtaining the HRC approval will be submitted.

10. Other matters pertinent to the human participants--- N/A.

11. Specify location of study--- It is held in the public vocational industrial schools in Taiwan.

12. List variables to be studied--- There are three dependent variables and five independent variables in this study. Teachers' attitudes about a) changes in the vocational teaching environment, b) their roles in decision-making, and c) their teaching assignments are the three dependent variables. Age, vocational department, teaching specialty area, gender, and education level are the five independent variables.

13. Describe methods of data collection--- Attach copies of surveys.

14. Describe activities involving participants, including frequency and duration of each activity. --- The participants will be asked to return the completed instrument within two weeks of receipt to the researcher in a sealed return envelope. Two weeks after the initial mailing, a follow-up postcard will be sent to all participants with appreciation for their participations and a reminder for those non-respondents to send back the questionnaire.

15. Describe equipment used with participants, if any. --- Not applicable.

16. Specify what factors will lead to cessation of procedures causing physical or emotional stress. --- N/A. No known risks.

17. Describe biological samples to be taken, method, and qualifications of individuals taking samples. --- N/A.

18. Provide de-briefing method and materials for participants. --- Personal telephone number, (04)2531-4208, is provided in Taiwan.

19. Other aspects of the procedures. --- N/A.

Risks to Participants

20. Describe potential risks and assess the likelihood, severity, duration, and effects of each. --- No known risks.

21. Describe methods for minimizing risk. --- No known risks.

22. Describe other methods, if any, that were considered alternatively and why they will not be used. --- The needed data using an anonymous questionnaire will be gathered.
23. Other matters relative to risk to participants. --- N/A. No known risk.

24. Describe the direct benefits to these participants because of their participation. --- No known benefit.

25. Describe the benefits accruing to the class of participants these individuals represent. --- The results will help obtain an accurate picture of Taiwanese secondary teachers' perceptions.

26. Describe the benefits accruing to society-at-large or other. --- They provide reference data for the Ministry of Education related decision-makers in Taiwan.

27. Other aspects of benefits to participants. --- N/A.

Consent Procedures

28. Describe how potential participants will be informed about the project activities. --- Simply, they can read the cover letter and answer the questions by following the instructions preceding each part.

29. Attach the consent form. --- Cover letter will be provided.

30. Other aspects of the consent process. --- N/A.

31. Describe the method(s) used to protect the identity of individual participants. --- This questionnaire is anonymous.

32. Describe plans for maintaining data after study is complete. --- The faculty advisor will retain a copy of the raw data: the co-investigator will retain the original.

33. Describe how the federal requirement for consent forms to be retained for three years following the conclusion of the project will be met. --- The original forms will stay at CSU.

34. If audio- or videotaping, specify tape storage, use, and when and how disposition of the tapes will take place. --- N/A.

35. Other aspects of confidentiality. --- N/A.