The study of teachers' task values and self-efficacy on their commitment and effectiveness for technology-instruction integration

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Abstract: The city of Taipei has been considered as a leading role of information technology education in Taiwan. However, many questions have been waited to be answered. The purpose of this study was to investigate the current situations and problems of primary school teachers' technology-instruction integration. By implementing the approach of cognitive motivators and the human performance technology (HPT) theory, this study also investigated the relationships among teachers' cognitive motivators (self-efficacy and task values) and their commitment and effort on technology-instruction integration. The researchers delivered 2,952 questionnaires via Internet, e-mail and airmail in January 2008. Finally, 1,549 questionnaires replied back and turned out to be ok. The findings were described as below. The situation of "high-tech schools, low-access technology" also happened in Taipei primary schools. The time teachers devote to use technology into instruction is about 1-3 hour(s) per week and the level of technology implementation to use was low. Besides, teachers' self-efficacy and task values have impact on their commitment and effort on technology-instruction integration. Teachers' age and the length of teaching presented opposite correlations with their commitment and effort on technology-instruction integration. Teachers have huge difficulty on comprehending and designing computer-animation related multimedia materials to help students clear their abstract learning concept to concrete. In the future, they hope to take more workshops related with multimedia design principles, how to integrate technology with learning areas, and other multimedia related theories.

Key words: technology-instruction integration; cognitive motivators; human performance technology (HPT); self-efficacy of technology-instruction integration; task value

1. Introduction

1.1 Background

The goal of integrating technology into classroom is hope to solve problems in learning and teaching, moreover, to increase the effectiveness of teaching and learning process and achievement. Technology makes an open learning environment, thus, learning is no longer confined within the four walls of a classroom. With the support of technology, instruction can be presented by vivid multimedia content and the Internet can also easily access worldwide information for students (Hagel, Zulian, Drennan, Mahoney & Trigg, 1996; Morrison & Lowther, 2001; Clark & Maye, 2003). According to Roblyer (2003; 2006), the method of technology-instruction

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integration is to achieve effective teaching goals and improve the process of teaching, instead of being considered as using computer only. Thus, students are able to integrate reading and writing activity by technology at their own pace. The long-term goal of integrating technology into instruction is to cultivate students as lifelong pursuits.

Previous research found that many factors had impact on teachers' technology-instruction integration such as teachers' previous background and motivation, teachers' adequate knowledge and skills, necessary resources, and adequate training programs, etc. (Schiefele, 1991; Eaton, 1994; Pintrich & Schunk, 1996; Bandura, 1997; Sandholtz, et al., 1997; Lumpe & Delafield, 1998; Wigfield & Eccles, 1998; Pierson, 1999; LIN, 1999; Fuller, 2000; Christensen, 2002; Whitehead, 2002; Margerum-leys & Marx, 2002; Gifford, 2004; LIN, 2006a, 2006b).

Since 1998, technology-instruction integration has been drawn highly attention in Taiwan. Government has invested a lot of money on buying technology equipments for primary schools and delivered thousands of training programs for teachers. Among them, the city of Taipei has been considered as a leading role of information technology education in Taiwan. However, many questions have been waited to be answered. For example, can technology integration be a support role for teaching, or just a teaching burden for teachers? After investing a lot of money to schools, do teachers exert their effort consistently for integrating technology into classroom? Do teachers really know how to design and develop technology related materials and can integrate them effectively into classroom? What factors have impact on teachers in technology-instruction integration? The researchers were invited by Taipei's Ministry of Education to find the answers for above questions. In order to have concert and profound view in this study, the researchers who adopted human performance technology (HPT) approach and cognitive motivators theory to hold this study tried to investigate the current situations of technology-instruction integration for Taipei teachers and their correlation factors.

1.2 Research questions

The researchers seek to answer the following questions:

(1) What are the current situations or problems for Taipei primary school teachers on integrating technology into instruction?

(2) What are important factors to have impact on teachers for implementing technology into classroom? Are they from environment, motivation variables or knowledge related?

(3) Do teachers' cognitive motivators (self-efficacy, task value and interest) have effects on their commitment and achievement with integrating technology into instruction?

1.3 The significance of the study

The present study used the HPT approach and Gilbert's BE Model to identify the problems and answers. In addition, cognitive motivators would be first to be explored on the relationships of the effective technology integration in Taipei primary schools. The researchers hoped to shed light on the researches in the fields of educational technology and make suggestions for Taipei Ministry of Education.

2. Relative literature review

2.1 Technology-instruction integration

Teachers' use of technology in the classroom has been encouraged and become one of educational policies among countries. Since 1999, America held a plan of "Preparing Tomorrow's Teachers to Use Technology (PT3)" with 4 billion budget that included teachers' professional development, curriculum redesigned and e-learning

teachers' training programs. However, on the first page of website of US Department of Education, they wrote a statement as "… although most of primary schools have connected to Internet, teachers still feel uncomfortable to use of technology" (US Department of Education, 2005). Researchers found that the more confident and comfortable teachers perceived, the more frequencies teachers use technology in the classroom (Christensen, 2002; Sandholtz, Ringstaff & Dwyer, 1997; Whitehead, 2002). Moreover, many researchers found that the situations of high-tech schools with low-teaching were very common (Cuban, 1999); or teachers did high access to technology with low use of technologies (Cuban, Kirkpatrick & Peck, 2001; Becker, 2001). Thus, LIN (2006a; 2006b) proposed three necessary abilities for teachers' effectively using technology into instruction: (1) the ability of operating multimedia software and computer hardware; (2) the ability of instructional design; and (3) the ability of implementing technology into learning fields.

In 2001, the goal of all classrooms in primary schools connected to Internet has achieved in Taipei. Then, increasing teachers' abilities to use effectively of technology into learning fields and cultivating students as independent learners with technology would be considered as the next milestones (Taipei Ministry of Education, 2002). Based upon the previous result of related studies, in this present study, the researchers used HPT approach to investigate factors that affect environment (information, resources and incentives) and individuals (knowledge, capacity and motives).

2.2 Human performance technology (HPT)

Human performance technology (HPT) is a relatively new field with about 30 years of history that has emerged from systems theory, behaviorism, communication/information theory, management science and cognitive science (Addison, 1997; Stolovitch & Keeps, 1992; Patricia, 1998; Pershing, 2006). HPT has attracted much attention over the past few years. HPT provides a means for the analysis and solution of human performance problems. Based on the literature of both fields, this section of this chapter examines the link between HPT and these two constructs of cognitive motivation, task values and self-efficacy. A performance gap can be caused by many reasons. Having a concrete model in mind will be easier to analyze the cause. Gilbert's behavior engineering model (see Table 1) provides as a checklist to follow during cause analysis (Gilbert, 1996; Binder, 1998; Chevalier, 2006). With this six-cell model, the deficiencies are obviously identified. In this model, there are two major categories: environment and people. It means that all behavioral components of performance have two aspects of equal importance: a supporting environment and a person's repertory of behavior.

Table 1 Gilbert's behavior engineering model (BE model) (Gilbert, 1996; Chevalier, 2006)

Environment	Information	Resources	Incentives
	(1) Descriptions of what is expected of performance (2) Relevant and frequent feedback about the adequacy of performance	(1) Tools, resources, time and materials designed to match human factors (2) Access to leaders (3) Organized work processes	(1) Financial incentives made contingent upon performance (2) Non-monetary incentives (3) Career development opportunities
Individual	Knowledge	Capacity	Motives
	(1) Systematically designed training that matches requirements of exemplary performance (2) Opportunity for training	(1) Match between people and position (2) Flexible schedule process to match peak capacity of workers	(1) Recognition of worker's willingness incentives (2) Assessment of peoples' motivation (3) Recruitment of workers to match realities of situation

Therefore, the researchers investigated the factors that affect teachers' use of technology based on the

Gilbert's model. The judgments of environmental problems with questions such as "Do schools lack data, information, or feedback provided to teachers?", "Do schools lack resources or tools?", or "Do schools lack consequences, incentives, or rewards for teachers?". On the other hand, teachers' individual repertory with questions such as "Do teachers lack motives and expectations?", "Do teachers lack skills and knowledge to implement technology into classroom?", or "Do teachers lack capacity of technology-instruction integration?".

2.3 Cognitive motivators and CANE model

Clark (1998a; 1998b; 1999) proposed a motivation model named CANE (commitment and necessary effort) model, which defines motivation as having two processes: commitment and necessary effort (see Figure 1). Commitment refers to actively pursuing a goal over time in the face of distractions. Effort is concerned with the amount and quality of non-automatic elaborations people invest in achieving the knowledge component of performance goals. Commitment and effort are two indicators of people's motivation. According to Pintrich and Schunk, motivation refers to "the process whereby goal-directed activity is instigated and sustained" (1996, p. 21). In the CANE model, there are three independent variables affecting commitment: personal agency, mood and task values. Personal agency includes self-efficacy and contextual factors. Ford (1992) suggested that personal agency involves two concerns: whether we have the required knowledge to achieve the goal (relating to self-efficacy); and whether there are barriers to our performance in the work setting (relating to contextual factors). Thus, capability beliefs have an impact on skills; contextual beliefs have an impact on responding to the environment. If we believe our ability and contextual factors will facilitate achievement of the work goal, our commitment to the goal will increase. Thus, commitment can be supported by increasing self-efficacy and changing perceptions for the barriers (Clark, 1998a; 1999). In addition, self-efficacy is also the key independent variable effecting effort.

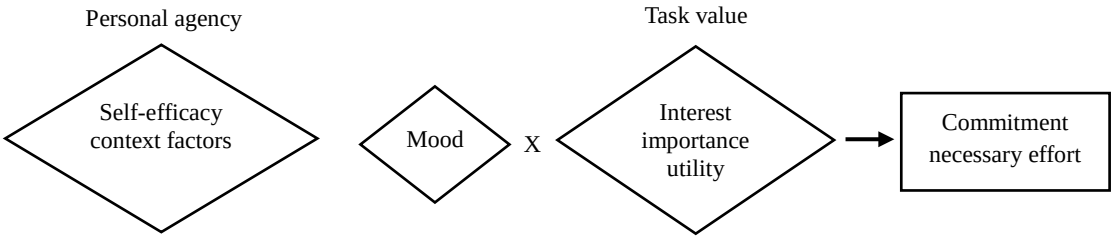

Figure 1 CANE model of factors influencing goal commitment (Clark, 1998a; 1998b; 1999)

Task values have three components: interest, utility and importance. Wigfield and Eccles (1992; 1998) suggested that people become involved in tasks that they positively value, but avoid tasks that they negatively value. Alternatively, people tend to value the task when they have better performance and devalue the task when they are not so good (Wigfield & Eccles, 1992, 1998; WANG, 1997). Thus, researchers found that an individual's perceived task value may influence the strength or intensity of the behavior (Pintrich & Schrauben, 1992). Clark (1998a) claimed that values do not directly impact on performance; rather, value influences our commitment at a task but not our effort. For example, researchers suggested that performance on a task such as course grades is most highly related to self-efficacy, whereas task choices such as course enrollment decisions are more highly related to the perceived task value (Wigfield & Eccles, 1995; 1998).

In this present study, based on CANE model, the researchers investigate whether teachers' cognitive motivators such as self-efficacy and task values (interest, utility and importance) have impact on teachers' commitment and effort on using technology into classroom.

3. Methodology

3.1 The research design

In this study, three approaches will be taken to discover the finding (see Table 2):

Table 2 The design of methodology for this study

The design of methodology:
(1) Delivering questionnaire with e-mail, airmail and internet for all primary schools teachers. The purpose of this stage is to understand the current situations and problems of technology integration and to investigate the relationships within teachers' cognitive motivators, commitment and achievement for teachers and students.
(2) Taking in-depth interviews; Subjects will be randomly selected from the previous questionnaire and based on their willingness.
(3) Collecting all data and analyzing it. Then reviewing related research studies to write final report that includes the current situations and problems of technology integration for Taipei primary schools and make suggestions for solving these problems.

3.2 The subjects

The method of random sampling was used for the subjects. Total 2,952 teachers randomly selected among elementary schools and secondary schools from 248 primary schools in Taipei.

3.3 Measurement

The questionnaire of teachers' technology-instruction integration was designed based on these theories: HPT theory, Clarks' CANE model (1998a; 1998b) and research about technology and self-efficacy (Murphy, Coover & Owen, 1989), the research of Internet self-efficacy scale (Joo, Bong & Choi, 2000), and the research of teachers' beliefs and technology (BATT) (Lumpe & Chambers, 2001), and the questionnaire of teachers' efficacy and use of computer (MUTEBI) (Enochs, Riggs & Ellis, 1993), and teachers' beliefs and the use of technology (Whitehead, 2002), and research studies about motivation and WBI, Internet self-efficacy and e-news (LIN, 1999, 2003; Lim, Kazlauskas & Tyan, 1999), and teachers' self-efficacy in the use of technology for Taiwan technology seeds schools (LIN, 2006a; 2006b). Besides, teachers' self-efficacy of technology-instruction integration includes of: (1) self-efficacy on teachers' operation of computer; (2) self-efficacy on teachers' multimedia instructional design; and (3) self-efficacy on teachers' implementing technology into learning fields (LIN, 2006). Based on these previous research studies, the researcher revised and designed "the questionnaire of teachers' technology-instruction integration".

4. Result

The researchers delivered 2,952 questionnaires via internet, e-mail and airmail in January 2008. After one month waiting, there were 1,549 questionnaires replied back and turned out to be ok. The findings were described as below.

4.1 The basic information of the subjects

The subjects includes of 1,195 female teachers and 316 male teachers. Teaching classes per week of 16-20 classes are 1008 teachers (see Table 3).

4.2 The current situations of teachers' technology-instruction integration in Taipei primary schools

There were 436 teachers (28.1%) spending 1-3 hour(s) per week for developing multimedia material and 552 teachers (35.6%) spending 1-3 hour(s) per week to integrate technology into instruction (see Table 4). This finding also agreed with previous research of that "high-tech schools, low-access technology" (Cuban, 1999; Cuban, Kerkpatrick & Peck, 2001; Becker, 2001; LIN, 2006a, 2006b).

Table 3 The background information of the subject

Item	Categories	Number	%
Gender	Female	1,195	77.1
	Male	316	20.9
Age	25-30	232	15.0
	30-35	307	19.8
	35-40	339	21.9
	40-45	281	18.1
	45-50	219	14.1
The year of being teachers	<5year	271	17.5
	6-10 year	402	26.0
	11-15 year	313	20.2
	16-20 year	238	15.4
	>20 year	301	19.4
Teaching classes per week	6-10 classes	47	3.0
	11-15 classes	148	9.6
	16-20 classes	1,008	65.1
	21-25 classes	270	17.4
Teaching subject/learning fields	Language	1,195	77.1
	Health and sports	579	37.4
	Society	388	25.0
	Arts	175	11.3
	Mathematics	324	20.9
	English	37	2.4
	Natural and life technology	54	3.5
	Synthesis activities	70	4.5

Table 4 Time for use of technology and developing materials

Item	Categories	Numbers	%
Time for developing multimedia materials	<30minuts	136	28.1
	<1 hour	418	27.0
	1-3hours	487	31.4
	3-5 hours	119	7.7
	5-7 hours	38	2.5
	7-10 hours	15	1.0
	>10 hours	25	1.6
The average Time for using technology into classroom per week	<30 minutes	369	23.8
	<1 hour	373	24.1
	1-3 hours	552	35.6
	3-6 hours	164	10.6
	6-9 hours	38	2.5
	9-12 hours	13	0.8
	>12 hours	24	1.5

Besides, teachers taking word processing training programs were the highest choice by 1,292 teachers (83.4%) (see Table 5). However, there were 1,248 teachers (80.6%) expressed the most wanted training program was how implementing technology into learning fields (see Table 6). Besides, teachers agreed that the most important factor influencing them to use of technology into instruction was teachers' ability of operating computer. The interest was the third important factor (see Table 7). These findings agreed with previous researches of teachers' professional knowledge, motives and capacity played significant roles in technology-instruction integration (Fuller, 2000; Gifford, 2004; Christensen, 2002; Sandholtz, et al., 1997; Whitehead, 2002; Margerum-leys & Marx, 2002; Pierson, 1999).

Table 5 Teachers' taking training programs

Items	Number	%
Word/word processing	1,292	83.4
PowerPoint	1,155	74.6
Excel	878	56.7
Dream weaver/FrontPage …	813	52.5
CD/DVD operation	197	12.7
Flash	137	8.8
Photo impact	132	8.5
Technology-instruction integration training	102	6.6
The Internet	65	4.2
The data base	56	3.6

Table 6 The most wanted training programs for the futures

Items	Number	%
How to implementing technology into learning fields	1,248	80.6
The strategies and instructional design of technology-instruction integration	1,022	66.0
Computer soft wares	67	4.3

Table 7 Teachers perceived the factors successfully influencing technology-instruction integration

Items	Number	%
Ability of operating computers	1,325	85.5
Time management	791	51.1
Someone can help and support	688	44.4
Interest	621	40.1
Team to work together	467	30.1
Consistency with individual teaching	419	27.0
Providing database	326	21.0
Schools leadership's encouragement	318	20.5
Reusable materials	290	18.7
Adequate equipment	135	8.7
Best for personal career development	95	6.1

4.3 Levels of implementing technology into instruction

According to Moersh's the levels of implementation (1995), teachers used much frequently as Word for preparing students' learning practices forms or constructing tests, exploring IE for teaching references, calculating students grades by Excel. Thus, teachers used technology mostly during the process were before (preparing) and

after (evaluation) the teaching (see Table 8). The most difficult part was to use flash to make animation for helping students' clear abstract concepts. 700 teachers (45.2%) never used flash, 417 teachers (26.9%) did not know how to use flash because they considered flash was one of the most difficult software to learn. Thus, the findings also agreed with previous study that of "high-tech and low use" (Cuban, 1999; Cuban, Kerkpatrick & Peck, 2001; Becker, 2001; LIN, 2006a, 2006b). After the in-depth interview, teachers shared that they really had difficulty to understand about how animation could clear abstract concepts and they found what they learned from software related training workshop seldom to far-transfer successfully to their real work job setting.

Table 8 The levels of implementation

Questions	M	SD	I don't know how to use	Never happen to me	Seldom happen to me	Sometime happen to me	Exactly 100% like me
Use Word for students' tests and activities	3.47	0.84	5	65	130	342	990
			0.3%	4.2%	8.4%	22.1%	63.9%
Explore IE for teaching references	3.29	0.63	5	72	183	490	783
			0.3%	4.6%	11.8%	31.6%	50.5%
Use Excel for calculating students' scores	2.88	1.22	68	195	248	361	660
			4.4%	12.6%	16.0%	23.3%	42.6%
Use PowerPoint for making materials in the classroom	2.07	1.20	157	364	443	348	218
			10.1%	23.5%	28.6%	22.5%	14.1%
Use flash to make animation for helping students' clear abstract concept	0.95	1.31	700	387	316	100	28
			45.2%	25.0%	20.4%	6.5%	1.8%
Make WBI to present instruction and for class management	1.72	1.28	332	371	379	288	162
			21.4%	24.0%	24.5%	18.6%	10.5%
Use CAI programs into classroom	1.62	1.25	348	390	414	269	111
			22.5%	25.2%	26.7%	17.4%	7.2%
Apply teaching strategies in the use of technology	2.02	1.10	131	380	478	413	130
			8.5%	24.5%	30.9%	26.7%	8.4%
Implement technology into suitable learning fields and teaching content	2.20	1.11	109	318	447	478	182
			7.0%	20.5%	28.9%	30.9%	11.7%
Develop multimedia materials by suitable ISD principles	1.71	1.39	225	408	498	259	114
			14.5%	26.3%	32.1%	16.7%	7.4%

4.4 Teachers' self-efficacy of technology-instruction integration, task values, environmental factors

The higher self-efficacy of technology-instruction integration teachers perceived, the more opportunities they devoted effort and time to it (see Table 9). The higher task values they perceived, the higher commitment they hold. Teachers' age and the length of teaching presented opposite correlations with their commitment and effort on technology-instruction integration. The above findings agreed with previous studies that teachers' self-efficacy and task values have impact on technology-instruction integration (Albion, 2001, 1999; Marcinkiewicz, 1994; Dawson, 1998). Moreover, a supporting environment encouraged teachers to integrate technology into instruction such as adequate technology equipments, CAI management systems, supporting teams to share experiences and solve problems, attracting incentives, and school leaders with technology vision had impact on that. The above

findings also support previous research studies that environmental factors and motivation had impact on teachers' use of technology in classroom (Sandholtz, et al., 1997; Lumpe & Delafield, 1998; Wigfield & Eccles, 1998; Pierson, 1999; Fuller, 2000; Christensen, 2002; Whitehead, 2002; Margerum-leys & Marx, 2002; Gifford, 2004; LIN, 1999, 2006a, 2006b).

Table 9 Teachers' self-efficacy of technology-instruction integration, task value, environmental factors and real use of technology into classroom

	Teachers' self-efficacy of technology-instruction integration	Real use of technology in classroom	environmental factors	task values
Age	-0.258**	-0.173**	0.051	-0.030
Degree	0.114**	0.102**	-0.009	0.014
The length of work	-0.204**	-0.115**	0.053*	-0.019
Teaching time	-0.015	0.008	-0.031	0.005
Training time	0.147**	0.177**	0.109**	0.132**
Time for developing multimedia materials per week	0.321**	0.354**	0.129**	0.258**
The time of implementing technology into classroom per week	0.315**	0.399**	0.230**	0.333**

Notes: **Correlation is significant at the 0.01 level; *Correlation is significant at the 0.05 level.

5. Conclusion and suggestion

5.1 Conclusion

By implementing the approach of cognitive motivators and the human performance technology (HPT) theory, this study investigated the current situations of teachers' technology-instruction integration and investigated the relationships among teachers' cognitive motivators (self-efficacy and task values) and their commitment and effort on technology-instruction integration for Taipei primary schools. The study showed that the higher self-efficacy of technology-instruction integration teachers perceived, the more opportunities they devoted effort and time to it.

The higher task values they perceived, the higher commitment they hold. A supporting environment encouraged teachers to integrate technology into instruction such as adequate technology equipments, CAI management systems, supporting teams to share experiences and solve problems and attracting incentives. However, they have difficulty in comprehending and designing computer-animation related multimedia materials to help students clarify their wrong learning concept and to transfer abstract concepts to concrete. They hope to take more workshops related to multimedia design principles, integrating technology to learning areas and other multimedia related theories.

5.2 Suggestion

Based on HPT approach, the study suggests that there were six inputs impacting on teachers' technology-instruction integration (see Table 10).

For future research, it is suggested that, as HPT model in mind, some effective interventions can be selected, designed and implemented. By giving real case models, it will help teachers easily integrate technology into their teaching subjects and help them to successfully transfer what they have learned from the training workshop into real work.

Table 10 Reflecting Gilber's BE model and the findings of this study, the researchers suggest that the factors may support teachers' successful technology-instruction integration

Environment	Information	Resources	Incentives
	(1) Providing clear concept of technology-instruction integration (2) Providing necessary and adequate training workshop	(1) Team building (2) Help system (3) Instructional materials database (4) Adequate computer hardware provided (5) Adequate computer software provided	(1) Necessary incentive policy (bonus, promotion, salary, etc.) (2) Reducing teaching load if using technology (3) School leadership (4) Good with school vision
Individual	Knowledge	Capacity	Motives
	(1) Ability of operating multimedia software and computer hardware (2) Ability of instructional design (3) Implementing technology into corresponding learning fields	(1) Necessary professional ability to be a teacher (2) Matching personal teaching style (3) Matching personal learning style	(1) Teachers' self-efficacy of technology-instruction integration (2) Task value (interest, importance, utility) (3) Matching with expectation

References:

Addison, R. M. (1997). What is HPT? Paper presented at *Annual Conference of the International Society for Performance Improvement*, Los Angeles, California.

Albion, P. R. (1999). Self-efficacy beliefs as an indicator of teachers' preparedness for teaching with technology. *Computers in the Social Studies, 7*(4).

Albion, P. R. (2001). Some factors in the development of self-efficacy beliefs for computer use among teacher education students. *Journal of Technology and Teacher Education, 9*(3), 321-347.

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

Becker, H. J. (2001). How are teachers using computers in instruction? Paper presented at the *2001 Annual Meeting of American Educational Research Association*, Seattle, WA.

Binder, C. (1998). The six boxes: A descendent of Gilbert's behavior engineering model. *Performance Improvement, 37*(6), 48-52.

Christensen, R. (2002). Effects of technology integration education on the attitudes of teachers and students. *Journal of Research on Technology in Education, 34*(4), 411-433.

Chevalier, R. (2006). Leadership in performance consulting. In: Pershing, J. (Ed.). *Handbook of human performance technology: Principles, practices, potential*. San Francisco, CA: Pfeiffer.

Clark, E. C. & Mayer, R. E. (2003). *E-learning and the science of instruction.* San Francisco, CA: John Wiley & Sons, Inc.

Clark, R. E. (1998a). The CANE model of motivation to learn and to work: A two-stage process of goal commitment and effort. In: Lowyck, J. (Ed.). *Trend in corporate training*. Leuven Belgium: University of Leuven Press, 1-25.

Clark, R. E. (1998b). Motivation performance: Part 1—Diagnosing and solving motivation problems. *Performance Improvement, 37*(8), 39-47.

Clark, R. E. (1999, July). Yin and Yang cognitive motivational processes operating in multimedia learning environment. Paper presented at the *Seminar of Cognition and Multimedia Design*, the Open University of Netherlands, Heerlen, Netherlands.

Cuban, L. (1999). High-tech schools, low-tech teaching. *The Education Digest, 64*(5), 53-54.

Cuban, L., Kerkpartrick, H. & Peck, C. (2001). High access and low use of technologies in high schools classrooms: Explaining an apparent paradox. *American Educational Research Journal, 38*, 813-834.

Dawson, K. (1998). Factors influencing elementary teachers' instructional computers use. In: Carter, L., Hall, S., Jurth, D., Mumma, P. & Sadera, W. (Eds.). *Research, technology and teacher education annual for the advancement of computing in education, Orlando, Florida*. Retrieved June 10, 2005, from http://www.coe.uh.edu/insite/elec_pub/ HTML1998/re_daws.htm.

Eccles, J. S. & Wigfield, A. (1995). In the mind of the actor: The structure of adolescents' achievement task values and expectancy-related beliefs. *Personality and Social Psychology Bulletin, 21*(3), 215-225.

Enochs, L. G., Riggs, I. M. & Ellis, J. D. (1993). The development and partial validation of microcomputer utilization in teaching efficacy beliefs instrument in a science setting. *School Science and Mathematics, 93*(5), 257-263.

Ford, M. E. (1992). *Motivating humans: Goals, emotions, and personal agency beliefs.* Newbury Park: Sage Publications.

Fuller, L. H. (2000). First teach their teachers: Technology support and computer use in academic subjects. *Journal of Research on Computing in Education, 32*(4), 511-524.

Gifford, B. L. (2004). *Teacher beliefs, learning styles, and technology implementation in rural, secondary classrooms in Massachusetts.* (Unpublished Doctoral dissertation, Johnson and Wales University)

Gilbert, T. F. (1996). *Human competence: Engineering worthy performance.* Amherst MA: HRD Press, Inc.

Hagel, P., Zulian, F., Drennan, J., Mahoney, D. & Trigg, M. (1996). *Value adding: Adapting a paper-based teaching case for the WWW environment.* Retrieved June 14, 2004, from http://www.ascilite.org.au/conf96/25.html.

Joo, Y., Bong, M. & Choi, H. (2000). Self-efficacy for self-regulated learning, academic self-efficacy, and Internet self-efficacy in web-based instruction. *Educational Technology Research and Development, 58*(2), 5-17.

LIN, C. M. (1999). Motivation and web-based instruction: A case study of using CANE model to assess motivation problems and find solutions. *Journal of Educational Media International (EMI), 36*(4), 287-294.

LIN, C. M. (2003). The study of e-news' interface design and users' internet self-efficacy. *Journal of Instructional Technology and Media, 65*, 4-16.

LIN, C. M. (2006a). Applying HPT approach and cognitive motivators to the study of effective technology-instruction integration for Taiwan technology seeds primary schools. *Journal of National Taipei University of Education, 19*(1), 117-148.

LIN, C. M. (2006b). *A research on integrating effective technology into instruction at technology seed primary schools in Taiwan*. Taipei: The Psychology Publisher.

LIN, C. M., Kazlauskas, E. & Tyan, N. (1999b). Web-based instruction: A study of the effects of self-efficacy and task values on students' commitment and achievement. Paper presented at *WEBNET 99 World Conference on the WWW and Internet*, Hawaii, USA.

Lumpe, A. J. & Delafield, D. P. (1998). Principal leadership for successful school technology implementation. *SITE 98: Society for Information Technology & Teacher Education International Conference Proceedings*. Norfolk, VA: Association for Advancement of Computing in Education, 296-300.

Lumpe, A. T. & Chambers, E. (2001). Assessing teachers' context beliefs about technology utilization. *Journal of Research on Computing in Education, 33*(5), 511-524.

Margerum-leys, J. & Marx, R. (2002). Teacher knowledge of educational technology: A case study of student/mentor teacher pairs. *Journal of Educational Computing Research, 26*(4), 427-462.

Marcinkiewicz, J. R. (1994). Computers and teachers: Factors influencing computers use in the classroom. *Journal of Research on Computing in Education, 27*(2), 220-237.

Moersch, C. (1995). Levels of technology implementation: A framework for measuring classroom technology use. *Learning and Leading with Technology, 23*, 40-42.

Morrison, G. & Lowther, D. (2001). *Integrating computer technology into the classroom (2nd ed.)*. New York: Prentice Hall.

Murphy, C. A., Coover, D. & Owen, S. V. (1989). Development and validation of the computer self-efficacy scale. *Educational Psychological Measurement, 49*, 893-899.

Patricia, S. (1998). How to use performance technology strategies to keep your company out of court. Paper presented at *Annual Conference of the International Society for Performance Improvement*, Chicago: Illinois.

Pershing, J. (2006). *Handbook of human performance technology: Principles, practices, potential*. San Francisco, CA: Pfeiffer.

Pierson, M. E. (1999). Technology integration practice as function of pedagogical expertise. *Harvard Educational Review, 57*(1), 1-22.

Pintrich, R. P. & Schunk, D. H. (1996). *Motivation in education*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc.

Pintrich, R. P. & Schrauben, B. (1992). Student's motivational beliefs and their cognitive engagement in classroom tasks. In: Schunk, D. & Meece, J. (Eds.). *Student's perceptions in the classroom: Causes and consequences*. Hillsdale, NJ: Erlbaum, 149-183.

Roblyer, M. D. (2003). *Integrating educational technology into teaching (3rd ed.)*. Prentice Hall.

Roblyer, M. D. (2006). *Integrating educational technology into teaching (4th ed.)*. Prentice Hall.

Sandholtz, J. H., Ringstaff, C. & Dwyer, D. C. (1997). *Teaching with technology: Creating student centered classrooms.* New York, NY: Teachers College Press.

Schiefele, U. (1991). Interest, learning, and motivation. *Educational Psychology, 26*(3&4), 299-323.

Stolovitch, H. & Keeps, E. (1992). What is human performance technology? In: Stolovitch, H. & Keeps, E. (Eds.). *Handbook of human performance technology: A comprehensive guide for analyzing and solving performance problems in organizations.* San Francisco: Jossey-Bass Publishers.

Taipei Ministry of Education. (2002). *The handbook of current situation of information technology education and the future in Taipei.* Taipei: Taipei Ministry of Education.

US Department of Education. (2005). *Preparing tomorrow's teachers to use technology program (PT3).* Retrieved August 26, 2005, from http://www.ed.gov/programs/teachertech/index.html.

WANG, S. (1997). *The roles of perceived beliefs in effort, self-efficacy, and task value on high school students' effort and math achievement in Taiwan.* (Unpublished Doctoral dissertation, University of Southern California)

Whitehead, A. R. (2002). *Self-efficacy and context beliefs of teachers regarding technology: Relationship of those beliefs to technology use in the classroom.* (Unpublished Doctoral dissertation, Marywood University)

Wigfield, A. & Eccles, J. S. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review, 12*, 265-310.

Wigfield, A. & Eccles, J. S. (1998). The development of children's motivation in school contexts. In: Perarson, P. & Iran-nejad, A. (Eds.). *Review of research in education.* NW Washington: American Educational Research Association.

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