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INSTRUCTIONAL TECHNOLOGY COMPETENCIES
PERCEIVED AS NEEDED BY
VOCATIONAL TEACHERS IN OHIO AND TAIWAN

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

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The Ohio State University
2002

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ABSTRACT

The purpose of this study is to explore and describe the perception of the perceived competence, importance, and educational needs of instructional technology for vocational and career-technical education teachers and draw comparisons between Ohio and Taiwan. The objectives of this study are to determine: (a) the demographic characteristics of vocational teachers such as age, gender, highest degree earned, instructional technology experience, and specialty; (b) the perceived knowledge and importance of instructional technology competencies for vocational teachers in Ohio and Taiwan; (c) the perceived need for further education in instructional technology by vocational teachers in Ohio and Taiwan; and (d) the relationships among the demographic characteristics of vocational teachers and their instructional technology education needs.

The population was all vocational education teachers working at 44 comprehensive high schools and six Joint Vocational Schools (JVS) in the Central Region of Ohio and 22 vocational high schools in Kaohsiung district, Taiwan, during the 2001-02 academic year. The Borich needs assessment model was adapted to determine the need of instructional technology knowledge and skills for vocational teachers and the instrument consists of two parts: (a) demographic data, and (b) a Likert-type scale, to measure the perceived importance and knowledge of instructional technology for

teachers. A questionnaire was designed to gather information about vocational teachers' characteristics and their perceptions of the instructional technology importance and competence in their teaching field. The questionnaire was developed with two parallel versions – English version used for Ohio and Mandarin version used for Taiwan.

The magnitude of the relationship between characteristics was defined according to Davis (1971). The t test for independent means was used to compare the mean scores of two different groups. The Pearson correlation coefficient r was used to measure the relationships between ages, year of teaching, instructional technology training experience and calculated perceived educational needs for instructional technology competencies. The Spearman correlation coefficient was used to measure the relationship between teachers' education degree earned and perceived educational needs. The multivariate analysis of variance (MANOVA) Eta Squared (R^2) was used to measure the association between gender, teachers' teaching specialty and perceived educational needs.

The following conclusions and implications were drawn from the research findings and are applicable only to the subjects of the study. The top 10 instructional technology competencies for educational needs that were ranked by both Ohio and Taiwan vocational teachers could be summarized in three categories: setup, maintenance, and troubleshooting of computer system; telecommunications; and media communication. The recommendations are based upon the findings and conclusions of this study. The findings of this study could be useful to a career-technical education department, in its endeavor to focus on vocational teachers' needs, as a guide in developing teacher education materials; conducting seminars, in-service training, and training workshops for vocational teachers.

DEDICATION

This study is dedicated:

... to my beloved parents, Koon-Shan Lu and Shie-Dai Chang (呂崑山 與 張喜代)

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TABLE OF CONTENTS

	<u>Page</u>
Abstract	ii
Dedication	iv
Acknowledgments	v
Vita	vii
List of Tables	xi
List of Figures	xiii
 Chapters	
1. Introduction	1
Vocational Education in Taiwan	4
Statement of the Problem	7
Purpose and Objectives	8
Definition of Terms	9
Limitation of Study	11
2. Literature Review	12
Needs Assessment	14
Instructional Technology Competencies in Teacher Education Program	16
Age	18
Gender	19
Instructional Technology Experience	20
Instructional Technology Pre-service and In-service Education	20
Summary	21
3. Methodology	22
Research Design	22
Population and Sample	25

Instrumentation	26
Data Collection	27
Data Analysis	30
4. Findings	32
Objective one	33
Demographics	34
Objective two, three and four	38
Section 1: Computer Operation Skills	39
Section 2: Setup, Maintenance, and Troubleshooting	41
Section 3: Word Process/Introductory Desktop Publishing	43
Section 4: Spreadsheet/Graphing	45
Section 5: Database	48
Section 6: Networking	50
Section 7: Telecommunications	52
Section 8: Media Communications	56
Objective five	62
5. Summary, Conclusion and Recommendations	70
Purpose and Objectives	70
Methodology	71
Research Design	71
Population and Sample	71
Instrumentation	72
Validity and Reliability	73
Data Collection	73
Data Analysis	75
Summary of the Findings	75
Conclusions and Implications	78
Demographics	78
Conclusion	80
Teachers' Instructional Technology Educational Needs	80
Conclusion	82
Relationship Between Demographic Characteristics and Instructional Technology Needs	83
Conclusion	83
Recommendations	84
Recommendations for Vocational Education Practice	84
Recommendations for Theory	85
Recommendations for Further Research	85
References	87

Appendices	96
A Panel of Experts	97
B Letters to Participants	99
C Human Subjects Approval Form	103
D Research Instrument (English version)	105
E Mandarin Translation of the Instrument	122
F Participating Schools in Ohio and Taiwan	139

LIST OF TABLES

<u>Table</u>	<u>Page</u>
3.1 Mean and Standard Deviation of Early, Late Respondents and Double-dipping Technique Respondents on the Level of Importance and Competence Scales	29
3.2 Equality of Means t-test of the Level of Importance and Competence Scale for Early and Late Respondent Teachers	29
3.3 Equality of Means t-test of the Level of Importance and Competence Scale for Early Plus Late Respondents and Double-dipping Respondent Teachers	29
4.1 Cronbach's Alpha Reliability Coefficients for the Eight Domain Areas ..	34
4.2 Age of Respondents	35
4.3 Gender of Respondents	35
4.4 Academic Preparation of Respondents	36
4.5 Years of Teaching Experience of Respondents	36
4.6 Teaching Specialty of Respondents	37
4.7 Instructional Technology Experience of Respondents	38
4.8 Rank Order of the Calculated Perceived Competence, Importance, and Educational Needs of the 13 Areas of Computer Operation Skills	42
4.9 Rank Order of the Calculated Perceived Competence, Importance, and Educational Needs of the Nine Areas of Setup, Maintenance and Troubleshooting of Computer System	45
4.10 Rank Order of the Calculated Perceived Competence, Importance, and Educational Needs of the 10 Areas of Word Process/ Introductory Desktop Publishing	46

4.11	Rank Order of the Calculated Perceived Competence, Importance, and Educational Needs of the 11 Areas of Spreadsheet/Graphing	49
4.12	Rank Order of the Calculated Perceived Competence, Importance, and Educational Needs of the Nine Areas of Database	51
4.13	Rank Order of the Calculated Perceived Competence, Importance, and Educational Needs of the Six Areas of Networking	52
4.14	Rank Order of the Calculated Perceived Competence, Importance, and Educational Needs of the 18 Areas of Telecommunications	54
4.15	Rank Order of the Calculated Perceived Competence, Importance, and Educational Needs of the 10 Areas of Media Communications	58
4.16	Rank Order of the Calculated Educational Needs	59
4.17	Davis' Convention for Describing Measures of Association	62
4.18	The Correlation Matrix of Age, Year of Teaching, Training Experience and Instructional Technology Educational Needs	65
4.19	The Correlation Matrix of Teachers' Education Degree Earned and Instructional Technology Educational Needs	66
4.20	Relationships Between Gender and Instructional Technology Educational Needs	67
4.21	Relationships Between Teaching Specialty (Field) and Instructional Technology Educational Needs	67
4.22	Contrasting Top Competencies Between Ohio and Taiwan Vocational Teachers as Ranked by Educational Needs	69

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1.1 Educational Administration System in Taiwan	6

CHAPTER 1

INTRODUCTION

The rapid spread of computers and computer-based technologies during the past two decades have had an impact on primary, secondary, and higher education. Knowledge and skills about information technology (IT) have become progressively more important as instructional vehicles in schools, business, industry, and government. Thus, this would also be true for vocational and technical education.

Vocational and technical education is often called on to train and educate secondary students for careers in technical areas. These careers often require mastery of both academic and vocational skills. As Rojewski, Schell, Rebold, and Evanciew (1995) noted, occupations will require more cognitive skills in the 21st century. According to Imel (1999), new technologies could be used to move the focus away from low-level cognitive tasks to higher-order thinking skills. In order to capitalize on instructional technology as a tool to develop cognitive abilities in the classroom context, educators must understand the technological innovations of the teaching and learning processes and the effect these tools have on cognitive development. Having hardware and software available in a classroom are not sufficient to improve learning, but what teachers do with these technological tools will determine the organizational structure of intellectual development (Proctor & Burnett, 1996).

According to the U.S. Department of Commerce, more than 50,000 information technology (IT) jobs will be created in Ohio during the next 10 years. But many of these jobs will remain vacant -- and employment opportunities will be lost -- because of a shortage of skilled workers. Students learn more when given the opportunity to apply knowledge and skills to real world challenges. But, in too many of Ohio's schools and colleges, that opportunity is absent. In order to success in a new economy environment, it will require new kinds of partnerships that unite employers, educators, parents and communities in a common effort to help young people chart effective pathways through high school and college and into satisfying, productive careers. The Council of Labor Affairs, Executive Yuan, Republic of China, estimates that IT-related occupations will become Taiwan's fastest growing occupations during the first decade of the 21st century.

Due to the shortage of IT workers in Ohio and throughout the world, students need to be prepared, now, to work with technology and computers. Educational programs should be teaching students to use the technological tools that the business and industry community are presently using and will be using in the future. Therefore, before preparing students for future jobs, teachers' preparation in the knowledge and skills of instructional technology become crucial.

The technology leader who affects student learning to the greatest degree is the classroom teacher. Teachers, who have been teaching for several years, may have had experiences in the workforce prior to the infusion of technology. Consequently, school districts are left with the responsibility of encouraging teachers to participate in professional development activities to acquaint them with the uses of educational technology for improving teaching effectiveness.

Vocational teachers have been, and will continue to be, challenged by these new and emerging technologies that influence the teaching and learning process. New ways of teaching and learning are requiring teachers to assume the roles of coach and facilitator and to situate student learning in real-world contexts. Teachers must be able to use these new technologies that are continually changing the ways that people live, work, and learn. Teachers need to upgrade their instructional technology competencies that can help them keep current and embrace new ways to improve their practice.

The citizens of Ohio expect vocational and technical education to deliver quality programs and services that meet the diverse career and education needs of Ohio's youth and adults as well as the ever-changing needs of the present and future workplace. Ohio's Future at Work: Beyond 2000, a forward-thinking plan for accelerating the modernization of vocational education, demonstrates the commitment to results, and ensuring that all individuals possess: (a) the skills needed to compete in a global marketplace, (b) credentials based on industry standards, (c) the capabilities needed to successfully enter, compete in and advance through the present and future workforce, and (d) the knowledge and skills for lifelong learning.

In order to response to a shortage of workers in IT careers, a set of industry-validated skill standards has been developed for occupational clusters with seamless pathways between secondary and postsecondary education. Guided by Ohio's Future at Work, vocational and technical education will continue to promote high academic and skill standards for all students, preparing them to enter the world prepared both for work and for continued education.

Vocational and technical programs are provided in 94 vocational education planning districts serving Ohio's 611 city, local, and exempted village school districts and 49 joint vocational schools/career centers. Vocational and technical education also provides six vocational areas including arts & communications, business & management, industrial & engineering systems, human resources/services, environmental & agricultural systems, and health services. According to an Ohio career, technical, and adult education (CTAE) report, more than 350,000 high school students (nearly one-third in occupationally specific workforce development programs and the rest in one or more classes) and over 200,000 adults (full-time or part-time) are taking courses related to career and technical education (CTAE, 2000). Over 10,000 Ohio educators are involved in career and technical education in addition to career development and adult basic literacy education personnel.

Vocational Education in Taiwan

Taiwan is now a developed nation and a leading exporter of industrial products. Technological and Vocational Education (TVE), known as vocational and technical education, has played an important role in Taiwan's economic transformation. As the domestic and international situation continues to change, and Taiwan looks ahead to establishing itself as a regional operation hub and to entering the World Trade Organization, TVE is also entering a new phase. The government wants TVE to make a gradual transition from the current planning-directed mode to a more market-oriented approach. The aim is to promote a more flexible TVE system, one that is more open and available to serving the general public with a diversified curriculum. Thus, the TVE

system is poised to play a major role in providing lifelong learning opportunities for the people of Taiwan. The administrative structure of TVE (See Figure 1.1) in Taiwan has three levels of authorities: central, municipal, and local. The central authority is the Department of Technological and Vocational Education (DTVE) under the Ministry of Education (MOE).

DTVE has established four divisions that are in charge of national TVE and have direct supervisory control of colleges/universities of technology, national and private junior colleges of technology and national vocational high schools. The Department also shares responsibility with the third division of central-region office of the MOE, the first division of the Taipei Education Bureau and the Kaohsiung Education Bureau, together forming an organizational network for TVE in Taiwan.

The third division of the central-region office is responsible for the supervision of national and private vocational high schools in the regions other than Taipei and Kaohsiung cities. Likewise, the relevant divisions within the city governments of Taipei and Kaohsiung supervise TVE in municipal and private vocational high schools, and the local governments administer technical arts programs in junior high schools.

Vocational high school teachers in Taiwan graduate from local and foreign universities, or receive training at normal universities. In addition, some specialist teachers and technical teachers come from industries. In accordance with the Taiwan Teacher Preparation Law, more higher-education institutes should participate in training school teachers. Before receiving certification and taking up employment as teachers, qualified individuals must complete the required number of course credits, and pass an initial qualification exam, a one-year internship, and a final qualification exam. In order

number of vocational schools included 188 vocational high schools, 50.5 % of which were public. Full-time students numbered 427,366, with 39.7% in public schools. The largest number were studying industry followed by commerce. Vocational teachers in Kaohsiung District numbered 18,812, with 60.7% in public schools, and 2,607 vocational teachers in 22 vocational high schools (DTVE statistical report, 2000).

Statement of the Problem

Instructional technology is used to manage and instruct in vocational and technical education and encompasses not only the computer but also other technologies and delivery systems. The career preparation of teachers, internationally, is impacted by their opportunities and decisions regarding their use of technology and is often contingent on their level of instructional technology knowledge and skill. As Sormumen and Chalupa (1994) noted, a U. S. Office of Technology report maintained that the use of technology could not be fully effective unless teachers receive adequate training and support. Due to the rapid changes in technology and reduced funds, instructional technology competencies' training for teachers is limited. Teachers need instructional technology competencies so they can teach these competencies to students for their entry-level job requirement.

The U.S. Bureau of Labor Statistics estimates that employment for key IT professionals more than doubled from 1988-1996. The pool of IT workers has not kept pace with the explosive demand. In fact, in many IT sectors, skilled workers are in short supply and companies are struggling to fill the positions available – particularly at entry

levels. Sixty-five percent of Ohio's new jobs will require high-tech skills during the 21st century (*itWORKS.OHIO* Ohio Information Technology Competency Profile, 1998).

The Council of Labor Affairs, Executive Yuan, Republic of China, estimates that IT-related occupations will become Taiwan's fastest growing occupations during the first decade of the 21st century. Schools, colleges and universities must play a pivotal role in responding to this need by preparing a skilled pool of future IT professionals.

Consequently, the problem investigated was to explore and describe the current knowledge, the perceived importance and the need for instructional technology competencies of Ohio vocational teachers, in the central region of Ohio, and compared to vocational teachers in Kaohsiung District, Taiwan.

Cross-cultural studies on instructional technology in education have gained considerable attention. The findings of cross-cultural studies provided information leading to better understanding of teachers' perceptions of instructional technology competencies across countries and identified some universal variables related to teachers' perceptions of instructional technology. This comparison study between Ohio and Taiwan also will provide information of each nation's circumstances in educational needs of instructional technology competencies. The information will be a resource worldwide in teacher education for future study.

Purpose and Objectives

The purpose of this study was to explore and describe the perception of the competence, importance, and educational needs of instructional technology for vocational

and technical education teachers and draw comparisons between Ohio and Taiwan. The objectives of this study were to determine:

1. The demographic characteristics of vocational teachers such as age, gender, highest degree earned, years of teaching, teaching specialty, and instructional technology experience.
2. The perceived competence in instructional technology possessed by vocational teachers in Ohio and Taiwan.
3. The perceived importance in instructional technology possessed by vocational teachers in Ohio and Taiwan.
4. The perceived need for further education in instructional technology by vocational teachers in Ohio and Taiwan.
5. The relationships among the selected demographic characteristics of teachers with instructional technology education needs and comparison between Ohio and Taiwan.

Definition of Terms

Competencies. Knowledge, skills, and/or attitudes required in performing work-related tasks.

Educational Needs. A discrepancy between the current and what the level of knowledge should be (Borich, 1980). Educational needs were operationally defined by using the Borich model and consisted of determining a needs score by subtracting the perceived knowledge score from the perceived importance score, and then multiplying the result by the average perceived importance score as is shown:

Equation: $Cal\ En = (In - Co) (Ig)$

Cal En = calculated educational need,

In = importance of the item reported by the respondent,

Co = perceived competence of the item reported by the respondent,

Ig = average importance of the item as rated by all the respondents.

Instructional Technology. Instructional technology refers to hardware, such as personal computers, CD-ROMs, and multi-media, handheld learning devices and software that are the instructional programs run on personal computers.

Perceived Importance. The perceived importance will be defined as the mean score of responses to 5-point Likert-type statements from vocational teachers. Each statement will be rated 1 (none), 2 (very little), 3 (somewhat), 4 (very) or 5 (a great deal). The score above the mean indicates that teachers place a high importance on getting information in a specific field.

Perceived Competence. The perceived competence will be defined as the mean score on 5-point Likert-type statements from vocational teachers. Each statement will be rated 1 (none), 2 (very little), 3 (somewhat), 4 (very) and 5 (a great deal). The score above the mean indicates that teachers perceived higher knowledge in a specific field.

Vocational and Technical Education. The organized educational program offering a sequence of courses which are directly related to the preparation of individuals in paid or unpaid employment in current or emerging occupations requiring other than a baccalaureate or advanced degree. Such programs include competency-based applied learning which contributes to an individual's academic knowledge, high-order reasoning, and problem solving skill, work attitudes, general employability skills, and the

occupational specific skills necessary for economic independence as a productive and contributing member of society (CPD II, Sec 521 41).

Limitation of study

Considering the size of Ohio and Taiwan and the practical constraints in gathering data from the total population of vocational teachers, the accessible population for this exploratory study was chosen as comprehensive high schools and joint vocational schools (JVS) teachers in the Central Region of Ohio and Kaohsiung County of Taiwan during the 2001-02 academic year. The following were limitations for this study:

1. The results were limited to the central Ohio geographical area that consists of Franklin, Licking, Fairfield, Madison, and Delaware counties, a population accessible to the researcher.
2. The results were limited to the southern Taiwan area that includes Kaohsiung City and Kaohsiung County, a population accessible to the researcher.

CHAPTER 2

LITERATURE REVIEW

The knowledge base in the perception of computer technology competencies needs has multiple perspectives (Armstrong, 1995; Kiattikomol, 1994; Lifer, 1992 & 1997). Lifer (1992) focused on the relationships of computer skills needed by business administration graduates as perceived by personnel directors in business and with computer skills being taught in a university. Kiattikomol (1994) examined computer literacy skills for business graduates and universities in Thailand. Armstrong (1995) compared the perceptions of the importance of computer literacy skills of junior high and high school computer teachers with those in business.

Some studies conducted in the area of instructional technology investigated the impact of training on teachers' skills in the area of instructional media during the 1980s when the leading edge of technology was the microcomputer. El-Hmaisat (1989) found that one of the barriers facing the teachers in the elementary schools was the lack of training in instructional technology. Bowies (1985) indicated that using instructional technology has certainly proven to be a powerful educational tool due to its ability to involve students in their own learning, to capture students attention and to extend their minds and to broaden the overall school experience of young people. Engstrom (1981) discussed new ways of thinking about teaching and learning. He identified competencies

that the teacher and school staff should attain. The teacher must attain skills in designing and developing materials that are specific to the learning needs for students. Koontz (1992) noted that the majority of teachers who used media had little or no training in the use of technology. Cropp (1990) indicated that media is an important component for teacher effectiveness and that teacher preparation programs should require an understanding of the instructional media prior to certification.

Researchers who have attempted to demonstrate the superior influence of educational technologies on achievement have been unsuccessful. On the other hand, researchers who have attempted to identify the appropriate techniques of message organization and the correct process of instructional delivery with technology have been more in the mainstream of what is considered appropriate (Thomson et al., 1991). Golden (1997) reported that teachers do not use new technology because they either do not feel comfortable with new technology or lack proper training. Miller (1997) identified a 1995 report by the U.S. Office of Technology which "... suggested that 30% of the nation's expenditures on school technology should be devoted to teacher training." McCaslin and Torres (1993) found that teachers were apprehensive about the use of microcomputers, and their finding is supported by research in the area of computer anxiety of vocational teachers.

Liao (1997) found that in-service teachers in Taiwan placed a high value on educational computing, felt quite comfortable with computers, and liked to work with computers. An Idaho survey of 60,000 teachers regarding teacher technology needs found that more than one-half of the respondents rated themselves as novices in the use of technology; recently hired teachers with a bachelors degree and the number of computers

in classrooms were the best predictors of teachers' actual use of technology (Matthews, 1996). Cross-national or cross-cultural studies on instructional technology competencies in education have also gained considerable attention. The questions pursued tend to focus on (a) comparing college students' instructional technology attitudes with respect to gender difference, confidence, and anxiety (Huang & Padron, 1997; Leuter & Weinsier, 1994; Makrakis, 1992; Marcoulides & Wang, 1990; Sensales & Greenfield, 1995), and (b) assessing computer use in education at elementary and secondary schools (Pelgrum & Plomp, 1993). Very little research has specifically investigated, cross-culturally, vocational teachers' perceptions of instructional technology competencies. Therefore, the focus of the current study was cross-culturally on the perceived instructional technology competencies needs for vocational teachers in Ohio and in Taiwan. The remainder of Chapter II addresses needs assessment, instructional technology competencies in teacher education program, and the characteristics of vocational teachers' attitude toward instructional technology.

Needs Assessment

A need is generally defined as "a lack of something useful, required, or desired" (Guralnick, 1982). Uko (1985) defined need as "a condition between what is and what should be, or between what is more desirable." Need is also commonly understood to indicate a state or condition, such as Maslow's (1954) hierarchy of needs from the physical (the lowest level of survival) to self-actualization (the highest level). Kaufman (1992) emphasizes that need is considered to be a discrepancy or gap between a present state (what is) and a desired end state, future state, or condition (what should be).

Therefore, a need is not a thing in itself, but an inference drawn from examining a present state, and comparing it with a vision of a better state.

Needs, in education, are generally defined as the discrepancy between a desired level of student performance (or ability, knowledge, skill, or attitude) and actual or perceived level of student academic or other performance (Witkin, 1984). Lowe (1982) pointed out that individual learning needs and community needs vary according to his/her circumstances, size of population and time. Lowe also indicated that education needs could not be satisfied prior to other needs, such as economic needs. One of the biggest problems in determining educational needs has been that a person may have an educational experience but may not be seriously motivated to achieve it (Lowe, 1982).

A needs assessment seeks to determine such discrepancies, examine their nature and causes, and sets priorities for future action. Witkin and Altschuld (1995) defined needs assessment as

a systematic set of procedures undertaken for the purpose of setting priorities and making decisions about program or organizational improvement and allocation of resources. The priorities are based on identified needs.

Soriano (1995) pointed out that needs assessment is used to collect data on the need for or current use of services, products, or information. The information gained from needs assessments is typically used to make decisions about the allocation of program resources and services.

Borich (1980) defined needs assessment as “a discrepancy between an educational goal and trainee performance in relation to this goal.” He suggested that training programs could utilize his model by employing the two extreme positions: *what is* (the

measured behaviors, skills, and competencies of trainees) and *what should be* (the goals of the training program. According to Borich (1980), the discrepancy between these two positions can be used as an index to determine the effectiveness of training. The Borich need assessment model has been demonstrated to be a valid model to assess participant's perceptions about educational needs. Many studies have used Borich's model (Arede, 1994; Garton & Chung, 1995; Layfield & Dobbins, 2000, Uko, 1985) since it allow one to collect data that can be weighted and ranked in order of priority. By doing so, responses can be linked to a practical decision framework to improve a training program. Borich's model determines a need score by subtracting the perceived competence score from the perceived importance score, and then multiply the result by the average perceived importance score.

Instructional Technology Competencies in Teacher Education Programs

Instructional technology is the great enabler and provides, for those who have access to it, extended powers of perception, comprehension, analysis, thought, concentration, and articulation through a range of activities that include: writing, visual images, mathematics, music, physical movement, sensing the environment, simulation, and communication (Carpenter, 1989). Instructional technology, in all of its various forms, offers users the tools to access, manipulate, transform, evaluate, use, and present information. Instructional technology in schools includes computers, televisions, video cameras, video editing equipment, and TV studios. According to some empirical indication, students who use technology as a tool may become better at managing information, communicating, and presenting ideas (Plotnick, 1999).

Early computer technology initiatives in schools were essentially technology centered. As Anderson, Hansen, Johnson, and Klassen (1979) noted, the principle seemed to be that “as long as the facilities are available and teachers are trained in computing, adoption is inevitable.” But it soon became evident that access to hardware and software alone were insufficient to ensure successful uptake of IT in schools. Learning how to use IT in the classroom requires pedagogic understanding of what computer assisted learning applications are trying to do and of what the hardware and software are capable of doing. In consequence, later initiatives of IT tended to focus on pedagogic rather than technical concerns.

Many professional organizations have incorporated instructional technology into their professional standards (Abramson, 1993). In 1989, the International Society for Technology in Education (ISTE) formed an alliance with the National Council for Accreditation of Teacher Education (NCATE) and established guidelines for technology competencies for all teacher education programs. ISTE developed standards for instructional technology competencies including: (a) the use of computer-based technologies to access information to enhance personal and professional productivity, and (b) application of computers and related technologies to facilitate emerging roles of the learner and the educator (Thomas, 1993). NCATE (2000) proposed that pedagogical studies of teachers need to include knowledge and appropriate experiences with educational computing, including the use of computer and related technologies in instruction, assessment, and professional productivity.

For vocational and technical education, Perkins II legislation and national and state reports addressing reform imply that a teacher must be prepared to use computers and technology throughout the instructional program. Furthermore, Perkins III legislation focused the Federal investment on high-quality programs in developing, improving and expanding the use of technology to provide professional development for teachers.

Students are confronted by more information than they can possibly assimilate and are overwhelmed by the need to learn the mechanics of locating information. To develop the student's capacity to recognize his or her need for information, and the ability to locate, evaluate, and use it becomes essential. Teachers must work in partnership with each other to articulate what students should know in regard to instructional technology competencies that pose an enormous challenge as a resource to the teacher because the use of computer technology may be changing the way teaching is conducted (Sheingold & Hadley, 1990). The fundamental change required to use computers for teaching is to affect teachers' existing conceptions of the teaching and learning process and to affect their conceptions of their pedagogic role.

Age

Several studies have attempted to determine the relationship between age and the perception of instructional technology. Liao (1995) found that older teachers (over 45 years old) have more experiences in teaching and perhaps develop the perceptions of gender- or ability-related differences in instructional technology competencies from classroom observation. On the other hand, Huang and Padron (1997) found that younger teachers (ages 18-35) felt more comfortable with using computer technology than the

olders teachers. Kotrlik and Smith (1989) reported that younger vocational teachers were more likely to have higher levels of computer literacy and that computer anxiety decreased as computer literacy increased.

Gender

Gender was identified as a critical factor that may affect teachers' attitudes toward computers. Several studies found that females tend to have both less experience with instructional technology competencies and lower scores on instructional technology confidence scales than males (Chen, 1986; Loyd & Gressard, 1984). Some studies found that males scored significantly higher than females on some computer attitude scales (Chen, 1986; Liao, 1993; 1995; Loyd & Gressard, 1984; Martinez & Mead, 1988) but other studies reported no significant differences (Eastman & Krendl, 1987; Kay, 1989).

Huang and Padron (1997) found that gender and instructional technology experience were related significantly with teachers' perception of gender-related differences in instructional technology competencies. They also indicated that instructional technology experiences in Taiwan were related positively with teachers' comfort, liking, and value of instructional technology perception. Female teachers disagreed with the view that males work better with instructional technology than females, but in the United States, teachers' views of gender-related differences in instructional technology competencies were not associated with instructional technology experiences.

Instructional Technology Experience

Length of time of computer use is the predominant factor that determines teachers' level of perceptions in instructional technology competencies. Instructional technology experience was also related positively with teachers' comfort, liking, and value of instructional technology competencies. The longer teachers had been using computers, the greater they liked, valued, and felt comfortable with the computers (El-Hmaisat, 1998; Huang & Padron, 1997; Liao, 1993; 1995; Padron, 1993).

Instructional Technology Pre-service and In-service Education

The need to integrate technology into pre-service and in-service education is becoming increasingly apparent (Colon et al., 1995). Pre-service teachers must be exposed to several applications of technology that can support their curriculum as they move into being teaching professionals (Wentworth & Breithaupt, 1995). These applications include: (a) technology that is used as a tool to help teachers in the daily management of the classroom (Schuttlöffel, 1994), (b) technology that is a catalyst to an expanded view of instructional practices (Salomon et al., 1991), and (c) technology that is an agent for massive system reform for schooling (Papert, 1993). Each of these applications is important in the marriage of technology and education and each should be the focus of the technology instruction and experiences a pre-service teacher receives.

Wentworth and Breithaupt (1996) found that computer technology in pre-service education attacks the problem of new secondary education teachers going into the classroom without the skills and knowledge necessary to integrate technology into their curriculum. Redmann (1998) recommended that pre-service programs should strengthen

their emphasis on preparing new teachers to be self-directed learners, especially in the area of instructional technology competencies. The recommendations also focused on the continuing need for in-service training in the area of instructional technology and the need for vocational teachers to embrace self-directed learning as one mode of upgrading teachers' perception of instructional technology competencies.

El-Hmaisat (1998) found that many teachers in Jordan did not take courses in the area of instructional technology during their pre-service training, and many teachers did not participate in in-service workshops and training in the area of instructional technology. Therefore, processing of instructional technology competencies in a controlled environment with the objective of supporting a specific lesson plan is vital to implementing broader computer use for instructional purposes.

Summary

In this chapter, a literature review was conducted related to the study of the perception of instructional technology competencies needs of vocational teachers in Ohio and Taiwan. The literature review encompassed the variables of the study which were: the concept of needs assessment; instructional technology competencies in teacher education programs; and the demographic characteristics of, age, gender, instructional technology experiences, and the instructional technology pre-service and in-service education.

CHAPTER 3

METHODOLOGY

The purpose of this study was to explore and describe the differences in perception of importance, knowledge and education needs for instructional technology for vocational education teachers in Ohio and Taiwan. This chapter describes the research design, the population and the sample, frame, selection and sampling error control, instrumentation, validity, reliability, data collection and data analysis.

Research Design

This study employed a descriptive survey that collected data from members of a population in order to determine the current status of that population with respect to one or more variables (Gray, 1987). A descriptive survey involved asking the same set of questions of a large number of individuals either by mail, by telephone, or in person (Fraenkel & Wallen, 1996). Ary et al. (1990) supports the use of descriptive surveys:

They are directed toward determining the nature of a situation as it exists at the time of the study. As with ex post facto research, there is no administration or control treatment as is found in experimental research. The aim is to describe “what exists” with respect to variables and conditions in a situation.

The difficulties of this research design are: (a) the clarity of the questions, (b) getting respondents to answer questions thoughtfully and honestly, and (c) getting a

sufficient number of questionnaires back (Salant & Dillman, 1994). A significant advantage of survey research is that it has the potential to provide a lot of information obtained from a large sample of individuals. In order to succeed in survey research, the understanding and avoiding major errors of survey research will be crucial. According to Miller (1998), the major errors of survey research include:

- (1) Frame error. According to Groves (1989), frame error occurs when the frame or survey population from which a sample is drawn does not include all elements of the population that the researchers wish to study. A discrepancy between intended target population and actual survey population results in frame error. For this study, frame error was controlled by ensuring that the most accurate list was secured from both Ohio Department of Education and Department of Technical and Vocational Education in Taiwan.
- (2) Sampling error. Sampling error occurs when researchers survey only a non-random subset or sample of all people in the population instead of conducting a census (Salant & Dillman, 1994), and can be controlled by just increasing sample size and using a random sampling procedure. Because sampling error can be estimated, it is often the only specific error referred to when survey results are presented.
- (3) Selection error. Selection error is a type of an external validity threat resulting from duplicate entries in a frame, and occurs when certain sampling units in the population have a greater or lesser chance of being selected into the sample than the other sampling units (Salant & Dillman, 1994). Selection error was controlled

by checking the lists to ensure that there was no duplication of names in this study.

- (4) Non-response error. Non-response error is the most problematic error in survey research, and occurs when people in the sample do not respond to the questionnaire and are different from those who do in a way that is important to the study (Salant & Dillman, 1994). In this study, a code number was placed on each questionnaire to allow the researcher to identify non-respondents for follow-up purposes. The double-dipping technique was used to control non-response error by drawing a random sample (10-20%) from the list non-respondents to get their response by phone, interview, etc. and statistically compare respondents to non-respondents. If there was no difference, data would be collapsed. If responses were different, a proportionately weighted formula would be calculated to get adjusted data (Miller & Smith, 1983; Ary, Jacobs, & Razavieh, 1990).
- (5) Measurement error. Measurement error occurs during data collection and from four sources that include survey method, the questionnaire, the interviewer, and the respondent, and occurs when a respondent's answer to a given question is inaccurate, imprecise, or cannot be compared in any useful way to other respondents' answers (Salant & Dillman, 1994). Control of this error will be discussed in the Instrumentation section.

According to Ary, Jacobs, and Razavieh (1990) and Fraenkel and Wallen (1996), the purposes of correlational research are to: (a) describe relationships that exist among variables and/or (b) use the known correlation to predict from one variable to another. This study is concerned with determining the relationships among the demographic

characteristics of teachers and their instructional technology education needs, and would help to explain and predict perceived instructional technology competencies by vocational education teachers at vocational schools in Ohio and Taiwan.

Population and Sample

The populations of this study consisted of all vocational education teachers working at 44 comprehensive high schools and six joint vocational school districts (JVSD) in the Central Region of Ohio and 10 teachers per 22 vocational high schools in Taiwan. Considering the size of Ohio and Taiwan and the practical constraints in gathering data from the total populations of vocational teachers, the accessible populations for this exploratory study was chosen as secondary vocational teachers in the Central Region of Ohio and Kaohsiung District (included Kaohsiung City and Kaohsiung County) of Taiwan during the 2001-02 academic year.

All 44 comprehensive high schools and six JVS were identified from a list published by the Division of Career-Technical and Adult Education, Ohio Department of Education, and Department of Technical and Vocational Education in Taiwan ($n=22$) (See Appendix F). The researcher selected all qualified vocational teachers ($N=247$) in central Ohio and randomly selected 10 teachers per school in Taiwan ($n=220$) by using a 2000-01 directory that listed all vocational education teachers at schools in Ohio and Taiwan. Generalizations can be made only to the secondary schools located in the Central Region of Ohio and Kaohsiung District of Taiwan. Those schools that were not part of the accessible population may differ, thus, causing potential error if generalizations were they to be extended to other schools.

Instrumentation

A questionnaire was designed to gather information about secondary vocational teachers' school and program characteristics and their perceptions of the instructional technology importance and knowledge in their programs. The questionnaire was developed with two parallel versions: (a) The English version used in the Central Region of Ohio and (b) the Mandarin version was used in the Kaohsiung District of Taiwan.

The instrument consists of two parts: (a) demographic data such as age, gender, highest degree earned, instructional technology experiences, and specialty; and (b) a Likert-type scale, to measure the perceived importance and knowledge. This scale was chosen because of its applicability to different types of populations and its functionality in construction, application and analysis of data (Kerlinger, 1973). The Borich (1980) needs assessment model was adapted to determine the need of instructional technology knowledge and skills for secondary vocational teachers.

The content validity of the questionnaire was assessed by a panel of experts; three of whom were professors in the Department of Human and Community Resource Development and Workforce Development and Education at The Ohio State University, and two were professionals in the Office of Career-Technical Education at the Ohio Department of Education (Appendix A). Each expert received a copy of the instrument and the objectives of the study. The experts evaluated the questionnaire considering whether the items really measured the objectives.

The suitability and clarity of the instrument were assessed through a field test with 15 Ohio vocational teachers who are in the CAREERTECH (careertech@lists.acs.ohio-state.edu) email list that was established by the National

Research Center for Career and Technical Education for Question-And-Answer Service and of similar characteristics of those in the study for the English Version. Then, the English version of the instrument was translated into Mandarin and was reviewed by 15 Taiwanese graduate students who were fluent in both languages. The Mandarin version was modified according to their suggestions. In the field test, wording, clarity and suitability were verified and corrected using the feedback from the vocational teachers.

The internal consistency reliability of the instrument was assessed using a pilot test of 15 vocational teachers in an area close to the Central Region of Ohio using Cronbach's alpha. For research purposes, a useful standard is that the coefficient of reliability should be at least .50 to .60 and preferably higher (Nunnally, 1967).

Data Collection

The data collection was carried out as follows; first, an application form for exemption from The Ohio State University Human Subjects Review Committee was submitted (See Appendix C). Next, the researcher contacted the Ohio Department of Education, Division of Career-Technical and Adult Education and Department of Technical and Vocational Education in Taiwan and obtained the directory of all vocational education teachers at vocational high schools for the academic year 2001-02. From the lists obtained, the researcher identified 44 comprehensive high schools and six JVS in Ohio and 22 vocational high schools in Taiwan. The researcher selected all qualified vocational teachers (N=247) in central Ohio and randomly selected 10 teachers per school in Taiwan (n=220).

The researcher sent by mail a packet, in late August 2001, to each vocational school with addressed sealed envelopes containing the instrument and return-stamped envelope for each teacher in the sample. To guarantee the teachers' confidentiality, code numbers were assigned to the instruments (Appendix D & E) with cover letter (Appendix B). This allowed the researcher to identify non-respondents for follow-up purposes. Another instrument and cover letter (Appendix B) was sent in late September 2001, to teachers that did not return their instruments as a result of the first mailing. Double-dipping was used to control non-response error by drawing a random sample (20%) from the list of non-respondents to get their response by telephone interview in the mid-October 2001. The returned completed instruments were dated and classified by country. The response rate was 74% (182/247) for Ohio vocational teachers and 87% (191/220) for Taiwan vocational teachers.

Early respondents were those participants whose teachers in both countries responded to the first mailing. The respondents of the second mailing were classified as late-respondents and the final respondents were classified as double-dipping. A t-test was conducted to determine if there was a significant difference between those responding and the non-respondents (Miller & Smith, 1983; Ary, Jacobs, & Razavieh, 1990). In this study, two t-tests were conducted between early respondents and late respondents, and also between early plus late respondents and double-dipping technique respondents. Table 3.1 reports mean and standard deviation of responding and non-respondent teachers for both levels of importance and competence scales. In Table 3.2 and 3.3, the t-test revealed that there was significant difference between early and late respondent teachers for the level of competence scale. However, the data revealed that there was no

significant difference between early and late respondents on the level of importance scale and also no significant difference between early plus late respondents and double-dipping respondents on both level of importance and competence scales.

	Respondents	Number of Cases	Mean	SD
Level of Importance Scale	Early	203	4.13	.87
	Late	164	4.46	1.03
	Double-dipping	6	3.12	.86
Level of Competence Scale	Early	203	3.48	1.11
	Late	164	3.31	.98
	Double-dipping	6	2.98	.83
Total		373		

Table 3.1: Mean and Standard Deviation of Early, Late Respondents and Double-dipping Technique Respondents on the Level of Importance and Competence Scales.

	Variances	Sig (2-tailed)	SE of Diff	95% CI for Diff
Level of Importance Scale	Equal	.11	.078	(-.30 ; -.05)
Level of Competence Scale	Equal	.000	.079	(-.44 ; -.10)

Table 3.2: Equality of Means t-test of the Level of Importance and Competence Scale for Early and Late Respondent Teachers.

	Variances	Sig (2-tailed)	SE of Diff	95% CI for Diff
Level of Importance Scale	Equal	.09	.08	(-.33 ; -.14)
Level of Competence Scale	Equal	.056	.07	(.013 ; .30)

Table 3.3: Equality of Means t-test of the Level of Importance and Competence Scale for Early Plus Late Respondents and Double-dipping Respondent Teachers.

Data Analysis

Descriptive statistics were used to describe the obtained characteristics by using percentages, means, frequencies and standard deviations. Relational statistics were calculated between each characteristic and the perception of instructional technology competencies. The magnitude of relationship between characteristics was defined according to Davis (1971). The scale consists of the following standards:

<i>Coefficient</i>	<i>Description of Relationship</i>
0.70 or greater	very strong association
0.50 to .69	substantial association
0.30 to .49	moderate association
0.10 to .29	low association
0.01 to .09	negligible association

The t-test for independent means was used to compare the mean scores of two different groups. The Pearson correlation coefficient r , a measure of linear association between two variables, was used to measure the relationships between age, year of teaching, instructional technology training experience and calculated perceived educational needs for instructional technology competencies. The Spearman correlation coefficient, a measure of association between rank orders, was used to measure the relationship between teachers' education degree earned and perceived educational needs. The multivariate analysis of variance (MANOVA) Eta Squared (R^2), a measure of association between nominal and interval variables, was used to measure the association between

gender, teachers' teaching specialty and perceived educational needs. For the missing items measurement, the mean values were substituted for the values of missing observations. According to Travers (1969), "the insertion of the mean is an attempt to substitute the most provable value for the missing one."

CHAPTER 4

FINDINGS

This chapter reports the data analysis and the results of the study. The purpose of this study was to describe the perceived educational needs in instructional technology of vocational teachers in Ohio and Taiwan. This was a descriptive survey that involved asking the same set of questions of a number of individuals by mail to explore and describe the perception of the competence, importance, and educational needs of instructional technology for vocational and technical education teachers. The population studied was all qualified vocational teachers (N = 247) in central Ohio and 10 teachers randomly selected per school in Kaohsiung District of Taiwan (n = 220). The number of Ohio respondent teachers was 182 (74%) and Taiwan respondent teachers were 191 (87%).

For non-response error control, a code number was placed on each instrument to allow the researcher to identify non-respondents for follow-up purposes. Another instrument and cover letter was sent to non-respondents who did not return their instruments as a result of the first mailing. A t-test was conducted to determine if there was significant difference between early respondents and late respondents and the double-dipping technique (Miller & Smith, 1983; Ary, Jacobs, & Razavieh, 1990) were used to control non-response error. A t-test of the instructional technology educational

needs revealed no significant differences for both “level of importance and competence” scales. However, the data revealed that there was significant difference between early and late respondents on the level of competence scale. Therefore, the findings of this study can be generalized from the respondents to the sample and to the entire population of both Ohio and Taiwan vocational teachers.

The instrument was field tested for face validity and clarity with 15 Ohio vocational teachers who are in the CAREERTECH (careertech@lists.acs.ohio-state.edu) email list that was established by the National Research Center for Career and Technical Education for a Question-And-Answer Service and were of similar characteristics to those in the study for the English version. Then, the English version of the instrument was translated into Mandarin and was reviewed by 15 Taiwanese graduate students who were fluent in both languages. The Mandarin version was modified according to their suggestions. A Cronbach’s alpha was used to establish the internal consistency reliability of the final instrument on educational needs and coefficients ranged from .67 to .98 (Table 4.1). These procedures controlled for measurement error. This chapter will present information according to the five objectives of the study.

Objective 1: The demographic characteristics of vocational teachers such as age, gender, highest degree earned, teaching experiences, teaching specialty, and instructional technology experience.

Table 4.2 to 4.7 displays a summary of the demographic characteristics of the 182 vocational teachers in the Central Region of Ohio and 191 vocational teachers in the Kaohsiung District of the Taiwan who participated in the study. The characteristics

included were age, gender, highest degree earned, teaching experience, teaching specialty, and instructional technology experience.

Domain	Number of Items	Perceived Knowledge (Cronbach's α)	Perceived Importance (Cronbach's α)
1. Computer Operation Skills	13	.94	.95
2. Setup, Maintenance, and Troubleshooting	9	.93	.83
3. Word Process and Introductory Desktop Publishing	10	.93	.91
4. Spreadsheet/Graphing	11	.98	.95
5. Database	9	.98	.93
6. Networking	6	.87	.82
7. Telecommunications	18	.67	.94
8. Media Communications	10	.95	.82

Table 4.1: Cronbach's Alpha Reliability Coefficients for the Eight Domain Areas.

Demographics

Table 4.2 reports teachers' age by category. For Ohio vocational teachers (N=182), 42 % were between the ages of 41 and 50 years. The average age of Ohio respondents was 42 years. Of the 191 Taiwan respondents, their age by category was 39% between the ages of 31 and 40 years old and 43 % were 41 years or more.

Table 4.3 shows the gender of Ohio vocational teachers (N = 182), about 48 % were males and 52% were females. For Taiwan vocational teachers (n = 191), 45% were males and 55% were female. Table 4.4 shows that more than 84% of the teachers had a Bachelor's Degree or higher and 16 % had an Associate Degree or less. More than 95%

of the Taiwan respondents had a Bachelor's Degree or higher and only 5% had an Associate Degree or less.

Age	Ohio		Taiwan	
	f	%	f	%
20 – 30 years old	22	12.1	34	17.8
31 – 40 years old	36	18.9	75	39.3
41 – 50 years old	76	41.8	65	34.0
51 – 60 years old	39	21.4	17	8.9
61 and up years old	9	4.9	0	0
Total	182	100.0	191	100.0
<i>Mean (years old)</i>	43.0		38.0	

Table 4.2: Age of Respondents (Ohio: N = 182; Taiwan: n = 191)

Gender	Ohio		Taiwan	
	f	%	f	%
Male	87	47.8	87	45.4
Female	95	52.2	104	54.6
Total	182	100.0	191	100.0

Table 4.3: Gender of Respondents (Ohio: N = 182; Taiwan: n = 191)

Table 4.5 reports teachers' years of teaching experience at their current school. Of the 182 Ohio vocational teachers in this study, data revealed that the largest group of respondents (24%) had six to ten years of teaching experiences, and 22% had 21 years or more of teaching experience. For Taiwan vocational teachers (n = 191), data revealed that the largest group of respondents (26%) had five years or less of teaching experience, and about 25% had six to ten years of teaching experience.

Academic Preparation	Ohio		Taiwan	
	f	%	f	%
Less than Associate Degree	13	7.1	1	.5
Associate Degree	17	9.3	8	4.2
Bachelor's Degree	84	46.2	158	82.7
Master's Degree	54	29.7	20	10.5
Higher than Master's Degree	14	7.7	4	2.1
Total	182	100.0	191	100.0

Table 4.4: Academic Preparation of Respondents (Ohio: N = 182; Taiwan: n = 191)

Years of Teaching Experience	Ohio		Taiwan	
	f	%	f	%
5 years or less	35	19.2	50	26.2
6 – 10 years	44	24.2	47	24.6
11 – 15 years	26	14.3	35	18.3
16 – 20 years	37	20.3	24	12.6
21 – 25 years	31	17.0	25	13.1
26 – 30 years	7	3.8	9	4.7
31 years or more	2	1.1	1	.5
Total	182	100.0	191	100.0
<i>Mean (years)</i>	<i>13.3</i>		<i>11.7</i>	

Table 4.5: Years of Teaching Experience of Respondents (Ohio: N=182; Taiwan: n=191)

Table 4.6 presents the teaching specialty of Ohio respondents of this study. Data revealed that 43% of the teachers had a teaching specialty in business and management, 26% of teachers were in the field of industrial and engineering systems, 14% of the teachers had a teaching specialty in environmental and agricultural system, and art and communications, human resources and services and health services were less than 10 % each. About 31% of the Taiwan vocational teachers had a teaching specialty in industrial and engineering system, 23% in business and management, 14% of the teachers taught in the field of marine science, 11% of the teachers had specialty in human resources and services, 8% taught in art and communications, another 8% taught health services, and only 5% of the teachers had a teaching specialty in environmental and agricultural systems.

Teaching Specialty	Ohio		Taiwan	
	f	%	f	%
Art and Communications	10	5.5	15	7.9
Business and Management	78	42.9	44	23.0
Industrial and Engineering System	47	25.8	60	31.4
Human Resources and Services	12	6.6	21	11.0
Environmental and Agricultural System	26	14.3	9	4.7
Health Services	9	4.9	15	7.9
Other (Marine Science)	0	0	27	14.1
Total	182	100.0	191	100.0

Table 4.6: Teaching Specialty of Respondents (Ohio: N = 182; Taiwan: n = 191)

Table 4.7 shows the instructional technology training experience of teachers. For Ohio vocational teachers, 24% did not have any instructional technology training experience. Nearly one-third of Ohio teachers had six to ten hours of instructional technology training experience before or after teaching. For Taiwan vocational teachers, 41% did not have any instructional technology training experience. Nearly 45% of the teachers had six and more hours of instructional technology training experiences before or after teaching.

Instructional Technology Training Experience (hours)	Ohio		Taiwan	
	f	%	f	%
Zero hours	43	23.6	79	41.4
1 – 5 hours	42	23.1	26	13.5
6 – 10 hours	58	31.8	40	20.9
11 hours or more	39	21.5	46	24.4
Total	182	100.0	191	100.0
<i>Mean (hours)</i>	<i>13.0</i>		<i>11.9</i>	

Table 4.7: Instructional Technology Training Experience of Respondents (Ohio: N = 182; Taiwan: n = 191)

Objective 2, 3, and 4: The perceived competence, importance, and educational needs of instructional technology competencies possessed by vocational teachers in Ohio and Taiwan.

The perceived educational needs were calculated through the use of the Borich (1980) model. Table 4.8 to 4.15 report, in rank order, the grand means, standard deviations, and the calculated educational needs, for the eight areas of educational needs that are computer operation skills, setup, maintenance, and troubleshooting, word

processing/introductory desktop publishing, spreadsheet/graphing, database, networking, telecommunications, and media communications as perceived by Ohio and Taiwan vocational teachers.

Section 1: Computer Operation Skills

Table 4.8 presents the calculated perceived computer operation skills needs in rank order for Ohio and Taiwan. The six areas reported by Ohio vocational teachers as the highest perceived educational needs in computer operation skills were: 1) create and name and rename subdirectories/folders, 2) save, open, and place documents inside subdirectories/folders, 3) identify and use icons, windows, and menus, 4) start an application and create a document, 5) open and work with more than one application at a time, and 6) copy document from hard disk to floppy disk. The following five items in computer operation skills were perceived as the lowest needs: 1) insert and eject floppy disk and CD-ROM, 2) start up and shut down the computer according to computer type, 3) save a document using both the save and save as commands, 4) use printing options, and 5) name a document (Table 4.8).

Analyzing the perceived competence in computer operation skills, Ohio vocational teachers had high perceived competencies in how to insert and eject a floppy disk and CD-ROM, start up and shut down the computer, save a document using both the save and save as commands and use printing options. Teachers perceived little competence in how to create, name and rename subdirectories/folders, save, open and place documents inside subdirectories/folders and how to open and work with more than one application at a time that affect computer operation. Analyzing the perceived level of importance in computer operation skills, Ohio vocational teachers perceived higher levels

in how to identify and use icons, windows, and menus, start an application and create a document, use printing options, save a document using both the save and save as commands, and start up and shut down the computer according to computer type. Lower levels of perceived importance were reported about: how to open and work with more than one application at a time, create and name and rename subdirectories/folders, and save, open, and place documents inside subdirectories/folders.

The five highest perceived needs for learning about computer operation skills reported by Taiwan vocational teachers were: 1) start an application and create a document, 2) save, open, and place documents inside subdirectories/folders, 3) open and work with more than one application at a time, 4) create and name and rename subdirectories/folders, and 5) name a document. Teachers lower perceived needs in computer operation skills were: 1) start up and shut down the computer according to computer type, 2) insert and eject floppy disk and CD-ROM, 3) use printing options, and 4) start up and shut down the peripherals.

Taiwan vocational teachers reported that the five skills they perceived the most for learning about computer operation skills were: 1) insert and eject floppy disk and CD-ROM, 2) start up and shut down the computer, 3) use printing options, 4) save a document using both the save and save as commands, and 5) start up and shut down the peripherals. Teachers reported that they perceived less in computer operation skills about: 1) open and work with more than one application at a time, 2) save, open, and place documents inside subdirectories/folders, 3) create and name and rename subdirectories/folders, and 4) start an application and create a document. Teachers perceived four items that they consider more important to learn: 1) name a document,

2) save a document using both the save and save as commands, 3) start an application and create a document, and 4) copy document from hard disk to floppy disk. However, teachers considered less perceived importance for 1) how to open and work with more than one application at a time, and 2) how to save, open, and place documents inside subdirectories/folders.

Section 2: Setup, Maintenance, and Troubleshooting

As illustrated in Table 4.9, the five highest perceived needs reported by Ohio vocational teachers in the area of setup, maintenance, and troubleshooting of computer system were: 1) protect against computer viruses, 2) install and upgrade an application, 3) use self-help resources to diagnose and correct common hardware problems, 4) proper operating environment for computer and peripherals, and 5) clean computer components and printers. The two lowest perceived needs reported were 1) protect and care for floppy disks, and 2) connect peripheral devices. Ohio vocational teachers reported having more perceived competence in setup, maintenance, and troubleshooting in these three areas: 1) Protect and care for floppy disks, 2) setup computer system, and 3) make back up copies of key applications and documents; and little competence in 1) protect against computer viruses, 2) use self-help resources to diagnose and correct hardware problems, and 3) install and upgrade an application. Analyzing the level of perceived importance in setup, maintenance, and troubleshooting of computer system, Ohio vocational teachers placed high perceived levels in 1) protect against computer viruses, 2) make backup copies of key applications and documents, and 3) protect and care for floppy disks. However, teachers placed low levels of perceived importance for 1) clean computer

components and printers, 2) use self-help resources to diagnose and correct common hardware problems, and 3) connect peripheral devices.

STATEMENTS*	OHIO				TAIWAN			
	*COMP.	* IM.	NEEDS	*R	*COMP.	* IM.	NEEDS	*R
	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>		<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	
Create and name/rename subdirectories/folders.	<u>3.54</u> 1.27	<u>4.32</u> .90	<u>3.35</u> 6.43	1	<u>3.99</u> 1.08	<u>4.20</u> .94	<u>.92</u> 5.67	4
Save, open, and place documents inside subdirectories/folders.	<u>3.69</u> 1.14	<u>4.40</u> .87	<u>3.03</u> 6.07	2	<u>3.94</u> 1.13	<u>4.17</u> .91	<u>1.01</u> 5.47	2
Identify and use icons, windows, and menus.	<u>4.19</u> .97	<u>4.76</u> .60	<u>2.54</u> 5.05	3	<u>4.15</u> .97	<u>4.23</u> 1.03	<u>.35</u> 5.60	7
Start an application and create a document.	<u>4.13</u> 1.23	<u>4.69</u> .58	<u>2.52</u> 6.05	4	<u>4.03</u> 1.06	<u>4.30</u> .90	<u>1.22</u> 5.68	1
Open and work with more than one application at a time.	<u>3.76</u> 1.29	<u>4.32</u> .93	<u>2.37</u> 6.34	5	<u>3.90</u> 1.10	<u>4.14</u> .99	<u>1.00</u> 5.60	3
Copy document from hard disk to floppy disk.	<u>3.92</u> 1.42	<u>4.46</u> .84	<u>2.32</u> 6.90	6	<u>4.21</u> 1.02	<u>4.28</u> 1.00	<u>.30</u> 5.71	9
Initialize, name/rename floppy disk.	<u>3.06</u> 1.08	<u>4.50</u> .82	<u>1.91</u> 5.66	7	<u>4.13</u> 1.05	<u>4.20</u> 1.03	<u>.34</u> 5.97	8
Start up and shut down the peripherals (printer, CD-ROM, or scanner).	<u>4.34</u> .83	<u>4.64</u> .86	<u>1.32</u> 5.52	8	<u>4.24</u> .93	<u>4.25</u> 1.03	<u>.07</u> 5.59	10
Name a document.	<u>4.36</u> .97	<u>4.56</u> .73	<u>.88</u> 5.31	9	<u>4.17</u> 1.01	<u>4.37</u> .92	<u>.86</u> 5.51	5
Use printing options.	<u>4.46</u> .85	<u>4.65</u> .70	<u>.74</u> 4.56	10	<u>4.26</u> .89	<u>4.24</u> .95	<u>-.09</u> 5.99	11
Save a document using both the save and save as commands.	<u>4.49</u> .92	<u>4.65</u> .74	<u>.74</u> 5.20	11	<u>4.25</u> .93	<u>4.35</u> .90	<u>.42</u> 5.28	6
Start up and shut down the computer according to computer type.	<u>4.56</u> .77	<u>4.65</u> .92	<u>.39</u> 5.48	12	<u>4.41</u> .87	<u>4.22</u> 1.04	<u>-.87</u> 5.71	13
Insert and eject floppy disk and CD-ROM.	<u>4.69</u> .62	<u>4.56</u> .91	<u>-.58</u> 3.81	13	<u>4.44</u> .91	<u>4.27</u> 1.09	<u>-.74</u> 5.99	12
DOMAIN MEAN (Mean of Means)	4.09	4.55	1.67		4.16	4.25	.37	

* Potential domain range = 13 to 65; R: Rank Order; COMP: Level of Competence; IM: Level of Importance

* Scale: 1 – None, 2 – Very Little, 3 – Somewhat, 4 – Very, 5 – A Great Deal

Table 4.8: Perceived Competence, Importance, and Rank Order of Calculated Needs of the 13 Areas of Computer Operation Skills (Ohio: N=182; Taiwan: n=191)

Data presented in Table 4.9 shows the four highest perceived educational needs Taiwan participants identified were: 1) how to protect against computer viruses, 2) how to install and upgrade an application, 3) how to clean computer components and printer, and 4) how to use self-help resources to diagnose and correct common hardware problems. The two lowest needs perceived themselves were competent about 1) how to setup a computer system, and 2) how to make backup copies of key applications and documents.

Analysis of perceived competence in setup, maintenance, and troubleshooting of computer system indicated that Taiwan participants perceived more in 1) setup computer system, 2) make backup copies of key applications and documents, 3) connect peripheral devices, and 4) protect and care for floppy disks. The three activities in which Taiwan participants perceived the least competence were: 1) how to install and upgrade an application, 2) how to protect against computer viruses, and 3) how to use self-help resources to diagnose and correct common hardware problems. Data indicated that respondents placed high levels of perceived importance on 1) protect against computer viruses, 2) setup computer system, 3) make backup copies of key applications and documents, and 4) protect and care for floppy disks. The two activities participants considered the least perceived important were: 1) use self-help resources to diagnose and correct common hardware problems, and 2) install and upgrade an application.

Section 3: Word Process/Introductory Desktop Publishing

As shown in Table 4.10, the five highest perceived educational needs for Ohio teachers in word processing/introductory desktop publishing were: 1) add columns to a document, 2) insert clip art into a document, 3) create a header and footer, 4) insert date,

time, and page number, and 5) change text format and style. However, checking spelling, grammar, and word usage and enter and edit text were the lowest perceived needs.

Analysis of perceived competence in word processing and introductory desktop publishing indicated that participants perceived more competence in 1) check spelling, grammar, and word usage, 2) change text format and style, and 3) enter and edit text. Participants reported little perceived competence in 1) add columns to a document, 2) insert clip art into a document, and 3) insert date, time, and page number.

As shown in Table 4.10 for Taiwan participants, the four highest needs perceived in this section were: 1) how to use margins, 2) insert date, time, and page number, 3) enter and edit text, and 4) use tab stop. The three lowest perceived needs reported were 1) change text format and style, 2) copy and move blocks of text, and 3) create a header and footer.

Taiwan vocational teachers reported having more perceived competence in word processing and introductory desktop publishing in these three areas: 1) change text format and style, 2) copy and move blocks of text, and 3) enter and edit text; and little competence in 1) spelling, grammar, and word usage checking, and 2) insert date, time, and page number. Participants identified the three activities they perceived most important to learn as: 1) how to copy and move blocks of text, 2) enter and edit text, and 3) use margins. However, those perceived least important were: 1) how to check spelling, grammar, and word usage, and 2) use tab stop.

STATEMENTS*	OHIO				TAIWAN			
	*COMP.	* IM.	NEEDS	*R	*COMP.	* IM.	NEEDS	*R
	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>		<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	
Protect against computer viruses.	<u>2.79</u> 1.27	<u>4.55</u> .76	<u>7.88</u> 6.43	1	<u>3.19</u> 1.23	<u>4.40</u> .84	<u>5.43</u> 6.39	1
Install and upgrade and application.	<u>2.93</u> 1.47	<u>4.34</u> .92	<u>5.81</u> 6.37	2	<u>3.12</u> 1.23	<u>3.97</u> .97	<u>3.56</u> 6.22	2
Use self-help resources to diagnose and correct common hardware problems.	<u>2.84</u> 1.32	<u>4.26</u> .98	<u>5.80</u> 5.85	3	<u>3.22</u> 1.12	<u>3.98</u> .92	<u>2.89</u> 5.61	4
Proper operating environment for computer and peripherals.	<u>3.24</u> 1.29	<u>4.42</u> .77	<u>5.04</u> 6.28	4	<u>3.41</u> 1.16	<u>4.08</u> .92	<u>2.85</u> 5.88	5
Clean computer components and printers.	<u>2.98</u> 1.34	<u>4.09</u> .98	<u>4.52</u> 5.93	5	<u>3.31</u> 1.12	<u>4.05</u> .91	<u>2.98</u> 5.52	3
Make backup copies of key applications and documents.	<u>3.56</u> 1.16	<u>4.52</u> .75	<u>4.20</u> 5.55	6	<u>3.74</u> 1.14	<u>4.23</u> .82	<u>2.11</u> 5.65	8
Connect peripheral devices (i.e.: printers, CD-ROM, external drives, modem, and scanner).	<u>3.50</u> 1.27	<u>4.32</u> 1.00	<u>3.50</u> 5.93	7	<u>3.61</u> 1.21	<u>4.19</u> .87	<u>2.45</u> 5.74	7
Setup computer system (i.e.: CPU, monitor, keyboard, and mouse).	<u>3.63</u> 1.37	<u>4.36</u> 1.01	<u>3.14</u> 5.84	8	<u>3.79</u> 1.18	<u>4.24</u> .85	<u>1.94</u> 5.75	9
Protect and care for floppy disks.	<u>3.97</u> 1.23	<u>4.47</u> .76	<u>2.19</u> 6.18	9	<u>3.57</u> 1.12	<u>4.21</u> .86	<u>2.76</u> 5.72	6
DOMAIN MEAN (Mean of Means)	3.27	4.37	4.68		3.44	4.14	3.00	

* Potential domain range = 9 to 45; R: Rank Order; COMP: Level of Competence; IM: Level of Importance

* Scale: 1 – None, 2 – Very Little, 3 – Somewhat, 4 – Very, 5 – A Great Deal

Table 4.9: Perceived Competence, Importance, and Rank Order of Calculated Needs of the Nine Areas of Setup, Maintenance and Troubleshooting of Computer System (Ohio: N=182; Taiwan: n=191).

Section 4: Spreadsheet/Graphing

Table 4.11 shows the five highest perceived needs for Ohio teachers in the area of using spreadsheet and graphing reported by respondents as: 1) create a graph or chart from spreadsheet data, 2) create a formula using functions, 3) insert a spreadsheet into a word processing document, 4) understand the function of label, value, and formula cells,

and 5) change the appearance of a spreadsheet by inserting columns and rows. Entering data in an existing spreadsheet and understanding the concept of a spreadsheet and relate a print spreadsheet to an electronic spreadsheet were reported as the lowest perceived needs in the area of using spreadsheet and graphing.

STATEMENTS*	OHIO				TAIWAN			
	*COMP.	* IM.	NEEDS	*R	*COMP.	* IM.	NEEDS	*R
	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>		<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	
Add columns to a document.	<u>3.52</u> 1.27	<u>4.47</u> .73	<u>4.15</u> 5.45	1	<u>3.86</u> 1.07	<u>4.21</u> .82	<u>1.52</u> 5.28	5
Insert clip art into a document.	<u>3.53</u> 1.44	<u>4.41</u> .73	<u>3.77</u> 5.45	2	<u>3.78</u> 1.03	<u>4.11</u> .89	<u>1.43</u> 5.14	6
Create a header and footer.	<u>3.77</u> 1.03	<u>4.48</u> .65	<u>3.04</u> 4.60	3	<u>3.73</u> 1.07	<u>4.00</u> .93	<u>1.15</u> 5.98	8
Insert date, time, and page number.	<u>3.70</u> 1.25	<u>4.40</u> .79	<u>2.92</u> 5.00	4	<u>3.57</u> 1.14	<u>4.03</u> .91	<u>1.96</u> 6.01	2
Change text format and style.	<u>4.29</u> 1.12	<u>4.70</u> .61	<u>2.76</u> 5.74	5	<u>4.16</u> .97	<u>4.20</u> .87	<u>.44</u> 4.80	10
Copy and move blocks of text.	<u>4.08</u> 1.26	<u>4.66</u> .62	<u>2.62</u> 5.40	6	<u>4.11</u> .96	<u>4.36</u> .79	<u>1.13</u> 4.66	9
Use margins.	<u>4.12</u> 1.06	<u>4.69</u> .55	<u>2.55</u> 4.39	7	<u>3.82</u> 1.07	<u>4.26</u> .80	<u>1.97</u> 5.53	1
Use tab stop.	<u>4.09</u> 1.11	<u>4.60</u> .59	<u>2.19</u> 4.75	8	<u>3.61</u> 1.10	<u>3.99</u> .92	<u>1.62</u> 5.95	4
Enter and edit text.	<u>4.23</u> 1.03	<u>4.71</u> .59	<u>2.16</u> 4.35	9	<u>3.95</u> 1.02	<u>4.34</u> .80	<u>1.75</u> 4.99	3
Check spelling, grammar, and word usage.	<u>4.35</u> .98	<u>4.81</u> .42	<u>1.98</u> 4.19	10	<u>3.47</u> 1.09	<u>3.78</u> 1.04	<u>1.32</u> 5.88	7
DOMAIN MEAN (Mean of Means)	3.97	4.59	2.81		3.81	4.13	1.43	

* Potential domain range = 10 to 50; R: Rank Order; COMP: Level of Competence; IM: Level of Importance

* Scale: 1 – None, 2 – Very Little, 3 – Somewhat, 4 – Very, 5 – A Great Deal

Table 4.10: Perceived Competence, Importance, and Rank Order of Calculated Needs of the 10 Areas of Word Process/ Introductory Desktop Publishing (Ohio: N=182; Taiwan: n=191).

Analyzing the perceived competence levels in spreadsheet and graphing as shown in Table 4.11, Ohio vocational teachers had high perceived competence in entering data in an existing spreadsheet and creating a spreadsheet. The two areas they perceived the least competence in were: 1) create a formula using functions, and 2) insert a spreadsheet into a word processing document. Analysis of perceived importance in spreadsheet and graphing indicated that participants placed high levels of perceived importance on 1) create a spreadsheet with rows, columns, and headings, 2) enter data in an existing spreadsheet, and 3) create a graph or chart from spreadsheet data. Participants placed low levels of perceived importance on inserting a spreadsheet into a word processing document and copying values using fill down and fill across.

As illustrated in Table 4.11, the three highest perceived needs reported by Taiwan vocational teachers in the area of spreadsheet/graphing were: 1) understand the three basic type of cells such as label, value and formula, 2) interpret the information from a spreadsheet and communicate the data in a graphical format, and 3) understand the possibilities of spreadsheet calculations. The two lowest perceived needs reported were 1) change the appearance of a spreadsheet by inserting columns and rows, and 2) create a spreadsheet with rows, columns, and headings. Analyzing the level of perceived competence in spreadsheet and graphing, respondents placed high levels in 1) how to change the appearance of a spreadsheet by inserting columns and rows, 2) create a spreadsheet with rows, columns, and headings, and 3) insert a spreadsheet into a word processing document. They perceived low levels of competence for 1) understand the three basic types of cells such label, value, and formula, and 2) interpret the information from a spreadsheet and communicate the data in a graphical format.

Analyzing perceived importance in spreadsheet and graphing, the participants placed high levels of importance on 1) create a spreadsheet with rows, columns, and headings, and 2) enter data in an existing spreadsheet. They placed low levels of perceived importance on 1) understand the three basic types of cells, and 2) understand the possibilities of spreadsheet calculations.

Section 5: Database

As illustrated in Table 4.12, Ohio respondents perceived 1) create custom layouts including columnar reports, 2) insert database fields into word processing document, 3) use sorting and searching techniques to solve a problem, and 4) use a database to search for desired information given as their highest needs for learning in the area of database. Analysis of perceived competence possessed in database by Ohio vocational teachers showed that they perceive more competence on 1) use a prepared database to enter data, 2) add and delete a record to an existing database, and 3) search a database for specific information. The participants reported little perceived competence about creating custom layouts and inserting database fields into a word processing document.

Ohio respondents placed high level of perceived importance on 1) use a prepared database to enter data, and 2) add and delete a record to an existing database. They placed a low level of perceived importance on creating custom layouts and inserting database fields into a word processing document. The three highest perceived needs reported in database by Taiwan vocational teachers were: 1) how to insert data base fields into word processing document, 2) create a database with multiple fields, and 3) use a data base to sort records. To add and delete a record to an existing database and use a prepared database to enter data were the lowest perceived needs.

STATEMENTS*	OHIO				TAIWAN			
	*COMP.	* IM.	NEEDS	*R	*COMP.	* IM.	NEEDS	*R
	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>		<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	
Create a graph or chart from spreadsheet data.	<u>2.51</u> 1.25	<u>4.30</u> .86	<u>7.43</u> 5.93	1	<u>3.43</u> 1.26	<u>4.01</u> .84	<u>2.39</u> 5.32	6
Create a formula using functions.	<u>2.35</u> 1.33	<u>4.18</u> 1.01	<u>7.41</u> 5.09	2	<u>3.29</u> 1.23	<u>3.92</u> .89	<u>2.55</u> 5.49	5
Insert a spreadsheet into a word processing document.	<u>2.43</u> 1.23	<u>4.09</u> .96	<u>6.77</u> 5.63	3	<u>3.61</u> 1.28	<u>4.06</u> .88	<u>1.82</u> 5.70	9
Understand the three basic types of cells: label, value, and formula.	<u>2.56</u> 1.26	<u>4.15</u> .91	<u>6.39</u> 5.23	4	<u>3.51</u> 1.24	<u>3.88</u> .88	<u>2.92</u> 5.05	1
Change the appearance of a spreadsheet by inserting columns and rows.	<u>2.69</u> 1.50	<u>4.22</u> .95	<u>6.34</u> 6.48	5	<u>3.80</u> 1.23	<u>4.09</u> .86	<u>1.22</u> 5.38	11
Copy values using fill down and fill across.	<u>2.63</u> 1.51	<u>4.13</u> .96	<u>6.11</u> 5.77	6	<u>3.48</u> 1.29	<u>4.02</u> .89	<u>2.20</u> 5.33	7
Create a spreadsheet with rows, columns, and headings.	<u>3.07</u> 1.37	<u>4.45</u> .70	<u>5.93</u> 6.18	7	<u>3.74</u> 1.19	<u>4.13</u> .83	<u>1.64</u> 5.26	10
Understand the possibilities of spreadsheet calculations.	<u>2.85</u> 1.42	<u>4.26</u> .82	<u>5.76</u> 5.25	8	<u>3.22</u> 1.22	<u>3.91</u> .94	<u>2.82</u> 5.22	3
Interpret the information from a spreadsheet and communicate the data in a graphical format.	<u>2.79</u> 1.44	<u>4.13</u> .83	<u>5.44</u> 5.44	9	<u>3.21</u> 1.19	<u>3.93</u> .89	<u>2.88</u> 5.22	2
Understand the concept of spreadsheet and relate a print spreadsheet to an electronic spreadsheet.	<u>2.86</u> 1.35	<u>4.19</u> .90	<u>5.36</u> 5.70	10	<u>3.27</u> 1.17	<u>3.92</u> .84	<u>2.63</u> 5.05	4
Enter data in an existing spreadsheet.	<u>3.15</u> 1.44	<u>4.30</u> .77	<u>4.82</u> 5.92	11	<u>3.61</u> 1.24	<u>4.10</u> .90	<u>2.07</u> 5.33	8
DOMAIN MEAN (Mean of Means)	2.72	4.22	6.16		3.44	4.00	2.29	

* Potential domain range = 11 to 55; R: Rank Order; COMP: Level of Competence; IM: Level of Importance

* Scale: 1 – None, 2 – Very Little, 3 – Somewhat, 4 – Very, 5 – A Great Deal

Table 4.11: Perceived Competence, Importance, and Rank Order of Calculated Needs of the 11 Areas of Spreadsheet/Graphing (Ohio: N=182; Taiwan: n=191).

Analysis of perceived competence in database indicated that Taiwan participants perceived more competence in 1) how to add and delete a record to an existing database, and 2) use a prepared database to enter data. They reported little perceived competence about 1) create a database with multiple fields, and 2) create custom layouts including columnar reports. Data indicated that respondents placed high levels of perceived importance on 1) add and delete a record to an existing database, and 2) use a prepared database to enter data, and lower levels on 1) create a database with multiple fields, and 2) create custom layouts including columnar reports.

Section 6: Networking

Table 4.13 shows the two highest perceived needs in the area of networking by Ohio respondents as: 1) select/de-select a network zone, and 2) share files with others on a network. Ohio respondents reported disconnect/log off and retrieve a program or document as the lowest perceived needs. The Ohio respondents reported two areas they perceived as their highest competence in networking as 1) disconnect/log off, and 2) retrieve a program or document. The two areas they perceived the least competence were: 1) select/de-select a network zone, and 2) share files with other on a network. Analyzing perceived importance in networking, the Ohio participants placed high levels of perceived importance on 1) save a document to a specified location, and 2) retrieve a program or document. However, they placed low levels of perceived importance on 1) select/de-select a network zone, and 2) share files with others on a network.

STATEMENTS*	OHIO				TAIWAN			
	*COMP.	* IM.	NEEDS	*R	*COMP.	* IM.	NEEDS	*R
	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>		<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	
Create custom layouts	<u>2.05</u>	<u>3.96</u>	<u>7.57</u>	1	<u>3.14</u>	<u>3.98</u>	<u>3.37</u>	4
including columnar reports.	1.01	.97	5.47		1.27	.92	5.81	
Insert database fields into word	<u>2.13</u>	<u>4.00</u>	<u>7.53</u>	2	<u>3.17</u>	<u>4.06</u>	<u>3.57</u>	1
processing document.	1.19	.90	5.58		1.23	.90	5.52	
Use sorting and searching	<u>2.37</u>	<u>4.04</u>	<u>6.79</u>	3	<u>3.34</u>	<u>4.12</u>	<u>3.16</u>	5
techniques to solve a problem.	1.31	.92	5.79		1.20	.89	5.45	
Use a database to search for	<u>2.58</u>	<u>4.20</u>	<u>6.75</u>	4	<u>3.42</u>	<u>4.16</u>	<u>3.11</u>	6
desired information given.	1.38	.89	5.67		1.18	.83	5.36	
Use a database to sort records.	<u>2.51</u>	<u>4.14</u>	<u>6.73</u>	5	<u>3.23</u>	<u>4.08</u>	<u>3.51</u>	3
	1.33	.91	5.50		1.18	.85	5.70	
Create a database with	<u>2.41</u>	<u>4.06</u>	<u>6.61</u>	6	<u>3.08</u>	<u>3.96</u>	<u>3.53</u>	2
multiple fields.	1.38	.84	5.67		1.23	.94	6.06	
Search a database for specific	<u>2.76</u>	<u>4.22</u>	<u>6.07</u>	7	<u>3.46</u>	<u>4.13</u>	<u>2.80</u>	7
information.	1.27	.91	5.43		1.12	.88	5.82	
Add and delete a record to an	<u>2.91</u>	<u>4.25</u>	<u>5.66</u>	8	<u>3.70</u>	<u>4.18</u>	<u>2.03</u>	9
existing database.	1.37	.83	5.62		1.21	.88	5.51	
Use a prepared database to	<u>2.97</u>	<u>4.28</u>	<u>5.51</u>	9	<u>3.55</u>	<u>4.18</u>	<u>2.68</u>	8
enter data.	1.35	.82	5.45		1.22	.91	5.94	
DOMAIN MEAN	2.52	4.13	6.58		3.34	4.09	3.09	
(Mean of Means)								

* Potential domain range = 9 to 45; R: Rank Order; COMP: Level of Competence;
IM: Level of Importance

* Scale: 1 – None, 2 – Very Little, 3 – Somewhat, 4 – Very, 5 – A Great Deal

Table 4.12: Perceived Competence, Importance, and Rank Order of Calculated Needs of the Nine Areas of Database (Ohio: N=182; Taiwan: n=191).

Taiwan respondents reported two areas they perceived as their highest needs in networking as 1) disconnect/log off, and 2) select/de-select a network zone. The two areas they perceived the least needs were: 1) save a document to a specified location, and 2) retrieve a program or document. Analyzing importance in networking, Taiwan participants placed high levels of perceived importance on 1) disconnect/log off, and 2) select/de-select a network zone. They placed low levels of perceived importance on 1) save a document to a specified location, and 2) retrieve a program or document.

STATEMENTS*	OHIO				TAIWAN			
	*COMP.	*IM.	NEEDS	*R	*COMP.	*IM.	NEEDS	*R
	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>		<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	
Select/de-select a network zone.	<u>2.30</u> 1.44	<u>4.08</u> 1.13	<u>7.35</u> 6.99	1	<u>3.76</u> 1.18	<u>4.20</u> .84	<u>1.80</u> 5.25	5
Share files with others on a network.	<u>2.82</u> 1.24	<u>4.39</u> .85	<u>6.67</u> 6.23	2	<u>3.64</u> 1.16	<u>4.13</u> .87	<u>2.08</u> 5.58	4
Connect/log on to a file server.	<u>3.61</u> 1.49	<u>4.59</u> .77	<u>4.28</u> 6.77	3	<u>3.47</u> 1.25	<u>4.12</u> .92	<u>2.82</u> 5.61	3
Save a document to a specified location.	<u>3.83</u> 1.24	<u>4.65</u> .69	<u>3.59</u> 5.64	4	<u>3.39</u> 1.27	<u>4.07</u> .96	<u>2.94</u> 6.07	1
Retrieve a program or document.	<u>3.97</u> 1.29	<u>4.63</u> .77	<u>2.91</u> 5.67	5	<u>3.44</u> 1.20	<u>4.12</u> .90	<u>2.94</u> 5.72	2
Disconnect/log off.	<u>4.28</u> 1.19	<u>4.63</u> .78	<u>1.54</u> 5.46	6	<u>3.90</u> 1.10	<u>4.26</u> .88	<u>1.58</u> 5.29	6
DOMAIN MEAN (Mean of Means)	3.47	4.50	4.39		3.60	4.15	2.36	

* Potential domain range = 6 to 30; R: Rank Order; COMP: Level of Competence; IM: Level of Importance

* Scale: 1 – None, 2 – Very Little, 3 – Somewhat, 4 – Very, 5 – A Great Deal

Table 4.13: Perceived Competence, Importance, and Rank Order of Calculated Needs of the Six Areas of Networking (Ohio: N=182; Taiwan: n=191).

Section 7: Telecommunications

Table 4.14 shows the calculated perceived educational needs of telecommunications in rank order. The following four areas were perceived by Ohio vocational teachers as the highest educational needs in telecommunications: 1) effective use of distance learning desktop video conferencing, and tele-teaching technologies, 2) use File Transfer Protocol (FTP) to send or retrieve files from remote computers, 3) install and configure telecommunications software, and 4) create and use group addresses for electronic mail. The following three items in telecommunications were

perceived as the lowest needs: 1) connect to Internet via an Internet service provider (ISP) with a user ID and password, 2) access a specific web site by enter the appropriate Uniform Resource Locator (URL), and 3) compose new e-mail.

Analysis of perceived competence in telecommunications indicated that participants perceived more competence in 1) connect to Internet via an ISP with a user ID and password, 2) compose new e-mail, and 3) send e-mail. Participants reported little perceived competence about 1) use FTP to send or retrieve files from remote computers, and 2) effective use of distance learning desktop video conferencing, and tele-teaching technologies. Data indicated that respondents place high levels of perceived importance on compose new e-mail, connect to Internet via an ISP with a user ID and password, and send e-mail; and lower levels on use Gopher to browse resources on the Internet, and 2) use FTP to send or retrieve files from remote computers.

The following items were reported as the highest perceived needs (Table 4.14) in telecommunications by Taiwan participants: 1) effective use of distance learning desktop video conferencing, 2) knowledge and use of filter, 3) use File Transfer Protocol (FTP) to send or retrieve files from remote computers, 4) use browser software such as hypertext, html, and homepage, and 5) be aware of on-line conference relevant to professional information. The four items in telecommunications were perceived as the lowest needs: 1) how to connect to county or university library, 2) read, save, print, and reply to forward electronic mail, 3) send e-mail, and 4) find a search engine site and perform a specific web search.

STATEMENTS*	OHIO				TAIWAN			
	*COMP.	* IM.	NEEDS	*R	*COMP.	* IM.	NEEDS	*R
	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>		<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	
Effective use of distance learning desktop video conferencing, and tele-teaching technologies.	<u>2.11</u> 1.23	<u>3.97</u> 1.07	<u>7.49</u> 6.43	1	<u>3.12</u> 1.23	<u>4.07</u> .97	<u>3.83</u> 6.02	1
Use File Transfer Protocol (FTP) to send or retrieve files from remote computers.	<u>1.83</u> 1.15	<u>3.64</u> 1.13	<u>6.91</u> 6.05	2	<u>3.11</u> 1.27	<u>3.98</u> .87	<u>3.36</u> 5.14	3
Install and configure telecommunications software.	<u>2.29</u> 1.28	<u>3.95</u> 1.10	<u>6.81</u> 5.96	3	<u>3.47</u> 1.25	<u>4.22</u> .87	<u>3.04</u> 5.38	9
Create and use group addresses for electronic mail.	<u>2.67</u> 1.31	<u>4.12</u> 1.01	<u>6.05</u> 6.08	4	<u>3.67</u> 1.14	<u>4.22</u> .85	<u>2.29</u> 5.16	14
Be aware of on-line conference relevant to professional information.	<u>2.89</u> 1.38	<u>4.22</u> .98	<u>5.65</u> 6.34	5	<u>3.50</u> 1.18	<u>4.27</u> .83	<u>3.27</u> 5.21	5
Upload a text file and send as electronic mail.	<u>2.89</u> 1.41	<u>4.19</u> .95	<u>5.50</u> 6.00	6	<u>3.69</u> 1.14	<u>4.25</u> .81	<u>2.36</u> 4.87	13
Knowledge and use of filter (software driven, server based, search engine inclusive).	<u>2.85</u> 1.39	<u>4.15</u> .98	<u>5.35</u> 5.91	7	<u>3.20</u> 1.22	<u>4.07</u> .89	<u>3.57</u> 5.45	2
Use Gopher to browse resources on the Internet.	<u>2.31</u> 1.30	<u>3.64</u> 1.27	<u>5.00</u> 5.52	8	<u>3.08</u> 1.27	<u>3.88</u> .96	<u>3.03</u> 5.59	10
Connect to country or university library.	<u>3.00</u> 1.43	<u>4.12</u> 1.06	<u>4.75</u> 6.10	9	<u>3.97</u> 1.07	<u>4.31</u> .86	<u>1.41</u> 4.79	18
Use browser software (hypertext, html, and homepage).	<u>3.29</u> 1.52	<u>4.34</u> .91	<u>4.53</u> 6.26	10	<u>3.54</u> 1.23	<u>4.31</u> .84	<u>3.33</u> 5.37	4
Obtain/maintain an account on the Internet or an on-line service that provides Internet access.	<u>3.51</u> 1.45	<u>4.37</u> .86	<u>3.72</u> 6.53	11	<u>3.60</u> 1.24	<u>4.31</u> .81	<u>3.20</u> 5.54	8
Connect a computer to a modem and telephone line for dial-in access.	<u>3.45</u> 1.50	<u>4.33</u> .89	<u>3.72</u> 6.57	12	<u>3.43</u> 1.30	<u>4.07</u> .97	<u>2.71</u> 6.00	11
Find a search engine site and perform a specific web search	<u>3.78</u> 1.49	<u>4.55</u> .80	<u>3.41</u> 6.54	13	<u>3.75</u> 1.18	<u>4.27</u> .90	<u>2.28</u> 5.65	15
Read, save, print, reply to forward electronic mail.	<u>3.79</u> 1.36	<u>4.47</u> .85	<u>3.00</u> 5.66	14	<u>3.79</u> 1.16	<u>4.25</u> .93	<u>2.01</u> 5.27	17

Continued

Table 4.14: Perceived Competence, Importance, and Rank Order of Calculated Needs of the 18 Areas of Telecommunications (Ohio: N=182; Taiwan: n=191).

STATEMENTS*	OHIO				TAIWAN			
	*COMP.	* IM.	NEEDS	*R	*COMP.	* IM.	NEEDS	*R
	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>		<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	
Send e-mail (concepts of carbon copy and blind carbon copy).	<u>3.96</u> 1.28	<u>4.57</u> .75	<u>2.86</u> 5.28	15	<u>3.94</u> 1.08	<u>4.42</u> .80	<u>2.16</u> 5.04	16
Compose new email (address and subject; explanation of address domains).	<u>4.01</u> 1.32	<u>4.63</u> .68	<u>2.81</u> 6.02	16	<u>3.80</u> 1.20	<u>4.34</u> .86	<u>2.44</u> 4.88	12
Access a specific web site by enter the appropriate URL.	<u>3.92</u> 1.34	<u>4.52</u> .83	<u>2.58</u> 5.60	17	<u>3.36</u> 1.26	<u>4.11</u> .94	<u>3.20</u> 5.46	6
Connect to Internet via an Internet Service Provider (ISP) with a user ID and password.	<u>4.12</u> 1.44	<u>4.62</u> .92	<u>2.26</u> 5.64	18	<u>3.60</u> 1.24	<u>4.31</u> .81	<u>3.20</u> 5.54	7
DOMAIN MEAN (Mean of Means)	3.15	4.24	4.58		3.53	4.20	2.86	

* Potential domain range = 18 to 90; R: Rank Order; COMP: Level of Competence; IM: Level of Importance

* Scale: 1 – None, 2 – Very Little, 3 – Somewhat, 4 – Very, 5 – A Great Deal

Analyzing the perceived competence in telecommunications, Taiwan vocational teachers had high perceived competence in how to connect to county or university library, how to send e-mail, and how to compose new e-mail. Taiwan teachers reported little perceived competence in how to use Gopher to browse resources on the Internet, and how to use FTP to send or retrieve files from remote computers.

Analyzing the level of perceived importance in telecommunications, Taiwan participants perceived higher levels about how to send e-mail, compose new e-mail, and connect to Internet via an Internet Service Provider (ISP) with a user ID and password. Lower levels of perceived importance were reported in the following areas: 1) use Gopher to browse resources on the Internet, and 2) use FTP to send or retrieve files from remote computers.

Section 8: Media Communications

The following items were reported by Ohio vocational teachers as the highest perceived needs (Table 4.15) in media communications: 1) connect a video output device to computer for large screen display such as Liquid Crystal Display (LCD) panel or projector, 2) use camcorder and edit video from a camcorder, 3) setup and operate a videodisk player and TV receiver or monitor, and 4) use digital document camera for 3D objects as well as documents and slides presentation.

Analysis of perceived competence in media communications (Table 4.15) indicated that Ohio vocational teachers perceived more knowledge in 1) setup and operate a videocassette recorder, player and monitor, 2) produce print-based products, and 3) produce electronic slides or overhead slides. They reported little perceived competence about 1) produce video, and 2) setup and operate a videodisk player and TV receiver or monitor. Analyzing the level of perceived importance in media communications, Ohio vocational teachers placed high perceived levels in 1) setup and operate a videocassette recorder, player and monitor, and 2) use digital camera and scanner. However, they placed low levels of perceived importance for 1) produce a video, and 2) setup and operate a videodisk player and TV receiver or monitor.

The following four areas were reported by Taiwan vocational teachers as the highest perceived educational needs in media communications: 1) use digital document camera for 3D objects as well as documents and slides presentation, 2) produce a video, 3) connect a video output device (LCD panel or LCD projector) to computer for large screen display, and 4) use camcorder and edit video from a camcorder. The following three items were perceived as the lowest needs: 1) produce electronic slides/overhead

slides, 2) use painting and drawing tools, and 3) produce print-based products such as newsletters, brochures, poster, and books.

Taiwan participants reported having more perceived competence in media communication in these two areas: 1) produce electronic slides and overhead slides, and 2) setup and operate a videocassette recorder, player and monitor. However, they showed little perceived competence in how to produce a video and how to use digital document camera for 3D objects as well as documents and slides presentation. Analyzing the level of perceived importance in media communications, participants placed high levels in 1) produce electronic slides or overhead slides, and 2) setup and operate a videocassette recorder, player and monitor. They placed low levels of perceived importance for 1) produce a video and 2) produce print-based products.

Table 4.16 provides ranks, means and standard deviations of computed needs for all 86 items for both Ohio and Taiwan. Educational needs score ranged from a mean of -.87 to a mean 7.88. The most important perceived educational needs that were ranked by both Ohio and Taiwan vocational teachers could be summarized in the four categories: setup, maintenance, and troubleshooting of computer system; media communications; telecommunications; and database. The least perceived educational needs were related to computer operation skills.

STATEMENTS*	OHIO				TAIWAN			
	*COMP.	* IM.	NEEDS	*R	*COMP.	* IM.	NEEDS	*R
	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>		<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	<u>Mean</u> <u>SD</u>	
Connect a video output device (LCD panel or LCD projector) to computer for large screen display.	<u>2.74</u> 1.56	<u>4.26</u> .89	<u>6.35</u> 6.85	1	<u>3.07</u> 1.29	<u>4.07</u> .90	<u>4.13</u> 6.19	3
Use camcorder and edit video from a camcorder.	<u>2.67</u> 1.25	<u>4.18</u> .90	<u>6.14</u> 6.74	2	<u>2.93</u> 1.21	<u>3.94</u> .92	<u>4.10</u> 5.93	4
Setup and operate a videodisk player and TV receiver or monitor.	<u>2.47</u> 1.35	<u>4.00</u> 1.11	<u>6.06</u> 6.52	3	<u>3.04</u> 1.30	<u>3.96</u> .93	<u>3.26</u> 5.68	5
Use digital document camera for 3D objects as well as documents and slides presentation.	<u>2.92</u> 1.35	<u>4.35</u> .89	<u>5.91</u> 6.31	4	<u>2.89</u> 1.22	<u>3.97</u> .97	<u>4.48</u> 5.97	1
Use digital camera and scanner.	<u>3.03</u> 1.38	<u>4.41</u> .77	<u>5.83</u> 6.68	5	<u>3.30</u> 1.30	<u>4.07</u> .87	<u>3.02</u> 5.45	7
Produce electronic slides/overheads.	<u>3.04</u> 1.55	<u>4.37</u> .97	<u>5.69</u> 7.12	6	<u>3.57</u> 1.26	<u>4.19</u> .86	<u>2.64</u> 5.72	10
Produce a video.	<u>2.74</u> 1.29	<u>3.91</u> 1.09	<u>5.55</u> 6.49	7	<u>2.64</u> 1.22	<u>3.78</u> .97	<u>4.34</u> 5.97	2
Use painting and drawing tools.	<u>2.94</u> 1.33	<u>4.27</u> .96	<u>5.51</u> 6.14	8	<u>3.36</u> 1.23	<u>4.04</u> .88	<u>2.85</u> 5.52	9
Produce print-based products (e.g., newsletters, brochures, poster, poster, books).	<u>3.28</u> 1.46	<u>4.40</u> .94	<u>4.66</u> 6.47	9	<u>3.21</u> 1.22	<u>3.94</u> .90	<u>2.85</u> 5.25	8
Setup and operate a videocassette recorder/player and monitor/TV.	<u>3.73</u> 1.53	<u>4.43</u> .97	<u>3.02</u> 6.70	10	<u>3.41</u> 1.18	<u>4.17</u> .80	<u>3.23</u> 6.34	6
DOMAIN MEAN (Mean of Means)	2.93	4.26	5.47		3.12	4.01	3.57	

* Potential domain range = 10 to 50; R: Rank Order; COMP: Level of Competence; IM: Level of Importance

* Scale: 1 – None, 2 – Very Little, 3 – Somewhat, 4 – Very, 5 – A Great Deal

Table 4.15: Perceived Competence, Importance, and Rank Order of Calculated Needs of the 10 Areas of Media Communications (Ohio: N=182; Taiwan: n=191).

STATEMENTS	*R	OHIO MEAN/SD	*R	TAIWAN MEAN/SD
Protect against computer viruses.	1	7.88/6.43	1	5.43/6.39
Create custom layouts including columnar reports.	2	7.57/5.47	13	3.37/5.81
Insert database fields into word processing document.	3	7.53/5.58	8	3.59/5.52
Effective use of distance learning desktop video conferencing, and tele-teaching technologies.	4	7.49/6.43	6	6.83/6.02
Create a graph or chart from spreadsheet data.	5	7.43/5.93	46	2.39/5.32
Create a formula using spreadsheet/graphing functions.	6	7.41/5.09	43	2.55/5.49
Select/de-select a network zone.	7	7.35/6.99	61	1.80/5.25
Use FTP to send or retrieve files from remote computers.	8	6.91/6.05	14	3.36/5.14
Install and configure telecommunications software.	9	6.81/5.96	24	3.04/5.38
Use sorting and searching techniques to solve a problem.	10	6.79/5.79	21	3.16/5.45
Insert a spreadsheet into a word processing document.	11	6.77/5.63	60	1.82/2.70
Use a database to search for desired information given.	12	6.75/5.67	22	3.11/5.36
Use a database to sort records	13	6.73/5.50	12	3.51/5.70
Share files with others on a network.	14	6.67/6.23	53	2.08/5.68
Create a database with multiple fields.	15	6.61/5.67	11	3.53/6.06
Understand the three basic types of spreadsheet/graphing cells: label; value; and formula.	16	6.39/5.23	30	2.92/5.05
Connect a video output device to computer for large screen display.	17	6.35/6.85	4	4.14/6.19
Change the appearance of a spreadsheet by inserting columns and rows.	18	6.34/6.48	71	1.22/5.38
Use camcorder and edit video from camcorder.	19	6.14/6.74	5	4.10/5.94
Copy values from a spreadsheet using fill down and fill across.	20	6.11/5.77	50	2.20/5.33
Search a database for specific information.	21	6.07/5.34	37	2.80/5.82
Setup and operate a videodisk player and TV receiver or monitor.	22	6.06/6.52	7	3.67/5.83
Create and use group addresses for electronic mail.	23	6.05/6.08	48	2.29/5.16
Create a spreadsheet with rows, columns, and headings.	24	5.93/6.18	63	1.64/5.26
Use digital document camera for 3D objects as well as documents and slides presentation.	25	5.91/6.31	2	4.48/6.01
Use digital camera and scanner.	26	5.83/6.68	18	3.23/6.34
Install and upgrade an application.	27	5.82/6.37	10	3.56/6.22
Use self-help resources to diagnose and correct common hardware problems.	28	5.80/5.85	31	2.89/5.61
*R: Rank Order				Continued

Table 4.16: Rank Order of the Calculated Educational Needs

STATEMENTS	*R	OHIO MEAN/SD	*R	TAIWAN MEAN/SD
Understand the possibilities of spreadsheet calculations.	29	5.76/5.25	36	2.28/5.22
Produce electronic slides/overhead slides.	30	5.70/7.12	41	2.64/6.72
Add and delete a record to an existing database.	31	5.66/5.62	55	2.03/5.51
Be aware of online conference relevant to professional information.	32	5.65/6.34	16	3.27/5.21
Produce a video.	33	5.55/6.49	3	4.34/5.97
Use painting and drawing tools for media communications.	34	5.52/6.14	33	2.85/5.52
Use a prepared database to enter data.	35	5.51/5.45	40	2.68/5.94
Upload a text file and send as electronic mail.	36	5.50/6.00	47	2.36/4.87
Interpret the information from a spreadsheet and communicate the data in a graphical format.	37	5.39/5.44	32	2.88/5.24
Understand the concept of spreadsheet and relate a print spreadsheet to an electronic spreadsheet.	38	5.36/5.70	42	2.63/5.05
Knowledge and use of filter.	39	5.35/5.91	9	3.57/5.45
Proper operating environment for computer and peripherals.	40	5.04/6.28	34	2.85/5.88
Use Gopher to browse resources on the Internet.	41	5.00/5.52	25	3.03/5.59
Enter data in an existing spreadsheet.	42	4.82/5.92	54	2.07/5.33
Connect to county or university library.	43	4.75/6.10	68	1.41/4.79
Produce print-based products (e.g., newsletters, brochures, poster, and books).	44	4.66/6.47	26	3.02/5.45
Use browser software such as hypertext, html, and homepage.	45	4.53/6.26	15	3.33/5.37
Clean computer components and printers.	46	4.52/5.93	27	2.98/5.52
Connect/log on to a file server.	47	4.28/6.77	35	2.82/5.61
Make backup copies of key applications and documents.	48	4.20/5.55	52	2.11/5.65
Add columns to a document in word process.	49	4.15/5.45	66	1.52/5.28
Insert clip art into a document.	50	3.77/6.01	67	1.43/5.14
Obtain/maintain an account on the Internet or an online service that provides Internet access.	51	3.72/6.53	23	3.04/5.47
Connect a computer to a modem and telephone line for dial-in access.	52	3.72/6.57	39	2.71/6.00
Save a document to a specified location.	53	3.59/5.64	28	2.94/6.07
Connect peripheral device.	54	3.50/5.93	44	2.47/5.74
Find a search engine site and perform a specific web search.	55	3.41/6.54	49	2.28/5.65
Create and name; and; rename subdirectories/folders.	56	3.35/6.43	76	.92/5.67
Setup computer system.	57	3.14/5.84	59	1.94/5.75
In word process, create a header and footer.	58	3.04/4.60	72	1.15/5.98
* R: Rank Order				Continued

Table 4.16: Rank Order of the Calculated Educational Needs

STATEMENTS	R	OHIO MEAN/SD	R	TAIWAN MEAN/SD
Save, open, and place documents inside subdirectories/folders.	59	3.03/6.07	74	1.01/5.47
Setup and operate a videocassette recorder, player and monitor.	60	3.02/6.70	17	3.26/5.68
Read, save, print and reply to forward electronic mail.	61	3.00/5.66	56	2.01/5.27
Insert date, time, and page number.	62	2.92/5.00	58	1.96/6.01
Retrieve a program or document.	63	2.91/5.67	29	2.94/5.72
Send e-mail.	64	2.86/5.28	51	2.16/5.04
Compose new e-mail.	65	2.81/6.02	45	2.44/4.88
Change text formats and style.	66	2.76/5.74	78	.44/4.80
Copy and move blocks of text in word process.	67	2.62/5.40	73	1.13/4.66
Access a specific web site by entering the appropriate URL.	68	2.58/5.60	19	3.20/5.46
Use margins.	69	2.55/4.39	57	1.97/5.53
Identify and use icons, windows, and menus.	70	2.54/5.05	80	.35/5.60
Start an application and create a document.	71	2.52/6.05	70	1.22/5.68
Open and work with more than one application at a time.	72	2.37/6.34	75	1.00/5.60
Copy document from hard disk to floppy disk.	73	2.32/6.90	82	.30/5.71
Connect to Internet via an ISP with a user ID and password.	74	2.25/5.64	20	3.20/5.54
Protect and care for floppy disks.	75	2.19/6.18	38	2.76/5.72
Use tap stop.	76	2.19/4.75	64	1.62/5.95
Enter and edit text in word process.	77	2.16/4.35	62	1.75/4.99
Check spelling, grammar, and word usage.	78	1.98/4.19	69	1.32/5.88
Initialize, name, and rename floppy disk and hard disk.	79	1.91/5.66	81	.34/5.97
Disconnect/log off.	80	1.54/5.46	65	1.58/5.29
Start up and shut down the peripherals.	81	1.32/5.52	83	.07/5.59
Name a document.	82	.88/5.31	77	.86/5.51
Use printing options.	83	.88/4.56	84	-.09/5.62
Save a document using both the save and save as commands.	84	.74/5.20	79	.42/5.28
Start up and shut down the computer according to computer type.	85	.39/5.48	86	-.87/5.71
Insert and eject floppy disk and CD-ROM.	86	-.58/3.81	85	-.74/5.99

*R: Rank Order

Table 4.16: Rank Order of the Calculated Educational Needs

Objective 5: The relationships among the demographic characteristics of teachers and their instructional technology educational needs.

For this study, a convention developed by Davis (1971) was used for describing measures of association (relationship) of the calculated correlation coefficients (Table 4.17).

Coefficient	Description
.70 or higher	Very Strong Association
.50 to .69	Substantial Association
.30 to .49	Moderate Association
.10 to .29	Low Association
.01 to .09	Negligible Association

Table 4.17: Davis' Convention for Describing Measures of Association

A correlation matrix (Table 4.18) was produced to describe the variables (age, year of teaching, instructional technology training experience and means of the eight areas of educational needs) and their association. For all participants ($n = 373$), a low association existed among word processing/ introductory desktop publishing, spreadsheet/graphing, database, networking, telecommunications, media communications and age. Negligible associations existed among computer operation skills and setup, maintenance, and troubleshooting and age. The correlations among the eight areas of instructional technology educational needs and year of teaching ranged from negligible to low association. Negative association existed among eight educational needs and

instructional technology training experience. The correlations among educational needs ranged from moderate to strong association (.70 to .49). Associations among age, year of teaching, instructional technology training experience and educational needs range from negative to low associations.

Table 4.19 shows correlation matrix of teachers' education degree and the eight areas of instructional technology educational needs. As illustrated in Table 4.20 correlations among the eight areas of educational needs ranged from a low negative to a negligible association (-.13 to .09). The relationships among computer operation skills, setup, maintenance, and troubleshoot of computer system, and word process/introductory desktop publishing and teachers' education degree earned.

A multivariate analysis of variance (MANOVA) was conducted. For Ohio teachers, those vocational teachers were a sample of teachers who might exist at other points in time. The Taiwan sample was randomly selected as 10 teachers per school. The dependent variable was perceived educational needs (instructional technology educational need of the eight domain areas) and the independent variables were gender (nominal variable) and teachers' teaching specialty (nominal variable). MANOVA is an extension of analysis of variance for use when there is more than one dependent variable. The importance of the impact of gender or teachers' teaching specialty can be evaluated using the effect size statistic provided by SPSS: Eta Squared (R^2). R^2 represent the proportion of the variance in the dependent variables (perceived educational needs) that can be explained by the independent variable (gender or teaching specialty).

As illustrated in Table 4.20 and 4.21, a set of multivariate tests of significance indicated whether there were statistically significant differences among the gender,

teaching specialty (field) on a linear combination of the dependent variables (eight areas of educational needs). Tabachnick and Fidell (1996) recommend Wilks' Lambda for general use of reported statistics. The R^2 value of Wilks' Lambda is appropriate for a measured of association between dependent variables that measured on an interval scale and an independent variable with a limited number of categories.

Table 4.20 shows the relationships between gender and eight areas of educational needs. The Wilks' Lambda R^2 was .04, considered quite a small effect, and that means only four percent of the variance in perceived educational needs was explained by gender. In Table 4.21, the R^2 between teachers' teaching specialty and eight areas of educational needs was .03 that showed the negligible association.

Correlations

	AGE	Teaching experiences (years)	IT training hours	NEEDQ1	NEEDQ2	NEEDQ3	NEEDQ4	NEEDQ5	NEEDQ6	NEEDQ7	NEEDQ8
AGE Pearson Coefficient	1										
Teaching experiences (years) Pearson Coefficient	.63	1									
IT train hours Pearson Coefficient	.11	.12	1								
NEEDQ1 Pearson Coefficient	.09	.10	-.03	1							
NEEDQ2 Pearson Coefficient	.08	.08	-.07	.60	1						
NEEDQ3 Pearson Coefficient	.14	.12	-.02	.70	.67	1					
NEEDQ4 Pearson Coefficient	.20	.11	-.11	.56	.75	.65	1				
NEEDQ5 Pearson Coefficient	.14	.06	-.12	.54	.70	.64	.80	1			
NEEDQ6 Pearson Coefficient	.15	.12	-.08	.53	.65	.58	.67	.75	1		
NEEDQ7 Pearson Coefficient	.14	.12	-.09	.61	.73	.70	.74	.74	.78	1	
NEEDQ8 Pearson Coefficient	.10	.05	-.11	.49	.70	.63	.74	.71	.66	.83	1

NEEDQ1, NEEDQ2, NEEDQ3, NEEDQ4, NEEDQ5, NEEDQ6, NEEDQ7, & NEEDQ8: Instructional Technology Educational Needs of Section 1 through Section 8

Table 4.18: The Correlation Matrix of Age, Year of Teaching, Training Experience and Instructional Technology Educational Needs

Correlations

		highest degree of education	NEEDQ1	NEEDQ2	NEEDQ3	NEEDQ4	NEEDQ5	NEEDQ6	NEEDQ7	NEEDQ8	
Spearman's Rho	highest degree of education	Correlation Coefficient	1								
	NEEDQ1	Correlation Coefficient	- .08	1							
	NEEDQ2	Correlation Coefficient	.09	.61	1						
	NEEDQ3	Correlation Coefficient	- .13	.65	.61	1					
	NEEDQ4	Correlation Coefficient	- .05	.60	.73	.64	1				
	NEEDQ5	Correlation Coefficient	.03	.52	.66	.57	.80	1			
	NEEDQ6	Correlation Coefficient	.03	.57	.65	.55	.71	.74	1		
	NEEDQ7	Correlation Coefficient	.02	.60	.71	.63	.77	.74	.76	1	
	NEEDQ8	Correlation Coefficient	- .06	.52	.68	.60	.73	.67	.69	.81	1

NEEDQ1, NEEDQ2, NEEDQ3, NEEDQ4, NEEDQ5, NEEDQ6, NEEDQ7, & NEEDQ8: Instructional Technology Educational Needs of Section 1 through Section 8

Table 4.19: Correlation Matrix of Teachers' Education Degree Earned and Instructional Technology Educational Needs

Effect		Sig.	Partial Eta Squared
Gender	Wilks' Lambda	.003	.04

Table 4.20: Relationships between Gender and Instructional Technology Educational Needs

Effect		Sig.	Partial Eta Squared
Field	Wilks' Lambda	.000	.03

Table 4.21: Relationships between Teaching Specialty (Field) and Instructional Technology Educational Needs

An analysis of the differences between Ohio vocational teachers and Taiwan vocational teachers found that seven of the top 15 highest perceived competencies were the same:

- Protect against computer viruses.
- Effective use of distance learning desktop video conferencing, and tele-teaching technologies.
- Insert database fields into word processing document.
- Use FTP to send or retrieve files from remote computers.
- Create a database with multiple fields.
- Create custom layouts for database including columnar reports.
- Use a database to sort records.

The remaining top eight highest perceived competencies on which Ohio vocational teacher had different responses were: create a graph or chart from spreadsheet data; create a formula using spreadsheet/graphing functions; select/de-select a network zone; install and configure telecommunications software; use sorting and searching techniques to solve a database problem; insert a spreadsheet into a word processing document; use a database to search for desired information given; and share files with others on a network (Table 4.22).

The top eight highest perceived competencies on which Taiwan vocational teachers differed from Ohio vocational teachers were: use digital document camera for 3D objects as well as documents and slides presentation; produce a video; connect a video output device to computer for large screen display; use camcorder and edit video from a camcorder; setup and operate a videodisk player and TV receiver or monitor;

install and upgrade an application; knowledge and use of filter (software driven, server based, and search engine inclusive); and use browser software such hypertext, html, and homepage.

Ohio Vocational Teachers	Taiwan Vocational Teachers
1. Create a graph or chart from spreadsheet data.	1. Use digital document camera for 3D objects as well as documents and slides presentation.
2. Create a formula using spreadsheet/graphing functions.	2. Produce a video.
3. Select/de-select a network zone.	3. Connect a video output device to computer for large screen display.
4. Install and configure telecommunications software.	4. Use camcorder and edit video from a camcorder.
5. Use sorting and searching techniques to solve a database problem.	5. Setup and operate a videodisk player and TV receiver or monitor.
6. Insert a spreadsheet into a word processing document.	6. Knowledge and use of filter (software driven, server based, and search engine inclusive).
7. Use a database to search for desired information given.	7. Install and upgrade an application.
8. Share files with other on a network.	8. Use browser software such hypertext, html, and homepage.

Table 4.22: Contrasting Top Competencies Between Ohio and Taiwan Vocational Teachers as Ranked by Educational Needs.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter is divided into the following sections: (a) Purpose and Objectives, (b) Methodology, (c) Summary of the Findings, (d) Discussion of Findings and Conclusions, and (e) Recommendations. The study was conducted in the Central Region of Ohio and the Kaohsiung district of Taiwan.

Purpose and Objectives

The purpose of this study was to explore and describe the perceived educational needs of both Ohio and Taiwan vocational teachers. The objectives of the study were to describe:

1. The demographic characteristics of vocational teachers such as age, gender, highest degree earned, years of teaching, teaching specialty, and instructional technology experience.
2. The perceived competence in instructional technology possessed by vocational teachers in Ohio and Taiwan.
3. The perceived importance in instructional technology possessed by vocational teachers in Ohio and Taiwan.

4. The perceived need for further education in instructional technology by vocational teachers in Ohio and Taiwan.
5. The relationships among the selected demographic characteristics of teachers with instructional technology education needs and comparison between Ohio and Taiwan.

Methodology

Research Design

This was a descriptive survey study that collected data from members of a population in order to determine the current status of that population with respect to one or more characteristics. This study involved asking the same set of questions of a number of individuals by mail to explore and describe the perception of the competence, importance, and educational needs of instructional technology for vocational and technical education teachers and draw comparisons between Ohio and Taiwan.

Population and Sample

The population studied was all vocational education teachers, working at 44 comprehensive high schools and six joint vocational schools (JVS) in the Central Region of Ohio and 10 randomly selected teachers per 22 vocational high schools in Kaohsiung District (included Kaohsiung City and Kaohsiung County) of Taiwan. Considering the size of Ohio and Taiwan and the practical constraints in gathering data from the total population of vocational teachers, the accessible population for this exploratory study was chosen as secondary vocational teachers in the Central Region of Ohio and the Kaohsiung District of Taiwan during 2001-02 academic year.

The researcher selected all qualified vocational teachers (n=247) in central Ohio and 10 randomly selected teachers per school in Taiwan (n=220) by using a 2000-01 directory that listed all vocational education teachers at schools in Ohio and Taiwan. The number of Ohio respondent teachers was 182 (74%) and Taiwan respondent teachers was 191 (87%).

Instrumentation

The two-part instrument was developed in parallel versions (See Appendices D & E): (a) an English version used for the Central Region of Ohio; (b) a Mandarin version using for Kaohsiung District of Taiwan. In both languages, part one requested demographic data such as age, gender, year of teaching, highest degree earned, instructional technology experiences, and specialty. The second part of the instrument was developed using the Borich Needs Assessment Model (Borich, 1980). A list of 86 professional competencies was categorized into eight sections. The list was from the National Council for Accreditation of Teacher Education (NCATE) that developed the standards for instructional technology competencies and was modified to meet the needs of both Ohio and Taiwan vocational teachers.

The teachers were asked to respond on a Likert-type scale to, the 86 professional competencies about instructional technology. Number 1 on the scale signified the least important competency and number 5 was the most important competency. The teachers were also asked to rate their self-perceived skill levels on the 86 professional competencies, by using a Likert-type scale, with number 1 meaning the least competence in a particular competency and number 5 as the most competence.

Validity and Reliability

A panel of experts was asked to review the instrument for content and face validity. The panel consisted of faculty members in the Department of Human and Community Resource Development and Workforce Development and Education at The Ohio State University and of professionals in the Office of Career-Technical Education at the Ohio Department of Education (See Appendix A).

A pilot test was conducted to determine the instrument's reliability. A Cronbach's alpha was used to establish the internal consistency reliability of the final instrument and coefficients ranged from .67 to .98. Table 4.1 reports the Cronbach's reliability coefficients for internal consistency. These procedures controlled measurement error.

Data Collection

The data collection was carried out in Ohio and Taiwan as follows:

- (1) Application form for exemption from the Human Subjects Review Committee was submitted (See Appendix C).
- (2) The researcher contacted the Ohio Department of Education, Division of Career-Technical and Adult Education and Department of Technical and Vocational Education in Taiwan and obtained the directory of all vocational education teachers at vocational high schools for the academic year 2001-02.
- (3) From the lists obtained, the research identified 44 comprehensive high schools and six joint vocational schools in Ohio and 22 vocational high schools in Taiwan.
- (4) The researcher selected all qualified vocational teachers (N=247) in central Ohio and randomly selected 10 teachers per school in Taiwan (n=220).

- (5) A packet was prepared and sent in late August of 2001 to each vocational school with addressed sealed envelopes containing the instrument and a stamped return envelope for each teacher.
- (6) To guarantee the teachers' confidentiality, code numbers were assigned to the instrument with cover letter.
- (7) A reminder card was sent to non-respondents.
- (8) Another instrument and cover letter was sent in late September of 2001 to teachers that did not return their instruments as a result of the first mailing and, later, another follow up card. The packet included the instrument with a cover letter and stamped return envelope. The cover letter encouraged non-respondent teachers to return the instruments.
- (9) The returned completed instruments were dated and classified by school.

The response rate was 74% (182/247) for Ohio vocational teachers and 87% (191/220) for Taiwan vocational teachers. A t-test of instructional technology need and competency assessments revealed significant difference between early and late respondents on the level of competence scale. However, the data revealed no significant difference between early and late respondents on the level of importance scale and between early plus late respondents and double-dipping technique respondents on both "level of importance and competence" scales. Therefore, the findings of this study can be generalized from the respondents to the sample and to the entire population of both categories of vocational teachers.

Data Analysis

The data were analyzed using SPSS/PC windows 10.1. Descriptive statistics were used to describe the obtained characteristics by using percentages, means, frequencies and standard deviations. Borich (1980) Needs Assessment Model was used to calculate educational needs of vocational teachers. Relational statistics were calculated between each characteristic and the perception of instructional technology competencies.

Summary of the Findings

Of the 467 anticipated respondent teachers, 182 (74%) Ohio vocational teachers and 191 (87%) Taiwan vocational teachers returned their instruments. All the returned instruments were usable; consequently, they were analyzed for the study.

Objective 1 of the study was to describe the demographic characteristics of Ohio and Taiwan vocational teachers. In Ohio, around one-quarter of the respondents had six to ten years of teaching experiences, while the most prevalent age group of the respondents was 41-50 (41.8%), followed by the 51-60 year age group (21.4%). Forty-seven percent of the respondents were male and the most common academic degree held was a bachelor's degree (46.2%), followed by a master degree (29.7%). Regarding program characteristics, the primary curricula taught during the 2001-2002 school year was in the category of Business and Management (42.9%) followed by Industrial and Engineering Systems (25.8%), and Environmental and Agriculture Systems (14.3%). Curricula of other programs included: Human Resources and Services (6.6%), Art and Communication (5.5%), and Health Services (4.9%).

In Taiwan, 26 percent of the respondents had five or less years teaching experience, while the prevalent age group of the respondents was 31-40 (39.3%), followed by the 41-50 year age group (34%). Forty-five percent of the respondents were male and the most common academic degree held was a bachelor's degree (82.7%). The main curricula taught during the 2001-2002 school year was in the category of Industrial and Engineering Systems (31.4%), Business and Management (23%), Marine Science (14.1%), and Human Resources and Services (11%). The other programs included: Health Services (7.9%), Art and Communication (7.9%), and Environmental and Agriculture Systems (4.7%).

Objective 2, 3, and 4 of study were to describe the perceived competence, importance, and educational needs of instructional technology competencies possessed by vocational teachers in Ohio and Taiwan using the Borich Needs Assessment Model.

For Ohio vocational teachers, the top three perceived competence were: insert and eject floppy disk and CD-ROM; start up and shut down the computer according to computer type; and save a document using both the save and save as commands. The top three perceived competences were in the category of computer operation skills. The least perceived competences were: effective use of distance learning desktop video conferencing, and tele-teaching technologies and how to use FTP to send or retrieve files from remote computers.

The perceived importance levels of competencies for Ohio vocational teachers were included: check spelling, grammar, and word usage in word process; identify and use icons, windows, and menus; and enter and edit text in word process. Using FTP to

send or retrieve files from remote computers and using Gopher to browse resources on the Internet were the two least perceived importance levels of competencies.

The top three perceived competence levels for Taiwan participants included: insert and eject floppy disk and CD-ROM; start up and shut down the computer according to computer type; and copy and move block of text in word process. The least perceived competencies were how to connect a video output device (LCD panel or LCD projector) to computer for large screen display and how to use camcorder and edit video from a camcorder in media communications category.

Analysis of perceived importance levels of competencies among 86 competencies, Taiwan vocational teachers placed high levels of perceived importance in: protect against computer viruses; name a document; and copy and move blocks of text in word process. The least perceived importance competencies included check spelling, grammar, and work usage in word process and set up and operate a videocassette recorder/player and monitor/TV in media communications category.

In Ohio, the top five instructional technology competency needs included: protect against computer viruses; create custom layouts including columnar reports in database; insert database fields into word processing document; effective use of distance learning desktop video conferencing, and tele-teaching technologies; and create a graph or chart from spreadsheet data. In Taiwan, the top five perceived needs included: protect against computer viruses; use digital document camera for 3D objects as well as documents and slides presentation; produce a video; connect a video output device to computer for large screen display; and use camcorder and edit video from a camcorder. For Both Ohio and

Taiwan participants, the lowest instructional technology competency needs was located in the category of computer operation skills.

Objective 5 of the study was to describe the relationships among the demographic characteristics of teachers and their instructional technology educational needs. The correlation coefficients among eight areas of instructional technology educational needs were negligible or low associations in both Ohio and Taiwan according to Davis's conventions for describing measures of association. An analysis of the differences between Ohio vocational teachers and Taiwan vocational teachers found the seven of the top 15 competencies were the same:

- Protect against computer viruses.
- Effective use of distance learning desktop video conferencing, and tele-teaching technologies.
- Insert database fields into word processing document.
- Use File Transfer Protocol (FTP) to send or retrieve files from remote computers.
- Create a database with multiple fields.
- Create custom layouts for database including columnar reports.
- Use a database to sort records.

Conclusions and Implications

Demographics:

The following conclusions and implications were drawn from the research findings and are applicable only to the subjects of the study. From the analysis of the findings, more than 70% of Ohio vocational teachers had a Bachelor's Degree or higher

and 16% had an Associate Degree or less. About 95% of the Taiwan vocational teachers had a Bachelor's Degree or higher. Thus, the information revealed that the academic preparation of respondent vocational education teachers was fairly high especially for the Taiwan vocational teachers.

Approximately 50 percent of Ohio and Taiwan vocational teachers had 10 years or more of teaching experience at the present school. This fact showed that more than one-half of respondent teachers were a fairly experienced teacher that leads one to assume that they were somewhat familiar with instructional technology technique and materials.

Surprisingly, this study discovered that around 50% of the teachers that responded were males and around 50% female. The researcher expected a greater proportion of female teachers compared to males. Therefore, results of this study represent a gender balanced perspective of participation in instructional technology competencies needs. For teachers in Ohio ($n = 182$), 67% were 41 years of age or more. Thus, the data presented a mature teaching faculty who should have more interest in learning the new information about instructional technology and its applications. However, the average age of Taiwan vocational teachers (38) are slightly younger than Ohio teachers (43).

When looking at both Ohio and Taiwan vocational teachers' teaching specialty, the predominant teaching fields were in business and management, and industrial and engineering systems. For Ohio teachers, 43% had specialty in business and management follow by industrial and engineering systems (26%). Around 31% of the Taiwan teachers taught in industrial and engineering systems and 23% in business and management. Thus, the data showed that both Ohio and Taiwan vocational teachers were in the same major

clusters of career fields in business and management, and industrial and engineering systems. When exploring the instructional technology experience of vocational teachers, 24% of the Ohio vocational teachers had not attended any instructional technology training or workshop. About 32% had 6-10 hours of some kind of instructional technology training. Surprisingly, nearly 42% of the Taiwan vocational teacher had not had any instructional technology training experience.

Conclusions

1. The average Ohio vocational education teacher was either a male or female, with a Bachelors or higher degree, taught in business or engineering and had more than 10 years of teaching experience.
2. The average Taiwan vocational teacher was either a male or female, with a Bachelors or higher degree, taught in business or engineering, had more than 10 years of teaching experience and more than 40% of them were without instructional technology training experience.

Teachers' Instructional Technology Educational Needs

The difference in mean scores for educational needs (the perceived importance score subtract the perceived competence score, and then multiply the result by the average perceived importance score) was calculated for Ohio and Taiwan vocational education teachers in each instructional technology competence areas. Participants in this study perceived a considerable amount of competence about computer operation skills. The findings show that computer operation skills were not a major educational priority for the vocational teachers in both Ohio and Taiwan. The lower educational needs scores in this area may imply that the teachers already have received information, have been

self-taught, and/or have participated in computer literacy training or workshops.

Information about creating and name/rename subdirectories/folders and starting an application and creating a document in the area of computer operation skills were vocational teachers' most important educational needs in computer operation skills. The fact that the rapid spread of computers and computer-based technologies has had a huge impact on Ohio teachers since Perkins II and III legislation implied computer literacy for teachers for a long time. Therefore, the computer operation skills were not a major educational priority for the vocational teachers.

Results confirmed that vocational teachers' competence for protecting against computer viruses in setup, maintenance, and troubleshooting of computer system area was low. In this area, both Ohio and Taiwan vocational teachers reported protecting against computer viruses as the number one educational need among the 86 competencies with the highest mean (Ohio = 7.88; Taiwan = 5.43). The reason could be that the infestation with a computer virus is unpredictable and uncontrollable.

Seven items among the top 15 ranked very high in educational needs (Table 4.16) among Ohio and Taiwan vocational teachers and could be summarized in the two categories: database, and telecommunications. Teachers are the key to every school. Database, as a data management program, can be very useful for teachers in keeping attendance records and/or recording grades, generating printed progress reports, sorting and locating particular records by category, importing records or merging files, and communication with district resources for class registration. Telecommunications; such as using Internet web browser to locate web sites, using an appropriate search tools to find accurate information for a specific topic, using e-mail to send, receive, reply &

forward messages, using conferencing tools to chat with or interview a colleague online, and creating web pages; were a booming and useful technology tool for any educational settings. Educational courses, formal or informal, should be planned that meet the most important identified needs of the vocational teachers in Ohio and Taiwan.

This researcher ranked educational needs for each item under the eight-domain areas (Table 4. 16). This information can help both Ohio Education Department and the Ministry of Education of Taiwan in placing their priorities for instructional technology educational programs on the items that were ranked high. Target planning will help meet the needs of vocational teachers, attract a wider array of teachers, and lead to the success of instructional technology educational programs. Educational courses should be planned that meet the identified needs of vocational teachers, with emphasis given to those needs ranked highest.

Conclusions

1. For both Ohio and Taiwan vocational teachers, the lowest instructional technology educational need was computer operation skills with average mean score .37.
2. Protecting against computer viruses was the most important educational need for both Ohio and Taiwan vocational teachers.
3. Database and Telecommunications, among the eight-domain areas, were the top two instructional technology educational needs for both Ohio and Taiwan vocational teachers.

Relationship Between Demographic Characteristics and Instructional Technology Needs

The relationship among selected demographic characteristics and educational needs were either low or negligible in this study. The findings appear to indicate that both Ohio and Taiwan participants have similar educational needs. Therefore, the instructional technology training program based on the educational scores will service the various groups of vocational teachers, regardless of their demographic characteristics.

The relationship between teachers' education degree held, instructional technology training experience and educational needs had a negligible to low relationship. Similar characteristics may account for the lack of association. A negative coefficient means that the predicted value of the dependent variable (educational needs) decreased when the value of the independent variable (teachers' education degree held) increases. Vocational teachers with higher degrees had lower educational needs; who had more instructional technology training experience had lower educational needs. Instructional technology competencies needs to be constantly practiced and updated as new technology emerges (Liao, 1993; 1995, Huang & Padron, 1997; Redmann, 1998).

Conclusions

1. Age, gender, year of teaching, and teaching specialty had low to negligible association with educational needs.
2. Teachers' degree held and instructional technology training experience had negligible to low association with educational needs.

Recommendations

Based upon the findings of this study, the following recommendations were offered:

Recommendations for Vocational Education Practice

1. Formal educational opportunities (courses, workshops, seminars, etc.) should be offered to update vocational teachers' instructional technology knowledge and skills on a consistent basis and teachers should take advantage of these opportunities when offered. If the available offerings do not meet the needs of vocational teachers, vocational teachers should assume their professional responsibility by being proactive in communicating this to appropriate service providers.
2. The Ohio Department of Education and the Ministry of Education in Taiwan, college/university teacher education programs, professional associations, and other service providers should place a high priority on increasing the instructional technology knowledge and skill levels of vocational teachers.
3. New instructional technology and applications are created almost daily. Results of this study indicate that setup, maintenance, and troubleshooting of computer system and database were the important priorities for Ohio vocational teachers, while telecommunications was an important priority for Taiwan vocational teachers. This research recommends that the new information about instructional technology and applications such as maintenance and troubleshooting of computer system, database, and telecommunications have to be provided periodically as a education training or workshop for teachers.

Recommendations for Theory

1. Studies based on the discrepancies analysis of Borich Need Assessment Model to determine accurate measurements of the differences between perceived competence and importance of instructional technology competencies to find out perceived instructional technology educational needs for teachers are recommended.
2. The International Society for Technology in Education (ISTE) standards for instructional technology competencies including: 1) the use of computer-based technologies to access information to enhance personal and professional productivity, and 2) application of computer and related technologies to facilitate emerging roles of the learner and the educator were recommended as references of instructional technology competencies.

Recommendations for Further Research

1. The findings of the instructional technology educational needs of vocational teachers could be used to explore how vocational teachers use these instructional technology competencies in the classroom or in other professional activities for further research.
2. The relationships among selected demographic characteristics and educational needs were negligible to low. Therefore, further studies should analyze the relationship of other selected demographic characteristics and educational needs in other states and countries in order to verify if there are differences or common patterns in findings.

3. Cross-national studies have provided information leading to better understanding of teacher's perceptions of instructional technology competencies across countries and identified some universal variables related to vocational teachers' perceptions of instructional technologies and applications. Further research may need to include other countries for comparison.
4. Most of the studies (Uko, 1985; Arede, 1994; Layfield & Dobbins, 2000) that used Borich's model had a very low correlation coefficients among needs and characteristics. Similar studies could explore other variables, such as types of computer currently using, effectiveness of the use of computer in the instructional process, and ethnicity.
5. The advanced instructional technology competencies for professional development such as: 1) integrate teaching methodologies with knowledge about use of technology to support teaching and learning; and 2) exhibit leadership in the identification, selection, installation, maintenance, and management of computing hardware and software and the uses of computer and related technologies throughout the curriculum were recommended for further research.
6. Replicate this investigation at other points in time.

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APPENDICES

APPENDIX A
PANEL OF EXPERTS

PANEL MEMBER	POSITION
Dr. Larry Miller	Professor Department of Human and Community Resource Development College of Food, Agriculture, and Environmental Sciences The Ohio State University
Dr. Wesley Budke	Associate Professor Department of Human and Community Resource Development College of Food, Agriculture, and Environmental Sciences The Ohio State University
Dr. Christopher Zirkle	Assistant Professor Department of Workforce Development and Education College of Education The Ohio State University
Dr. Raúl Soto	Assistant Director Administrative Field Services Ohio Department of Education Office of Career Technical and Adult Education
Barb Nicol	Assistant Director Adult Workforce Education Ohio Department of Education Office of Career Technical and Adult Education

APPENDIX B
LETTERS TO PARTICIPANTS

Department of Human and
Community Resource Development

208 Agricultural
Administration Building
2120 Pythe Road
Columbus, OH 43210-1067

Phone 614-292-6321
FAX 614-292-7007

Dear Teachers,

Sep. 3, 2001

We are conducting a study to explore and describe the perception of the current competence, importance, and needs of instructional technology for vocational teachers. Instructional technology is used to manage and instruct in vocational and technical education and encompasses not only the computer but also other technologies and delivery systems. Teachers need instructional technology competencies so they can teach these competencies to students for their entry-level job requirement.

We are asking if you could help us by participating in this study. An instrument has been prepared to measure the importance and competence level of instructional technology competencies needed by vocational teachers. This instrument will take approximately **SEVEN TO TEN MINUTES FOR YOU TO COMPLETE**. In this study, we will guarantee confidentiality. The code number will be used only to process data and follow-up with non-respondents. We know that you are busy, but your opinion is very important. This is a great opportunity to express how you feel regarding the importance, competence and needs of instructional technology competencies. Enclosed the instrument set for this study. We ask you respond to all items and send it in the stamped return self-addressed envelope by Friday, September 28, 2001. Your participation is very important and highly appreciated. If you have questions, call me at the number below.

Sincerely,

Chifang Lu
Doctoral Student
Vocational Education
Tel: (614)291-7959

Larry E. Miller
Professor
Dept. of Human and Community
Resource Development

Department of Human and
Community Resource Development

208 Agricultural
Administration Building
2120 Fyffe Road
Columbus, OH 43210-1067

Phone 614-292-6323
FAX 614-292-7007

親愛的教師們,

2001/9/12

我知道您們很忙,所以我先簡潔的介紹一下我自己。我,呂季芳,美國俄亥俄州立大學博士班學生,主修專攻在職業教育與人力社區資源管理。目前我與我的專任教授,Dr. Larry Miller,正在著手一個研究,此研究是在探討評估職業學校老師對於科技應用於教學上認知的需求。問卷調查就此成為最佳的研究方法之一。

此問卷包含兩大部分:第一部份又分為八小節包含有關科技應用在教學上問題,第二部分則包含受訪者的基本資料。注意,請不要把您的姓名寫在問卷上,問卷的代碼則是研究者用於對未回應者的追蹤。如您有任何問題,請您盡快與研究者聯繫,聯絡電話如下。

鈞安

呂季芳
研究者(博士班學生)
職業教育系
電話:0912116888
0612116886

Larry E. Miller
教授
人力社區發展部門
美國俄亥俄州立大學

Agricultural Communication • Agricultural Education • Extension Education • Rural Sociology • Vocational Education

Date

Dear

In late August we wrote to you seeking your opinion about issues related to your PERCEIVED INSTRUCTIONAL TECHNOLOGY COMPETENCIES. As of today, we have not received your completed questionnaire. We realized that you might not have had time to complete it. However, we would genuinely appreciate hearing from you. Your opinion is very important to us.

The study is being conducted so that teachers like you can express how you feel regarding the importance, competence, and needs of instructional technology competencies. We are writing to you again because the study's usefulness depends on our receiving a questionnaire from each respondent. In order for information from study to be truly representative, it is essential that each person in the sample return their questionnaire which takes approximately 12 minutes to complete.

In the event that your questionnaire has been misplaced, a replacement is enclosed. We would be happy answer any questions you have about the study. Please return the questionnaire in the stamped self-addressed envelop by October 28, 2001. This is an opportunity to make a contribution to your school district and your profession. Please call us at 614-291-7959 if additional information is needed.

Sincerely,

Chifang Lu
Doctoral Student
Vocational Education

Larry E. Miller
Professor
Dept of Human and Community Resource
Development

APPENDIX C
HUMAN SUBJECTS APPROVAL FORM

**TITLE PAGE - APPLICATION FOR EXEMPTION
FROM REVIEW BY THE INSTITUTIONAL REVIEW BOARD
The Ohio State University, Columbus OH 43210**

 For office use only
PROTOCOL NUMBER:
 01E0232

Principal Investigator University Title: ☒ Professor ☐ Associate Professor ☐ Assistant Professor ☐ Instructor ☐ Other. Please specify. (May require prior approval.)	Name: Miller, Larry E.	Phone: 292-0450
	Department or College: Department of Human and Community Resource Development	E-mail: miller.103@osu.edu
	Campus Address (room, building, street address): 204 Agricultural Administration Building 2120 Fyffe Road Columbus, OH 43210	
	Signature: <i>Larry E. Miller</i> Date: 7/20/01	Fax: 292-7007

Co-Investigator University Status: ☐ Faculty ☐ Staff ☒ Graduate Student ☐ Undergraduate Student ☐ Other. Please specify.	Name: Lu, Chifang	Phone: 291-7959
	Campus Address (room, building, street address) or Mailing Address: 130 W. Lane Ave. #38 Columbus, OH 43201	E-mail: lu.124@osu.edu
	Signature: <i>Chifang Lu</i> Date: 7/20/01	Fax: 291-7959

Co-Investigator University Status: ☐ Faculty ☐ Staff ☐ Graduate Student ☐ Undergraduate Student ☐ Other. Please specify.	Name:	Phone:	
	Campus Address (room, building, street address) or Mailing Address:	E-mail:	
	Signature:	Date:	Fax:

Protocol Title	Instructional Technology Competencies Perceived As Needed By Vocational Teachers In Ohio and Taiwan
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Source of Funding	Chifang Lu Personal Funds.
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For Office Use Only	
☒ Approved.	Research has been determined to be exempt under these categories: <u>2</u> Research may begin as of the date of determination listed below.
☐ Disapproved.	The proposed research does not fall within the categories of exemption. Submit an application to the appropriate Institutional Review Board for review.
Date of determination: 7/20/2001	Signature: <i>Jane E. Healey</i> Office of Research Risk Protection

APPENDIX D
RESEARCH INSTRUMENT (ENGLISH VERSION)

**Instructional Technology
Competencies Needed by
Vocational Teachers**

Department of Human and Community Resource Development

The Ohio State University

2001

106

Information About this Survey

This questionnaire consists of two parts. Part I contains statements and questions about the instructional technology competencies and is divided into eight sections. Section 1 is related to the knowledge of computer operation skills; Section 2 is related to computer setup, maintenance, and troubleshooting; Section 3 asks about your perception of word processing/introductory desktop publishing; Section 4 is related to the using of spreadsheet/graphing; Section 5 is related to knowledge of database; Section 6 asks about your perception of networking; Section 7 is about telecommunications; and Section 8 is related to the using of media communications.

Part II contains statements about participants' demographic information. Remember that you do NOT have to identify your name on this questionnaire. The code number will be used only to process data and follow-up with non-respondents.

We greatly appreciate your help and would like to offer our sincere thanks to you.

GO TO NEXT PAGE AND BEGIN

Part I
Perception of Instructional Technology Competencies

Please indicate by circling the appropriate number the degree to which you believe the following statements describe your instructional technology competencies.

There are two columns: one for Importance and the other for Competence under which rating scales are provided to aid the participants in describing their responses and reactions to each statement and question.

Responses are interpreted in the following manner:

Example:

Level of Importance in instructional technology	Statements or Questions	Level of Current Competence in instructional technology
1 2 3 4 5	How to start up and shut down the computer?	1 2 3 4 5

This person answered 1 (None) under Level of Importance, and indicated that they place a low importance. They answered 5 (A Great Deal) under Level of Current Competence and indicated that they had a great deal of knowledge.

Part I. Section 1. Computer Operation Skills

Level of Importance	Computer operation skills	Level of Current Competencies
1 2 3 4 5	1-1. Start up and shut down the computer according to computer type.	1 2 3 4 5
1 2 3 4 5	1-2. Start up and shut down the peripherals (printer, CD-ROM, and/or scanner).	1 2 3 4 5
1 2 3 4 5	1-3. Identify and use icons, windows, and menus.	1 2 3 4 5
1 2 3 4 5	1-4. Start an application and create a document.	1 2 3 4 5
1 2 3 4 5	1-5. Name a document.	1 2 3 4 5
1 2 3 4 5	1-6. Save a document using both the save and save as commands.	1 2 3 4 5
1 2 3 4 5	1-7. Use printing options.	1 2 3 4 5
1 2 3 4 5	1-8. Insert and eject floppy disk and CD-ROM.	1 2 3 4 5
1 2 3 4 5	1-9. Initialize, name/rename floppy disk and hard disk.	1 2 3 4 5
1 2 3 4 5	1-10. Copy document from hard disk to floppy disk.	1 2 3 4 5
1 2 3 4 5	1-11. Create and name and rename subdirectories/folders.	1 2 3 4 5

Please continue on the next page

1 = None 2 = Very Little 3 = Some 4 = Quite a bit 5 = Very Much
 6 = Great Deal

Level of Importance	Computer operation skills	Level of Current Competencies
1 2 3 4 5	1-12. Save, open, and place documents inside subdirectories/folders?	1 2 3 4 5
1 2 3 4 5	1-13. Open and work with more than one application at a time.	1 2 3 4 5

Please continue on the next page

Part I. Section 2. Setup, Maintenance, and Troubleshooting

1 = None, 2 = Very Little, 3 = Somewhat, 4 = Fairly, 5 = A Great Deal

Level of Importance	Setup, maintenance, and troubleshooting	Level of Current Competence
1 2 3 4 5	2-1. Setup computer system (i.e.: CPU*; monitor; keyboard; and mouse).	1 2 3 4 5
1 2 3 4 5	2-2. Connect peripheral devices (i.e.: printers, CD-ROM, external drives, modem, scanner).	1 2 3 4 5
1 2 3 4 5	2-3. Protect and care for floppy disks.	1 2 3 4 5
1 2 3 4 5	2-4. Clean computer components and printers?	1 2 3 4 5
1 2 3 4 5	2-5. Make backup copies of key applications and documents?	1 2 3 4 5
1 2 3 4 5	2-6. Use self-help resources to diagnose and correct common hardware problems?	1 2 3 4 5
1 2 3 4 5	2-7. Install and upgrade an application?	1 2 3 4 5
1 2 3 4 5	2-8. Proper operating environment for computer and peripherals.	1 2 3 4 5
1 2 3 4 5	2-9. Protect against computer viruses?	1 2 3 4 5

CPU: Central Processing Unit

Please continue on the next page

Part I. Section 3. Word Process/ Introductory Desktop Publishing

KEY: 1 = None 2 = Very Little 3 = Some what 4 = Very
5 = A Great Deal

Level of Importance	Word Process/Introductory Desktop Publishing	Level of Current Competence
1 2 3 4 5	3-1. Enter and edit text.	1 2 3 4 5
1 2 3 4 5	3-2. Copy and move blocks of text.	1 2 3 4 5
1 2 3 4 5	3-3. Change text format and style (change actual size of text and choose type and special effects such as bold, italic, or underline).	1 2 3 4 5
1 2 3 4 5	3-4. Use margins (amount of white space on the top, bottom, left and right edges of page).	1 2 3 4 5
1 2 3 4 5	3-5. Use tab stop (align/justify to left, right, center, decimal tab).	1 2 3 4 5
1 2 3 4 5	3-6. Check spelling, grammar, and word usage.	1 2 3 4 5
1 2 3 4 5	3-7. Create a header and footer.	1 2 3 4 5
1 2 3 4 5	3-8. Insert date, time, and page number.	1 2 3 4 5
1 2 3 4 5	3-9. Add columns to a document.	1 2 3 4 5
1 2 3 4 5	3-10. Insert clip art into a document.	1 2 3 4 5

Please continue on the next page

Part I. Section 4. Spreadsheet/Graphing

KEY: 1 = None 2 = Very Little 3 = Some what 4 = Very
5 = A Great Deal

Level of Importance	Spreadsheet/Graphing	Level of Current Competence
1 2 3 4 5	4-1. Understand the concept of spreadsheet and relate a print spreadsheet to an electronic spreadsheet.	1 2 3 4 5
1 2 3 4 5	4-2. Understand the possibilities of spreadsheet calculations.	1 2 3 4 5
1 2 3 4 5	4-3. Interpret the information from a spreadsheet and communicate the data in a graphical format.	1 2 3 4 5
1 2 3 4 5	4-4. Enter data in an existing spreadsheet.	1 2 3 4 5
1 2 3 4 5	4-5. Create a spreadsheet with rows, columns, and headings.	1 2 3 4 5
1 2 3 4 5	4-6. Understand the three basic types of cells: label; value; and formula.	1 2 3 4 5
1 2 3 4 5	4-7. Create a formula using functions.	1 2 3 4 5
1 2 3 4 5	4-8. Copy values using fill down and fill across.	1 2 3 4 5
1 2 3 4 5	4-9. Change the appearance of a spreadsheet by inserting columns and rows.	1 2 3 4 5
1 2 3 4 5	4-10. Create a graph or chart from spreadsheet data.	1 2 3 4 5
1 2 3 4 5	4-11. Insert a spreadsheet into a word processing document.	1 2 3 4 5

Please continue on the next page

Part I. Section 5. Database

1 = None 2 = Very Little 3 = Some 4 = Fair 5 = A Great Deal														
Level of Importance					Database					Level of Current Competence				
1	2	3	4	5	5-1. Use a prepared database to enter data.					1	2	3	4	5
1	2	3	4	5	5-2. Add and delete a record to an existing database.					1	2	3	4	5
1	2	3	4	5	5-3. Search a database for specific information.					1	2	3	4	5
1	2	3	4	5	5-4. Use a database to sort records.					1	2	3	4	5
1	2	3	4	5	5-5. Use a database to search for desired information given.					1	2	3	4	5
1	2	3	4	5	5-6. Use sorting and searching techniques to solve a problem.					1	2	3	4	5
1	2	3	4	5	5-7. Create a database with multiple fields.					1	2	3	4	5
1	2	3	4	5	5-8. Create a database with multiple records.					1	2	3	4	5
1	2	3	4	5	5-9. Insert database fields into word processing document.					1	2	3	4	5

Please continue on the next page

Part I. Section 6. Networking

Level of Importance	Networking	Level of Current Competence
1 2 3 4 5	6-1. Connect/log on to a file server.	1 2 3 4 5
1 2 3 4 5	6-2. Retrieve a program or document.	1 2 3 4 5
1 2 3 4 5	6-3. Save a document to a specified location.	1 2 3 4 5
1 2 3 4 5	6-4. Disconnect/log off.	1 2 3 4 5
1 2 3 4 5	6-5. Share files with others on a network.	1 2 3 4 5
1 2 3 4 5	6-6. Select/de-select a network zone?	1 2 3 4 5

Please continue on the next page

Part I. Section 7. Telecommunications

1 = Not at all, 2 = Very little, 3 = Some, 4 = Quite a bit, 5 = Very much

Level of Importance	Telecommunications	Level of Current Competence
1 2 3 4 5	7-1. Connect to Internet via an Internet Service Provider (ISP) with a user ID and password.	1 2 3 4 5
1 2 3 4 5	7-2. Compose new e-mail (address and subject; explanation of address domains).	1 2 3 4 5
1 2 3 4 5	7-3. Send e-mail (concepts of carbon copy (cc) and blind carbon copy (bcc)).	1 2 3 4 5
1 2 3 4 5	7-4. Use browser software (concepts: hypertext, html, homepage).	1 2 3 4 5
1 2 3 4 5	7-5. Access a specific web site by enter the appropriate URL* (concept of URL, http*, web site).	1 2 3 4 5
1 2 3 4 5	7-6. Find a search engine site and perform a specific web search (list of search engines and purposes).	1 2 3 4 5
1 2 3 4 5	7-7. Knowledge and use of filter (software driven, server based, search engine inclusive).	1 2 3 4 5
1 2 3 4 5	7-8. Obtain/maintain an account on the Internet or an on-line service that provides Internet access.	1 2 3 4 5
1 2 3 4 5	7-9. Be aware of on-line conference relevant to professional information.	1 2 3 4 5

Please continue on the next page

KEY: 1 = None 2 = Very Little 3 = Some what 4 = Very 5 = A Great Deal

Level of Importance	Telecommunications	Level of Current Competence
1 2 3 4 5	7-10. Connect to county or university library.	1 2 3 4 5
1 2 3 4 5	7-11. Connect a computer to a modem and telephone line for dial-in access.	1 2 3 4 5
1 2 3 4 5	7-12. Install and configure telecommunications software.	1 2 3 4 5
1 2 3 4 5	7-13. Upload a text file and send as electronic mail.	1 2 3 4 5
1 2 3 4 5	7-14. Create and use group addresses for electronic mail.	1 2 3 4 5
1 2 3 4 5	7-15. Read, save, print, reply to forward electronic mail.	1 2 3 4 5
1 2 3 4 5	7-16. Use Gopher to browse resources on the Internet.	1 2 3 4 5
1 2 3 4 5	7-17. Use FTP* to send or retrieve files from remote computers.	1 2 3 4 5
1 2 3 4 5	7-18. Effective use of distance learning desktop video conferencing, and tele-teaching technologies.	1 2 3 4 5

URL: Uniform Resource Locator
 HTTP: Hypertext Transfer Protocol
 FTP: File Transfer Protocol

Please continue on the next page

Part I. Section 8. Media Communications

1 = Not at all, 2 = Fairly little, 3 = Fairly good, 4 = Somewhat, 5 = Very good

Level of Importance	Media communications	Level of Current Competence
1 2 3 4 5	8-1. Produce print-based products (e.g., newsletters, brochures, poster, books).	1 2 3 4 5
1 2 3 4 5	8-2. Produce electronic slides/overheads.	1 2 3 4 5
1 2 3 4 5	8-3. Set up and operate a videocassette recorder/player and monitor/TV.	1 2 3 4 5
1 2 3 4 5	8-4. Connect a video output device (LCD panel or LCD projector*) to computer for large screen display.	1 2 3 4 5
1 2 3 4 5	8-5. Use digital document camera for 3D objects as well as documents and slides presentation.	1 2 3 4 5
1 2 3 4 5	8-6. How to use painting and drawing tools.	1 2 3 4 5
1 2 3 4 5	8-7. Use digital camera and scanner.	1 2 3 4 5
1 2 3 4 5	8-8. Use camcorder and edit video from a camcorder.	1 2 3 4 5
1 2 3 4 5	8-9. Produce a video.	1 2 3 4 5
1 2 3 4 5	8-10. Set up and operate a videodisk player and TV receiver or monitor.	1 2 3 4 5

LCD: Liquid Crystal Display

Please continue on the next page

Part II

Demographic Characteristics

Part II concerns participants' demographic characteristics in this study. Items from 1 to 7 ask you for personal and job-related information. Please write your responses or circle one letter that is most applicable to yourself.

1. What is your age? _____ Years

2. Gender: A. Male B. Female

3. Total years of teaching experience.

_____ Years

4. Do you have a computer at home?

- A. Yes
- B. No

5. What is your highest degree of academic preparation?

- A. Less than Associate Degree
- B. Associate Degree
- C. Bachelor's Degree
- D. Master's Degree
- E. Higher than Master's

Please continue on the next page

6. What is your vocational education program or main teaching area (Circle one)?

- A. Arts & Communications
- B. Business & Management
- C. Industrial & Engineering Systems
- D. Human Resources/Services
- E. Environmental & Agricultural System
- F. Health Services
- G. Other _____

7. Have you taken any pre-service or in-service training or workshop in instructional technology?

- A. Yes, how many training hours: _____
- B. No

Your comments will be appreciated.

Comments:

Thank You!

APPENDIX E
MANDARIN TRANSLATION OF THE INSTRUMENT

職業學校教師對科技應用教學

認知的須求

人力及社區資源發展系

美國俄亥俄州立大學

2001

123

研究概論及問卷說明

此研究是在探討評詁職業學校老師對於科技應用於教學上認知的須求。問卷設計包含了兩大部份，第一部份又分為八小節包含有關科技應用於教學上的問題。第一節是有關電腦操作的能力；第二節是有關電腦裝備設置之組織、維護修理；第三節是問有關於文書處理及版面設計的題目；第四節則是有關於工作表及圖表的使用；第五節是有關資料庫的知識；第六節則是問有關於網際網路的問題；第七節是有關教學與電信相關問題；最後第八節是有關教學傳播媒體的使用。

第二部份包含受訪者的基本資料。注意，請不要把您的姓名寫在問卷上。問卷上的代碼則是研究者用於對未回應者的追蹤。

我們很感謝您的幫助並獻上我們最誠心的謝意。

下一頁並開始填寫

第一部份

科技應用於教學的認知

請按照下列數字的指示圈選您認為最適和並能描寫您對科技應用於教學的認知的答案。
問卷上分為三欄，中間欄則是問題的所在，左右兩欄為量取對於問卷上問題的重要性及認知等級的刻度，一到五級的等級刻度提供給受訪者去回答對每個問題的回應。

一到五級的等級刻度解釋如下：

答案：1 = 非常不重要或非常不了解 2 = 不重要或不了解 3 = 不確定
4 = 重要或了解 5 = 非常重要或非常了解

例題：

對使用電腦 重要程度	題目	目前對使用 電腦認知程度
① 2 3 4 5	打開和關閉電腦	1 2 3 4 ⑤

當您的答案是1(非常不重要)在重要程度欄時，它代表著您認為此一題目對您沒有重要性。
假如您的答案是5
(非常了解)在目前認知程度欄時，它代表著您對此一題目有極大的認知。

下一頁

第一部份、第一節 電腦操作技能

答案 1 = 非常不重要或非常不了解 2 = 不重要或不了解 3 = 不確定
4 = 重要或了解 5 = 非常重要或非常了解

重要程度	電腦操作技能	目前 認知程度
1 2 3 4 5	1-1. 根據電腦的形態開機關機。	1 2 3 4 5
1 2 3 4 5	1-2. 開啓及關閉電腦的周邊設備(例如: 印表機、光碟機、 或掃描機)。	1 2 3 4 5
1 2 3 4 5	1-3. 認識及使用電腦視窗和目錄。	1 2 3 4 5
1 2 3 4 5	1-4. 應用電腦程式去製作一份文件。	1 2 3 4 5
1 2 3 4 5	1-5. 文件的命名、儲存、復原、和修改。	1 2 3 4 5
1 2 3 4 5	1-6. 使用儲存和儲存於指令去儲存檔案。	1 2 3 4 5
1 2 3 4 5	1-7. 使用印表機製之列印選項。	1 2 3 4 5
1 2 3 4 5	1-8. 磁碟片和光碟的插入和取出。	1 2 3 4 5
1 2 3 4 5	1-9. 命名\重新命名磁碟片和硬碟。	1 2 3 4 5
1 2 3 4 5	1-10. 複製檔案從硬碟到磁碟片。	1 2 3 4 5
1 2 3 4 5	1-11. 創造及命名\重新命名附屬目錄或文件夾。	1 2 3 4 5

下一頁

重要程度	電腦操作技能	目前 認知程度
1 2 3 4 5	1-12. 如何在附屬目錄或文件夾中儲存、開啓、 及另置文件。	1 2 3 4 5
1 2 3 4 5	1-13. 同時開啓和運作一個以上的電腦軟體運用。	1 2 3 4 5

下一頁

第一部份、第二節 電腦裝備設置之組織、維護修理

案	1 = 非常不重要或非常不了解	2 = 不重要或不了解	3 = 不確定
	4 = 重要或了解	5 = 非常重要或非常了解	

重要程度	電腦裝備設置之組織、維護修理	目前 認知程度
1 2 3 4 5	2-1. 電腦系統的裝備設置〔例如：電腦銀幕、鍵盤、和滑鼠〕。	1 2 3 4 5
1 2 3 4 5	2-2. 連接電腦周邊設備〔例如：印表機、光碟、外接磁碟機、數據機、和掃描機〕。	1 2 3 4 5
1 2 3 4 5	2-3. 磁碟機的保護及管理。	1 2 3 4 5
1 2 3 4 5	2-4. 電腦組件及印表機的清理。	1 2 3 4 5
1 2 3 4 5	2-5. 複製電腦程式或文件。	1 2 3 4 5
1 2 3 4 5	2-6. 使用‘小幫手’去診斷和矯正一般的硬體問題。	1 2 3 4 5
1 2 3 4 5	2-7. 電腦程式的安裝及升級。	1 2 3 4 5
1 2 3 4 5	2-8. 對電腦及其週邊設備運作環境的了解。	1 2 3 4 5
1 2 3 4 5	2-9. 防止和解決電腦病毒的發生。	1 2 3 4 5

CPU: 中央處理單元

下一頁

第一部份、第三節 文書處理及版面設計

重要程度	文書處理及版面設計	目前認知程度
1 2 3 4 5	3-1. 輸入及編輯文件。	1 2 3 4 5
1 2 3 4 5	3-2. 使用複製及貼上文件的功能。	1 2 3 4 5
1 2 3 4 5	3-3. 改變字型樣式 〔例如：字型大小、粗體、斜體字型〕。	1 2 3 4 5
1 2 3 4 5	3-4. 文章段落編排。	1 2 3 4 5
1 2 3 4 5	3-5. Tab 鍵的使用〔例如：格式的校正〕。	1 2 3 4 5
1 2 3 4 5	3-6. 拼字 和文法校正。	1 2 3 4 5
1 2 3 4 5	3-7. 使用首頁/尾頁的功能。	1 2 3 4 5
1 2 3 4 5	3-8. 日期、時間及頁碼的插入。	1 2 3 4 5
1 2 3 4 5	3-9. 插入表格功能的使用。	1 2 3 4 5
1 2 3 4 5	3-10. 插入美工圖案的使用。	1 2 3 4 5

下一頁

第一部份、第四節 工作表及圖表的使用

重要程度	電腦工作表及圖表的使用	目前 認知程度
1 2 3 4 5	4-1. 對工作表內容及印刷品和電腦工作表間關係的了解。	1 2 3 4 5
1 2 3 4 5	4-2. 對於電腦工作表計算程式的了解。	1 2 3 4 5
1 2 3 4 5	4-3. 電腦工作表內容及圖表資料的解析。	1 2 3 4 5
1 2 3 4 5	4-4. 電腦如何在工作表裡輸入資料。	1 2 3 4 5
1 2 3 4 5	4-5. 使用欄、列及標題去建立一個工作表。	1 2 3 4 5
1 2 3 4 5	4-6. 對三種工作表的儲存格型態的了解 〔例如：分類表、數值、和公式〕。	1 2 3 4 5
1 2 3 4 5	4-7. 使用功能鍵建立工作表的公式。	1 2 3 4 5
1 2 3 4 5	4-8. 相鄰儲存格自動填滿資料〔在欄或列內複製資料〕。	1 2 3 4 5
1 2 3 4 5	4-9. 增加欄或列到工作表裡。	1 2 3 4 5
1 2 3 4 5	4-10. 運用工作表內的資料去建立圖表。	1 2 3 4 5
1 2 3 4 5	4-11. 在文書處理文件內插入一個工作表。	1 2 3 4 5

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第一部份、第五節 資料庫

1 = 非常不重要或非常不了解	2 = 不重要或不太了解	3 = 不清楚
4 = 重要或了解	5 = 非常重要或非常了解	

重要程度	資料庫	目前 認知程度
1 2 3 4 5	5-1. 輸入新的資料到原有的資料庫裡。	1 2 3 4 5
1 2 3 4 5	5-2. 從原有的資料庫中，增加或刪除一份資料。	1 2 3 4 5
1 2 3 4 5	5-3. 從資料庫去尋找特殊資料。	1 2 3 4 5
1 2 3 4 5	5-4. 從原有的資料庫，做分類記載資料。	1 2 3 4 5
1 2 3 4 5	5-5. 使用資料庫去搜尋已知的資料。	1 2 3 4 5
1 2 3 4 5	5-6. 使用分類及搜尋功能去解決問題。	1 2 3 4 5
1 2 3 4 5	5-7. 建立一個多重領域的資料庫。	1 2 3 4 5
1 2 3 4 5	5-8. 訂製資料庫的版面設計。	1 2 3 4 5
1 2 3 4 5	5-9. 在文書處理文件中插入資料庫內的資料。	1 2 3 4 5

下一頁

第一部份、第六節 網際網路

1 = 非常不重要或不知道, 2 = 不重要或不知道, 3 = 中等, 4 = 重要或了解, 5 = 非常重要或非常了解

目前 認知程度	網際網路	目前 認知程度
1 2 3 4 5	6-1. 連線/登入到一個檔案的伺服器。	1 2 3 4 5
1 2 3 4 5	6-2. 復原網路上的文件。	1 2 3 4 5
1 2 3 4 5	6-3. 儲存文件到一特殊的定點。	1 2 3 4 5
1 2 3 4 5	6-4. 離線/登出。	1 2 3 4 5
1 2 3 4 5	6-5. 在網路上，檔案分享。	1 2 3 4 5
1 2 3 4 5	6-6. 選擇/跳出網際網路區。	1 2 3 4 5

下一頁

第一部份、第七節 教學相關電信系統

重要程度	教學相關電信系統	目前 認知程度
1 2 3 4 5	7-1. 經由ISP (Internet Service Provider, 網路服務供應商), 讓電腦連上Internet。	1 2 3 4 5
1 2 3 4 5	7-2. 編輯新郵件〔包含電子信箱的住址、郵件的標題、和郵件內容編輯〕。	1 2 3 4 5
1 2 3 4 5	7-3. 寄電子郵件〔包含副本抄送及密件副本送〕。	1 2 3 4 5
1 2 3 4 5	7-4. 軟體瀏覽器的使用〔包含超文件、html*、homepage〕。	1 2 3 4 5
1 2 3 4 5	7-5. 使用URL*到一個特定的網址〔對URL和 http*的了解〕。	1 2 3 4 5
1 2 3 4 5	7-6. 尋找及使用搜尋器去搜尋特定的網址。	1 2 3 4 5
1 2 3 4 5	7-7. 過濾器的認知及使用〔包含軟碟機、伺服器、及搜尋器〕。	1 2 3 4 5
1 2 3 4 5	7-8. 申請/保持Internet的帳號或路服務所提供的Internet 途徑。	1 2 3 4 5
1 2 3 4 5	7-9. 了解網路上重要的會議商量對專業知識的重要性。	1 2 3 4 5

下一頁

重要程度	教學相關電信系統	目前 認知程度
1 2 3 4 5	7-10. 連線到其他縣市或大學圖書館。	1 2 3 4 5
1 2 3 4 5	7-11. 安裝數據機與設定撥號網路系統。	1 2 3 4 5
1 2 3 4 5	7-12. 安裝及配置電子郵件的通訊錄。	1 2 3 4 5
1 2 3 4 5	7-13. 純文件檔案的下載並經由電子郵件傳送。	1 2 3 4 5
1 2 3 4 5	7-14. 建立及使用電子郵件的通訊錄。	1 2 3 4 5
1 2 3 4 5	7-15. 讀取、存檔、列印、回覆及轉寄電子郵件。	1 2 3 4 5
1 2 3 4 5	7-16. 使用Gopher(地鼠系統)瀏覽Internet的資源。	1 2 3 4 5
1 2 3 4 5	7-17. 從其他電腦，使用FTP*傳送或復原檔案。	1 2 3 4 5
1 2 3 4 5	7-18. 有效的運用遠距學習錄影帶講習會及電信教學科技。	1 2 3 4 5

Html: hypertext markup language (超文件標記描述語言)

URL: Uniform Resource Locator (homepage位址或網址)

HTTP: Hypertext Transfer Protocol (超文件檔案傳輸協定)

FTP: File Transfer Protocol (檔案傳輸協定)

下一頁

第一部份、第八節 教學媒體傳播相關科技運用

答案: 1 = 非常不重要或非常不了解 2 = 不重要或不了解
4 = 重要或了解 5 = 非常重要或非常了解

重要程度	教學媒體傳播相關科技運用	目前 認知程度
1 2 3 4 5	8-1. 製造印刷產品（例如：簡訊小冊子海報及書籍等）。	1 2 3 4 5
1 2 3 4 5	8-2. 製造電子投影片。	1 2 3 4 5
1 2 3 4 5	8-3. 設置及操作錄放影機和電視螢幕。	1 2 3 4 5
1 2 3 4 5	8-4. 連接LCD*(液晶顯示螢幕)的投射器到電腦，為顯示在大螢幕專用。	1 2 3 4 5
1 2 3 4 5	8-5. 使用數位相機製造3D立體物體及幻燈片進行演說。	1 2 3 4 5
1 2 3 4 5	8-6. 使用繪畫及描寫工具。	1 2 3 4 5
1 2 3 4 5	8-7. 使用數位相機和掃描機。	1 2 3 4 5
1 2 3 4 5	8-8. 攝影機的使用及影像的編輯。	1 2 3 4 5
1 2 3 4 5	8-9. 製作錄影帶。	1 2 3 4 5
1 2 3 4 5	8-10. 設置操作影碟(VCD/DVD)放映器和電視接收器。	1 2 3 4 5

下一頁

第二部份

受訪者基本資料：第一題至第七題是有關受訪者本身的及工作方面的資料，請在每一項目中圈選或填寫最符合您狀況的答覆。

1. 年齡：_____ 歲
2. 性別： A. 男 B. 女
3. 教學年資：_____ 年
4. 在家有沒有電腦： A. 有 B. 沒有
5. 教育程度：
 - A. 專科以下
 - B. 專科
 - C. 大學
 - D. 碩士
 - E. 碩士以上
6. 教學領域或科目：
 - A. 農業教育
 - B. 家庭科學教育
 - C. 工業科學教育
 - D. 醫護衛生教育
 - E. 商業教育
 - F. 其他：_____

下一頁

7. 任職前或任職後有沒有受過科技應用於教學的訓練或研習：

A. 有，訓練或研習時數_____

B. 沒有

建議:

APPENDIX F

PARTICIPATING SCHOOLS IN OHIO AND TAIWAN

List of Participating Comprehensive High Schools & JVS in the Central Region of Ohio	Delaware Buckeye Valley High Sch 901 Coover Rd Delaware OH 43015	Delaware Olentangy High Sch 675 Lewis Center Rd Lewis Center OH 43035
Delaware Big Walnut High Sch 555 S Old 3C Hwy Sunbury OH 43074	Franklin Briggs High Sch 2555 Briggs Rd Columbus OH 43223	Franklin Brookhaven High Sch 4077 Karl Rd Columbus OH 3224
Franklin Beechcroft High Sch 6100 Beechcroft Rd Columbus OH 43229	Franklin East High Sch 1500 E Broad St Columbus OH 43205	Franklin Eastmoor Academy High Sch 417 S Weyant Ave Columbus OH 43213
Franklin Centennial High Sch 1441 Bethel Rd Columbus OH 43220	Franklin Independence High Sch 5175 E Refugee Rd Columbus OH 43232	Franklin Linden-Mckinley High Sch 1320 Duxberry Ave Columbus OH 43211
Franklin Marion-Franklin High Sch 1265 Koebel Rd Columbus OH 43207	Franklin Mifflin High Sch 3245 Oak Spring St Columbus OH 43219	Franklin Northland High Sch 1919 Northcliff Dr Columbus OH 43229
Franklin South Urban Academy High Sch 1160 Ann St Columbus OH 43206	Franklin Walnut Ridge High Sch 4841 E Livingston Ave Columbus OH 43227	Franklin West High Sch 179 S Powell Ave Columbus OH 43204
Franklin Whetstone High Sch 4405 Scenic Dr Columbus OH 43214	Franklin Grandview Heights High Sch 1587 W 3rd Ave Columbus OH 43212	Franklin Upper Arlington High Sch, 1650 Ridgeview Rd Upper Arlington OH 43221
Franklin Westerville-North High Sch 950 County Line Rd Westerville OH 43082	Franklin Westerville-South High Sch 303 S Otterbein Ave Westerville OH 43081	Franklin Thomas Worthington High Sch 300 W Granville Rd Worthington OH 43085
Franklin Worthington Kilbourne High Sch 1499 Hard Rd Columbus OH 43235	Fairfield Amanda-Clearcreek High Sch 414 N School St Amanda OH 43102	Fairfield Berne Union High Sch 506 N Main Sugar Grove OH 43155

Fairfield Bloom-Carroll High Sch 69 S Beaver St Carroll OH 43112	Franklin Canal Winchester High Sch, 300 Washington St Canal Winchester OH 43110	Fairfield Fairfield Union High Sch 6401 Cin-Zanesville Rd NE, Lancaster OH 43130
Franklin Lincoln High Sch 140 Hamilton Rd Gahanna OH 43230	Franklin Groveport Madison High Sch, 4475 S Hamilton Rd Groveport OH 43125	Franklin Hamilton Township High Sch, 4999 Lockbourne Rd Columbus OH 43207
Fairfield Liberty Union High Sch 500 Washington St Baltimore OH 43105	Fairfield Pickerington High Sch 300 Opportunity Way Pickerington OH 43147	Franklin Reynoldsburg High Sch 6699 E Livingston Ave Reynoldsburg OH 43068
Franklin Franklin Heights High Sch, 1001 Demorest Rd Columbus OH 43204	Grove City High Sch 4665 Hoover Rd Grove City OH 43123	Westland High Sch 146 Galloway Rd Galloway OH 43119
Licking Johnstown-Monroe High Sch, 401 S Oregon St Johnstown OH 43031	Licking Licking Valley High Sch 100 Hainsview Dr Newark OH 43055	Licking Newark High Sch 314 Granville St Newark OH 43055
Licking Utica High Sch 260 Jefferson St PO Box 677 Utica OH 43080	Licking Northridge High Sch 6066 Johnstown-Utica Rd Johnstown OH 43031	Licking Watkins Memorial High Sch, 8868 Watkins Rd SW Pataskala OH 43062
Delaware Delaware North Campus Jt Voc S 1610 St Rt 521 Delaware OH 43105	Delaware Delaware South Campus Jt Voc S 4565 Columbus Pike Delaware OH 43105	Franklin Eastland Career Center Jt Voc 4465 S Hamilton Rd Groveport OH 43125
Fairfield Fairfield Career Center Jt Voc S 4000 Cols-Lanc Rd NW Carroll OH 43112	Madison H E Tolles Technical Center Jt 7877 Rt 42 NE Plain City OH 43064	Licking Licking County Jt Voc Sch 150 Price Rd Newark OH 43055

**List of Participating Vocational High
Schools in Taiwan**

高雄市

1. 市立三民家商
高雄市左營區裕誠路1102號
2. 市立中正高工
高雄市前鎮區光華二路80號
3. 市立海青工商
高雄市左營區左營大路1號
4. 市立高雄高工
高雄市三民區建工路419號
5. 市立高雄高商
高雄市新興區五福二路3號
6. 私中華藝校
高雄市鼓山區中華一路2204號
7. 私立三信家商
高雄市苓雅區三多一路186號
8. 私立育英護校
高雄市三民區大昌二路420巷15號
9. 私立高鳳工家
高雄市港區高松里松崗路119號
10. 私立國際商工
高雄市苓雅區三多二路84號
11. 私立樹德家商
高雄市三民區建興路116號

高雄縣

1. 私立中山工商
高雄縣大寮鄉會社村正氣路79號
2. 私立立德商工
高雄縣岡山鎮岡山路6號
3. 私立高英工商
高雄縣大寮鄉鳳林三路19巷44號
4. 私立高苑工商
高雄縣橋頭鄉東林村芋寮路1號
5. 私立高美護工
高雄縣美濃鎮成功路309號
6. 私立高旗工家
高雄縣鳳山市鳳仁路90號
7. 私立華德工家
高雄縣茄萣鄉濱海路4段66號
8. 私立旗美商工
高雄縣美濃鎮中興路2段275號
9. 國立岡山農工
高雄縣岡山鎮壽天里岡山路533號
10. 國立鳳山商工
高雄縣鳳山市文衡路51號
11. 國立旗山農工
高雄縣旗山鎮旗甲兔路1段195號