

Self-Efficacy toward Educational Technology: The Application in Taiwan Teacher Education

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Abstract

In the twenty-first century, the rapid growth of information technologies has transformed the capacity of educational institutes to deliver educational and training programs. New technologies provide public accessibility to a vast variety of educational resources and learning opportunities. Technology integration in education can enhance learning and teaching. The quality of teaching, learning, researching, and course offerings must be considered in Taiwan teacher education. The learner's self-efficacy could undermine a valuable program if not recognized and dealt with in advance. The overall purpose of this paper is to discuss the application of self-efficacy in Taiwan teacher education. It should be considered and planned for before initiating programs to avoid potential roadblocks and to maximize returns in Taiwan teacher education toward computer technology.

Keywords : *Computer technology; Self-efficacy; Teacher education; Educational technology; Elementary education*

Introduction

Since the mid-twentieth century, Taiwan has experienced rapid socio-economic development. As a result, the Taiwan government has committed resources to monitor and encourage this expansion. One significant aspect of the above is the desire to expand technology education into teacher education. According to a report by the Ministry of Education (1999), Taiwan will speed up the diversification, liberalization, and internationalization of its public school system. The curricula and teaching methods used in schools at all levels will undergo modernization, with significant improvements being made in the educational environment. The educational goal is to enhance the applications of computer technology in the following manner: a. 70% of the K-12 teachers are required to have basic computer technological skills; b. upgrade the software and replace the old hardware in all elementary schools; c. provide at least one computer in every K-12 classroom; and d. 80% of K-12 classrooms will utilize the Internet for teaching and learning.

During the fall of 1996, a survey on technology was distributed to member institutions affiliated with the American Association of Colleges for Teacher Education. The study showed a number of positive aspects for the use, and potential use, of both basic and interactive information technologies within teacher education.¹ This study determined that out of 466 responding schools, colleges, and departments of education, 40% of the respondents were required to design and deliver instruction incorporating various technologies during the on-campus part of their programs. In addition, 50% of the respondents stated that preservice teachers were required to demonstrate the use of at least one technology during their on-campus classes. Finally, 28% of the respondents indicated that preservice teachers were required to design and deliver instruction that incorporated various technologies during their teaching experience. Almost all institutions provided preservice teachers accessibility to basic word processing, spreadsheet, and presentation programs. Preservice teachers at 57% of these schools had access to advanced electronic technologies. The results of this survey showed that the introduction of educational technology in preservice classes had a positive effect for elementary teachers.²

By utilizing computer technologies, it is hoped that teachers and students in Taiwan can gain access to information far beyond the quality and quantity available in textbooks. However, the rapid changes in technological development have had little impact on the implementation of educational technology in Taiwan.³ There is still a lack of technological applications in the training curriculum of teacher education in Taiwan. In his study, T. Wang pointed out that in Taiwan, only limited amounts of information about technology education programs are available at the elementary school level and even less in teacher education programs.⁴ This problem has limited the successful implementation of educational technology into Taiwan teacher training programs. Understanding more about student attitudes toward computer technology would provide insights for future strategies in curriculum and program design in Taiwan elementary teacher training programs.

1 K. A. Perschitte, D. D. Tharp, & E. P. Caffarella, *The Use of Technology by Schools, Colleges, and Departments of Education : 1996*. Unpublished manuscript (Washington, DC : American Association of Colleges for Teacher Education, 1997).

2 *Ibid.*

3 Kuei-Chih KC Chuang, *An Investigation of the Application of Computers as an Educational Technology Tool in Taiwan Senior High Schools Technology Education Programs* (Doctoral dissertation, Iowa State University, 1999). *UMI ProQuest Digital Dissertations*. [Online] URL <http://wwwlib.umi.com/dissertations/fullcit/9833959>

4 T. Wang, *A Study to Identify the Program Elements for an Elementary School Technology Teacher Education Program in Taiwan, Republic of China (China)* (Doctoral dissertation, Ohio State University, 1999). *UMI ProQuest Digital Dissertations*. [Online] URL <http://wwwlib.umi.com/dissertations/fullcit/9946308>



Technology Integration Programs in Teacher Education in the U.S.

Ely described technology as hardware that delivers that information serves as a tool to accomplish a task or to refer to a systematic process of solving problems by scientific means.⁵ The Association for Educational Communications and Technology defined instructional technology as the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning.⁶ Saettler asserted that the major developments of educational technology occurred during and immediately after World War II. Mainly a 20th century movement, it began with an emphasis on audiovisual communications and then focused on the systematic development of teaching and learning procedures based on behavioral psychology. Contributing fields in educational technology are cognitive psychology, social psychology, psychometrics, perception psychology, and management.⁷

The American Association of Colleges for Teacher Education (1998) reported that the Curry School of Education at the University of Virginia, the College of Education and Human Services at Western Illinois University, and the College of Education at Michigan State University have identified long-term efforts to integrate technology throughout their programs.

Curry School of Education, University of Virginia

In the mid-1980s, in order to ensure that teachers had the ability to integrate the proper use of technologies in teaching after graduation, the Curry School designated education technology as a requirement in its teacher education program. The school developed specific programs, including the Technology Infusion Project (TIP), pairing preservice teachers with local classroom teachers; TeacherLink, a regional telecommunications network; CaseNET, a series of case-based courses on the World Wide Web; and Public Education Network (PEN), one of the nation's first statewide K-12 Internet systems, in addition, the Curry Educational Technology Center provided support and resources to local school district.⁸

College of Education and Human Services, Western Illinois University The College of Education and Human Services, Western Illinois

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- 5 D. P. Ely, (1995). *The Field of Educational Technology : A dozen frequently asked questions*. Eric Clearinghouse on Information and Technology Syracuse NY. (ED 387117)
- 6 Association for Educational Communications and Technology, *Instructional Technology : The definition and domains of the field* (Washington, DC: Author).
- 7 P. E. Saettler, *The Evolution of American Educational Technology* (Englewood, CO : Libraries Unlimited, 1990).
- 8 Curry School of Education, *The Curry School Technology Strand*. Unpublished manuscript, (Charlottesville, Virginia : University of Virginia, 1997).



University, had remarkable success in achieving external and state funding. To develop interactive multimedia laboratories and numerous electronic classrooms, the school established an instructional video lab, and with faculty involvement, made use of compressed video links to school districts. The college also set up a distance-learning program with a middle school located 90 miles from campus. In order to develop the technology competencies for its teacher education program, the school redesigned the curriculum in 12 different courses and employed instructional designers to assist faculty in course development.⁹

College of Education, Michigan State University

The technology integration program at Michigan State University includes a technology exploration center, authentic assessment of technology competencies for teacher education students, and an educational technology certificate program. Michigan State provides local school districts with assistance in the development of learning laboratories and technology curriculum by providing graduate students and teacher candidates who are knowledgeable in this field.¹⁰

Rationale for Self-Efficacy Research

Self-efficacy theory was originally developed and used in psychotherapy to guide behavior changes in clinical problem research such as phobias (e.g., Bandura, 1977; Bandura, Adams, Hardy, & Howells 1980).¹¹ Recently, research has been conducted on Bandura's self-efficacy theory in different settings, populations, and problems. These studies included adherence to medical regimens (e.g., O'Leary, 1985),¹² smoking cessation maintenance (e.g., Colletti, Supnik, & Pyne, 1985),¹³ weight loss (e.g., Edell, & Associates, 1987),¹⁴ teaching performance (e.g., Gibson, & Dembo, 1984),¹⁵ academic performance (e.g., Schunk, 1987),¹⁶ job-related skills (e.g., Lee, &

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- 9 B. Smith, B. Barker, & M. Dickson, (1996). Tools for Teaching with Technology. The WIU approach to integrating technology into teacher education. Macomb, IL : Western Illinois University. (ERIC Document Reproduction Service No. ED 404307)
- 10 Michigan State University, *Learning and Teaching with Technology* (East Lansing, MI : Author, 1997).
- 11 A. Bandura, *Social Learning Theory* (Englewood Cliffs, NJ : Prentice-Hall, 1997); and A. Bandura, N. E. Adams, & G. N. Howells, "Tests of the generality of self-efficacy theory," *Cognitive Theory and Research*, 4(198) : 39-66.
- 12 A. O'Leary, "Self-efficacy and health," *Behavioral Research Therapy*, 23(1985) : 437-451.
- 13 G. Colletti, J. A. Supnik, & T. J. Payne, "The smoking self-efficacy questionnaire (SSEQ) : Preliminary scale development and validation," *Behavioral Assessment*, 7(1985) : 249-260.
- 15 S. Gibson, & M. H. Dembo, "Teacher efficacy : A construct validation," *Journal of Educational Psychology*, 76 : 4(1984) : 564-582.
- 16 D. H. Schunk, "Domain-specific measurement of students' self-regulated learning process," 30 pages. Paper presented at the Annual Meeting of the American Psychological Association, Washington, DC., 1987.

Gillen, 1989),¹⁷ and career decision-making (e.g., Taylor, & Poma, 1990).¹⁸

Bandura's theory of self-efficacy advocated a belief in one's capability of performing a specific task. Self-efficacy is a key concept in Bandura's social cognitive theory.¹⁹ Bandura proposed the theory of social cognitive, which indicates that behavior, is best understood in terms of "triadic reciprocity". Reciprocal determinism refers to the notion that cognition (perceived ability to perform the task), environment (the setting), and behavior (the task being performed) are bi-directional.²⁰

Figure 1 illustrated the model of reciprocal determinism, which is summarized schematically, cognitive and other personal factors, environmental influences, and behavior all operate interactively as determinants of each other in triadic reciprocal causation.

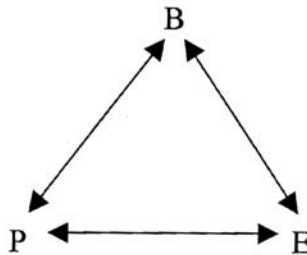


Figure 1 Schematization of the relations between the three classes of determinants in triadic

(Bandura, 1986, p.22).

Bandura (1989) reported that:

In social cognitive theory, people are neither driven by inner forces nor automatically shaped and controlled by the environment.....they function as a contributors to their own motivation, behavior, and development within a network of reciprocally interacting influences. Persons are characterized within this theoretical perspective in terms of a number of basic capabilities. (p. 6)

Bandura (1986) believed that people are able to generate innovative courses of action by drawing on their knowledge and symbolizing powers. Before plunging into action, people often examine possible solutions and give up or

17 C. Lee, D. Gillen, & D. J. Gillen, "Relationship of type a behavior pattern, self-efficacy perceptions and sales performance," *Journal of Counseling Psychology*, 34 : 3(1984) : 293-298.

18 R. M. Taylor, & J. Poma, "An examination of the relationship among career decision-making self-efficacy, career science, locus of control and vocational indecision," *Journal of Vocational Behavior*, 1(1990) : 33.

19 A. Bandura, *Social Foundations of Thought and Action: A social cognitive theory* (Englewood Cliffs, NJ : Prentice Hall, Inc, 1986).

20 *Ibid.*

stay back on the basis of estimated outcomes.²¹ Bandura (1997) explained that self-efficacy beliefs determine the goals individuals set for themselves, how much effort they expend, how long they persevere, and how resilient they are in the face of failure and setbacks.²² In relation to Bandura's theory, it is important to identify the attitudes of preservice teachers in Taiwan toward computers, their knowledge and confidence level in using educational technologies.

Bandura's (1986) theory of self-efficacy may provide the theoretical framework that will suggest whether preservice teachers in Taiwan will have the confidence and beliefs necessary to change their teaching styles from the traditional methods of instruction to one that incorporates computer assisted instruction. Based on Bandura's theory, Compeau and Higgins found that individuals with high self-efficacy levels used computers more, enjoyed using them, and experienced less computer-related anxiety.²³ It is crucial to identify the attitudes of Taiwan elementary preservice teachers toward computer technology by their self-efficacy scale. Taiwan educators are able to determine whether preservice teachers will be successful in learning how to utilize computer technology in their classrooms and to reduce the failure of teachers by changing the curriculum and teaching techniques of computer technology.

Conclusion

Computer technology has been widely applied and researched in many countries. As technological innovations keep on changing and expanding, educational administrators must support teachers in their efforts to meet the educational demands of the 21st century. Computer self-efficacy was defined as a judgment of one's ability to use a computer.²⁴ Computers impact on many facets of daily lives, but for many people, the ability to utilize computers is limited by an incapability of controlling or even using them. As for self-efficacy expectations, it may be the beliefs of an individual that results in the inability to use computers.

The knowledge of preservice teachers and their attitudes toward computers are assumed to be important for implementing computer-based technology in Taiwan's elementary teacher training programs. According to a report by the Ministry of Education, Taiwan,²⁵ the main function of teacher training

21 *Op. Cit.*

22 A. Bandura, *Self-efficacy: The exercise of control* (New York : W. H. Freeman and Company, 1997).

23 D. R. Compeau, & C. A. Higgins. "Computer self-efficacy : Development of a measure and initial test," *MIS Quarterly*, (1995).

24 *Op. Cit.*

25 Ministry of Education, Taiwan, Republic of China, "Overview of Taiwan's present educational system," [Online]. URL <http://www.edu.tw/english/>



colleges is to train teachers for elementary schools. During the year 2000, 27,925 preservice teachers were enrolled in nine elementary teacher training colleges in Taiwan. These preservice teachers will play an important role in the future development of elementary education and will also play a vital role in the growth of technology education in Taiwan.

The application of self-efficacy in Taiwan teacher education toward computer technology can provide a better understanding about the attitudes of preservice teachers toward computer technology and offer insights for future strategies in curriculum and program design in Taiwan's elementary teacher training programs. Self-efficacy can provide information that will assist Taiwan elementary teacher training colleges to develop effective training practices and programs that will lead to the successful implementation of educational technology through computer applications in the classroom.



