DETERMINING RELIABILITY AND VALIDITY OF A FACULTY SURVEY TO IDENTIFY CURRENT TEACHING STRATEGIES AND APPLICATION OF INTERNET TECHNOLOGIES IN A TAIWANESE UNIVERSITY

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By
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The undersigned, appointed by the dean of the Graduate School, have examined the dissertation entitled

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ABSTRACT

The purpose of this study was to determine the validity and reliability of web-based teaching strategies for use as an instrument to conduct a survey to determine the level of instructional practices by a Taiwanese university faculty and the degree to which Taiwanese university faculty perceive their performance regarding internet technology usage as measured by the faculty response. The seven independent variables included gender, served college, degree source, years of experience teaching web-based courses, years in higher education, attendance at the web-based training courses, and college encouragement to attend web-based training courses. This study consisted of four dependent variables of internet technologies usage and twenty-eight dependent variables of teaching strategies.

The population included in this project consisted of all full-time faculty members employed at four colleges of a selected Taiwanese university. The entire population (N=320) was survey yielding a sample of 104 subjects for a 32.5% return rate and a confidence level of 95%.

The findings demonstrated that the teaching strategies questionnaire was a reliable and valid instrument. Additionally, the results of analyses showed that gender, degree source, and years of experience teaching web-based courses significantly affected teaching strategies. Moreover, analyses were used to determine that the following

variables significantly affected use of internet technologies: served college, years of experience teaching web-based courses and attendance at the web-based training courses.

New knowledge was learned through interpreting the findings and provided several conclusions. First, this instrument confirmed the processes of internalization and externalization, and acculturation and reacculturation (Bruffee, 1999), from faculty members perspectives, and the dynamic of tacit knowledge to explicit knowledge, regarding explicit knowledge to tacit knowledge of knowledge creation (Nonaka and Takeuchi, 1995). Second, faculty members with western degrees were more likely to converse with students concerning the idea of individual differences than were faculty members with eastern degrees (Nonaka and Takeuchi). Third, men faculty members were more likely to request students to self-regulate their learning strategies than were women faculty members. Fourth, faculty members with more years of web-based teaching experience were more likely to provide student the chance to apply theory and practice in their learning goals than were faculty members with fewer years of web-based teaching experience. This study illustrated an "explicit knowledge and tacit knowledge" dynamic of the knowledge creation cycle for faculty members to support students constructing their own knowledge.

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INTRODUCTION

In higher education, web-based learning has become widely used to as a supplement to a traditional face-to-face classroom. Faculty members, when teaching in web-based environments, need to adopt diversified teaching strategies and utilize internet technologies to support their teaching activities. Teachers are keys to facilitate web-based learning and to determine the success of higher education systems (Beck & Schornack, 2004). It is critical for teachers to integrate internet technologies to support teaching and to foster learning (Jonassen, Peck, & Wilson, 1999). Moreover, it is important for teachers to integrate internet technologies into web-based learning activities to foster learners acquisition of new knowledge (O'Donnell, 2006). Reeves (1997) provided a model of effective web-based learning and pointed out that teaching strategies should emphasize the idea of learner-centered learning experiences and teaching with technology to support learners construction of their own knowledge. It is time for teachers to integrate current practices and to import the idea of teaching with internet technologies.

Although web-based learning has been conducted for several years, teachers tend to use learning systems as a place for file storage so learners can retrieve material anywhere and anytime. It is cost effective for teachers to post documents on the web and to allow students to learn, but this is not the goal of education (Beck & Schornack, 2004). This educational method would be effective only if knowledge possessed by teachers can be transferred directly from the teacher to student by the availability and access to the information the teacher possesses. Under this assumption, using lecture-style direct instruction employed web-based learning, the knowledge is transmitted via an alternative

media and dispatches the need for classrooms and schedules. The learning process for students is still passive and only focuses on memorizing and regurgitating facts (Merisotis & Phipps, 1999; Paolucci & Jones, 1999; Reeves, 1997).Teachers evaluate learner's performance based on knowledge they have gained through the various web-based lectures and some interactive content and then measure how much they have learned using tests. However, the effectiveness of web-based learning using direct instruction by technology still needs further investigation (Reeves).

There is a need for learners with the ability to communicate with other learners and teachers through web-based learning activities. In web-based learning, the learning activities should focus on encouraging learners to share their understanding through interacting with learning contents and discussing their findings. Effective learning asks learners to use their abilities to reflect on learning objectives and to communicate with other learners regarding their perspectives. "The educational process requires feedback from the professor, from the student, and from the wider community" (Beck & Schornack, 2004, p. 120). Meristois and Phipps (1999) argued that the curriculum in web-based learning needs to address learners having an opportunity to obtain "critical thinking skills" (p. 15). Furthermore, Beck and Schornack supported the idea that teachers need to identify their own roles and responsibilities and those of learners and computers in the learning processes to promote the success of web-based learning.

It is necessary to clarify the roles and relationships among teachers, technology and learners in the learning process of web-based learning. The role of technology is to promote and support learning activities but not to drive learners achievement (Jonassen, et al., 1999). However, Gumport and Chun (1999) collected abundant evidence to support

their beliefs that using technology can benefit teaching and learning, thus, learners can obtain knowledge efficiently. Their beliefs are based on assumptions that knowledge is a product that can be delivered from teachers to learners. The more technology provides an efficient learning method, the more learners become knowledgeable. Therefore, learners tend to accept those materials that technology delivered without reflection on what they have learned. It is a considerable approach by "learning from technology" (Jonassen, et al., 1999, p. 2) without thinking about the needs of learners. Clark (1983) argued that technologies are tools "that deliver instruction(s) but do not influence [learners] achievement" (p. 445).

Learners learn best based through their experience, their view of reality, and their shared understanding with others (Jonassen, et al., 1999). It is critical for teachers to employ their idea about providing students learner-centered experiences as an opportunity to construct new knowledge in web-based learning settings (Reeves, 1997). Additionally, teachers have to adapt to the role as facilitators instead of didactic lecturers (Bauersfeld, 1990). "Peer experiences are intrinsically motivating or at least more motivating than passive listening to teacher talk" (Lisi, 2006, p. 17). Thus, role of teachers is shifted from instructing the material "far from" learners to facilitating learning activity which is "close to" learner's experience. Furthermore, teachers need to encourage learners to communicate and reflect those findings with others to discover their own knowledge. Throughout the learning activities, learners improved their ability to solve problems and to negotiate meaning with other learners perspectives (Nonaka & Takeuchi, 1995).

It is essential for teachers to provide learners with skills of argumentation and reasoning and to facilitate discussion through collaboration in web-based learning settings (O'Donnell, 2006). Internet technology provides a function, like threaded discussion forums, for learners to communicate and store their conversations for future reference (Andriessen, 2006; Richards, 2001). Furthermore, threaded discussion allows more time for students to reflect their understanding thoughtfully, beyond the limitations of traditional face-to face classroom discussion, in which feedback is immediate. However, it is still a challenge for learners using threaded discussion function to discuss what they are learning deeply and reflectively (O'Donnell).

No studies or research instruments have been identified that would help teachers determine the needs and assess the performance of web-based learning and integration of internet technologies. Reeves (1997) provided a theoretical framework of web-based learning to help teachers prepare their teaching strategies and implied that further research should focus on the development of instruments to investigate the effectiveness of web-based learning.

No instrument exists to investigate faculty implementation of their teaching strategies and practice with internet technologies in web-based learning activities. Understanding faculty perspective on students learning achievement in web-based learning and faculty practices with internet technologies benefited them as they monitor their own performance and improve their teaching strategies. There is a lack of a reliable and valid instrument to investigate the effectiveness of teaching strategies and their practice with internet technologies in web-based learning environments.

Conceptual Underpinnings for the Study

Teaching with technology has been required to effectively implement web-based learning into higher education systems (Jonassen, et al., 1999; O'Donnell, 2006). Web-based learning "guided by stronger learning theory and richer instructional models" helps teachers to facilitate learners' attainment of new knowledge (Reeves, 1997, p. 7). This study focuses on the constructivist learning theory that "knowledge is constructed, not transmitted" (Jonassen, et al., 1999, p. 3). Moreover, Bruner (1990) emphasized that effective learning involves learners actively discovering new knowledge from their current knowledge and reflecting on those understandings. O'Donnell (2006) believed that learners gain expertise by having the opportunity to discover their own knowledge. Furthermore, faculty understanding of implementing teaching strategies integrated with internet technologies helped them facilitate the success of web-based learning.

In web-based learning settings, teachers help students identify that the role of technology facilitated learners' discovery of their own knowledge. In the assumption of constructivists' perspectives, learners construct new knowledge from their previous understandings and interest. "Learners have a variety of different characteristics" and they learn based on their beliefs, background and perspectives on reality (Merisotis & Phipps, 1999, p. 15). Additionally, learners can not learn solely from the delivery of material by technology and by teachers. It is important for teachers to change their beliefs from "teaching from technology" to "teaching with technology" (Jonassen, et al., 1999). The role of technology is to support learning activities and to help learners to construct knowledge (O'Donnell, 2006). It is critical for teachers to understand that the effective web-based learning should be supported by a theoretical framework (Merisotis & Phipps,

1999) and by the ideal of teaching with technology (Jonassen, et al., 1999; O'Donnell). However, from the assumption of instructivists' perspectives, technology plays a role as a teacher and delivers knowledge to learners in an efficient way. Knowledge can be transmitted from teachers' lectures to learners' minds, meaning, learners' ability to become knowledgeable relies on how much information they can memorize. From the instructivists' perspective, knowledge is a product that can be delivered to learners' minds, thus, how much learners can learn depends on how productively they accumulate their knowledge.

Effective Teaching Strategies in Web-based Learning

Reeves (1997) provided a model of web-based learning which includes three parts—inputs, processes, and outcomes—and implied that further research was needed to establish an instrument to investigate students achievement. This study focused on the "process" component—the part of the model in which an actual learning activity happens. In Reeves' model of web-based learning, the process—includes learners with the opportunity to construct learning, task ownership, a sense of audience, collaborative support, teacher support and metacognitive support—has been investigated in the following study. This dimension of a web-based learning model provided a theoretical support for teachers to conduct effective teaching strategies in web-based environments.

Opportunity to Construct Learning

Instructivists believed learning is in sequencing order and the objective is not based on the learners' individual experience. However, constructivists argued that it is impractical for teachers to make all the current decisions and dump the information to students without involving students in the decision process (Cronjé, 2006).Constructivists

believe students have the ability to construct their own knowledge. Dewey (2004) argued that learners are motivated by the topic which relates to their understandings and interest. When learning objectives are close to the learner experience and interest, learners were motivated and had confidence in learning.

Teachers provided the opportunity for free inquiry, in which learners' research topics related to the teaching objectives and to the learners' interest (Yorks, 2005). The role of teacher is changed from instructing the material "far from learners" to addressing the needs of learners' experience. Teachers arrange learning activities and encourage students to reflect on what they discover. Teachers learn from learning activities with students and become learners. Bruner (1990) stated that instructors' engaging in a conversation with students is a way to help them build upon existing knowledge structures.

In problem-based learning activities, learners solve a problem related to their own experience instead of memorizing the content teachers provided (Chang, 2001). The focus of the learning activity is shifted from teachers transmitting knowledge to students actively obtaining knowledge from teachers and other students. Problem-based learning is a learner-centered approach emphasizing the discovery of the relationship of learning objectives and their impact on context (Chang).

Task Ownership

Task ownership focuses on the idea that learning should reflect the reality in learners' experiences. Jonassen (1999) stated that "the key to meaningful learning is ownership of a problem or learning goal" (p. 196). Learners define the issue related to their experiences and discover a way to solve an unknown problem. Jonassen argued that

learners tend to be motivated to obtain knowledge while they are authorized to define the problems that they analyzed.

Learning should connect existing knowledge to a relevant context for obtaining new knowledge. Additionally, learning activities embedded with theory and practice benefit learners, transforming experience into their own knowledge (Reeves, 1997). Learners are acculturated by previous experience while framing their knowledge base and influencing their perspective in reality (Brown, Collins, & Duguid, 1989). Traditional teaching focuses on teachers providing fixed definitions, well-defined problems and solutions and plans for students to learn. Moreover, traditional teaching tends to transmit isolated material for learners to commit to memory. However, the traditional learning process is not connected to students' experience in their environment.

Teachers provide a theory and encourage learners to relate new information from their environment to discover new knowledge. It is necessary to understand what the outside world is thinking and to develop new ways to meet the demands and opportunities that the outside world offers (Bielaczyc & Collins, 2006). The process of participating in learning activities, and the resulting gains in knowledge, can be applied to similar situations. The knowledge gained helped learners understand how outside factors.

Teachers evaluate the quality of reasoning about the problem that learners provided and the ways learners justify their approaches to solve a problem. A rubric provides a way for learners and teachers to monitor the learning progress. Jonassen (1999) stated that a rubric is a criterion for teachers to evaluate learning performance. The rubric provides a guideline for learners to achieve learning goals as well as to support learners focusing on major topics.

Sense of Audience

A “sense of audience” means that learners share their knowledge in ways that make sense to other learners, teachers and "larger communities" (Bruffee, 1999, p. 47). It is important that students have the ability to transform what they have learned into a common language for the public to understand. A “public” is a larger community, with existing knowledge, which informs and is informed by students’ acquired knowledge.

Bruffee (1999) stated that learners sharing their knowledge and receiving feedback interested and motivated them in their learning activity. Additionally, learners reflect on feedback and feel a sense of belonging. Sharing knowledge refers to conversation among learners. Bruffee stated that conversation helps benefit learners to internalize and to externalize their perspectives. This change motivates them to be "ready to write and interested in what [she/he] had to say" (Bruffee, p.11). When learners participate in discussion, they begin to share knowledge with the outside world.

However, Reeves (1997) suggested that students’ process of sharing knowledge with the public needs to be guided by teachers. Teachers provide a structured forum to guide learners sharing their knowledge in public. Teachers helping students present their argumentation provide a forum for learners to "speak the same language" (Bruffee, 1999, p.118) and to construct a meaningful conversation. Bolman and Deal (2003) stated that “a frame is a set of ideas... [that] helps you understand and negotiate a particular [topic]" (p. 12). Framing an issue of concern benefited learners reasoning about their argument. Bolman and Deal implied that problem solvers focus on issues of concern in a framing structure and communicate it using the same language to help solve problems. While sharing knowledge among learners, argumentation provides a way to “focus on the same

issues and negotiate about the meaning of each other's information" (Andriessen, 2006, p. 199). Learning to frame concepts through the process of argumentation and sharing knowledge provides learners with a way to redefine their knowledge to obtain new knowledge.

Teachers provide forums for learners to express their thoughts in a systematic way and to improve effective conversation. Also, in writing tasks, teachers evaluate and judge the quality of knowledge learners produced. This process helps learners become responsible for their arguments "so that others in the community can understand what they have written" (Bruffee, 1999, p. 50). Knowledgeable communities have the authority to encompass the effectiveness of knowledge published by individuals and groups (Bruffee).

Collaborative Support

Bruffee (1999) stated that "collaborative learning ... [is] a nonfoundational understanding of knowledge" (p. xiv). Collaborative learning refers to group members learning to communicate and to construct a group knowledge in working toward sharing a goal (Hron & Friedrich, 2003). The goal of collaborative learning focuses on sharing knowledge among group members and reaching an agreement for obtaining new knowledge (Nonaka & Takeuchi, 1995) .

Bruffee (1999) argued that "knowledge is a social construction, a consensus among the members of a community of knowledgeable peers" (p. xiv). Learners communicate and justify their beliefs among individuals, group members, teachers and contexts. Richards (2001) stated that the "internet is invaluable in the dissemination of information and materials as well as communication" (p. 374). However, in instructivists'

perspectives, teachers authorize the domain of knowledge and transmit material for students to learn. Students passively accept content without reflection and judgment. Teachers and students are limited to interact about the content teachers provided. In constructivists' perspectives, knowledge is a social and a constructing process through collaborative learning among knowledgeable members to reach an agreement.

Bruffee (1999) argued that knowledge is learned through conversation to reach an agreement among knowledgeable peers. The role of teachers is to guide and to facilitate the learning activity. It is important for teachers to discover a way to change students' beliefs and learning culture. Teachers are required to change the learning culture of students from passively receiving knowledge to actively discovering their own knowledge.

Teachers are required to set up groups and individual roles in web-based learning environments. It is important to organize group members and help them understand their experience. Clarifying the goal of the team is a critical beginning for collaborative learning success (Salmon, 2004). In task assignment, teachers provided a criterion for group success and introduced technological tools to help groups discover and share knowledge. It is important for students to have the ability to share knowledge using technological tools in web-based learning (Jones & Rice, 2000). Bruffee (1999) supported the idea that group success is based on the ways students discover the issue, share understandings and solve the problems.

Authority in knowledge is based on agreements among group members (Bruffee, 1999). While authority of knowledge is transferred from teachers to group members, teachers pay attention to negotiate the meanings of the agreement and disagreement from

different perspectives. Teachers require learners to provide reasoning and evidence as support for their stance. If there is a disagreement among students with different perspectives, teachers and group members require positive thinking and believe that a disagreement provides an opportunity for a further research. Bruffee supported the idea that different perspectives of group members are derived from their culture, background and knowledge base, thus, differences in these areas can lead to different beliefs. Bielaczyc and Collins (2006) suggested a "crosstalk" among different groups to reference their experience. Furthermore, Bruffee stated that a disagreement of beliefs in a group may be an agreement in other groups. A contradiction of beliefs in team provides an opportunity to create new knowledge (Nonaka & Takeuchi, 1995).

Teacher Support

It is vital for teachers to identify roles and responsibilities of learners, technology and themselves in web-based learning (Reeves, 1997). The role of teachers shifts from conveying knowledge for learners to facilitating learners' construction of knowledge.

Teachers are responsible for collaboration with learners to guide and to facilitate the process of knowledge construction. Additionally, teachers support learning structure and processes for learners to learn through problem-solving experience (Hmelo-Silver, 2006). In supporting learning activities, teachers help learners to share and negotiate ideas with other learners.

Learners are responsible for learning to construct their own knowledge (Jonassen, et al., 1999; Reeves, 1997). Learners are required to judge the reliability of information before transforming it to knowledge.

Furthermore, teachers must clarify the role of internet technologies as a tool to transmit information to learners and to foster the learning activity. Internet technology is responsible for supporting learners as they efficiently obtain information. Also, internet technology provides a function to calculate data and analyze it accurately and quickly.

Metacognitive Support

Metacognitive learning refers to learners' ability to understand existing knowledge, to identify assigned tasks, to adapt correct action, and to monitor progress toward achieving the goal (Flavell, 1979). Reeves (1997) stated that learners with metacognitive skills enable themselves to understand the learning goal, to arrange strategic plans, to evaluate and monitor learning progress, and to adjust learning strategies. Furthermore, Paris and Winograd (1999) suggested that learners' self-regulation skills help them plan their tasks and to select strategies to achieve the learning goals. Moreover, metacognition refers to learners' ability to understand their own thinking and to control their learning activity and to understand how to look for help (White, 1999). Finally, metacognitive learning supported the idea that learners need to experience the context, to construct their own knowledge, and to discuss their learning progress with teachers (Paris & Winograd).

While discussing topics with teachers, learners understood individual strengths and weaknesses and enhanced their ability to choose a useful plan to accomplish tasks. Furthermore, a learner learns effectively by using their knowledge of individual strengths when evaluating different strategies (Pintrich, 2002). A learner with metacognitive ability can evaluate her or his learning process and learn how to learn (Reeves, 1997).

The role of teachers is shifted to providing a strategic plan and to motivating learners to learn independently, rather than merely delivering lectures (Paris & Winograd, 1999). Teachers need to introduce teaching strategies such as inductive and deductive logical thinking and to encourage students to evaluate different styles of logical writing (Pintrich, 2002).

Statement of the Problem

Web-based learning has become a crucial issue in higher education systems worldwide (Hara, 2004; O'Donnell, 2006). If a goal of education systems is to provide students with the ability to solve problems and develop argumentation skills that technology can support, teachers are required to understand the strengths, weaknesses, and limitations of technology (Feldman, Coulter, & Konold, 2000) and apply this to web-based learning (Aggarwal & Bento, 2000; O'Donnell, 2006). Konold and Benzi (2000) have found that teachers using technology in web-based learning were able to lead efforts to effectively communicate, monitor, and analyze students' level of understanding as well as improve their teaching strategies. Furthermore, Kemery (2000) argued that training faculty with an understanding of technology to be facilitators in web-based collaborative learning helped students to discover new knowledge.

Current Situation

There are no studies reported in the literature identifying or analyzing how teachers of Taiwanese university perceived their teaching performance in web-based learning environments. There is a lack of knowledge about how teachers in a Taiwanese university use internet technologies in their teaching activities. Additionally, there is a

lack of a reliable and valid instrument to measure teaching strategies in relation to the use of internet technologies.

At the beginning of 2003, Taiwanese government's Ministry of Education encouraged all levels of education systems to establish diverse teaching strategies along with emerging technology to support students' learning achievement (Ministry of Education, 2007). Most of the Universities in Taiwan have employed web-based learning classes to provide students an alternative learning method. This study investigated faculty perspectives in a Taiwanese university about their current teaching practice and application of internet technologies. Also, this university has provided many training courses for teachers to help them become familiar with applying internet technologies in web-based learning classes.

Benefits

The results of this study provided information to faculty allowing them to examine how they and their peers are performing in the related areas of teaching strategies and internet technologies application. Knowledge learned from this investigation should inform colleges and universities about ways to discover and improve areas of current weaknesses when analyzing web-based learning practices and when preparing future faculty members to use web-based learning. The results could enable school authorities to better focus their resources to the areas of high needs. The results should benefit faculty members' understanding of web-based learning strategies and provide an alternative way to analyze how students obtain new knowledge. The survey could be used by other researchers to replicate this study in other universities or with a national population.

Problem Statement

The concept map illustrated in Figure 1 was used to identify the problem that this research project should address. The review of literature identified the need for internet technologies to be integrated into university curricula. The Web-based learning strategies have guided and influenced change in higher education. Educators and trainers have used web-based learning strategies to train faculty members to become effective teachers in web-based learning. Faculty members have used internet technologies in schools' daily activities.

There is a lack of knowledge about teaching strategies and internet technology usage by faculty in Taiwanese universities. Also, there is no valid instrument to measure teaching strategies and internet technologies usage by faculty in Taiwanese universities. This study started a process to define the usage of internet technologies by faculty members of Taiwanese universities and its relationships to teaching strategies in web-based courses. Additionally, there is a lack of knowledge about trends and differences among internet technologies usage and relationships to teaching strategies when faculty members are grouped by gender, served college, degree source, years of experience teaching web-based courses, and attendance at the web-based training courses.

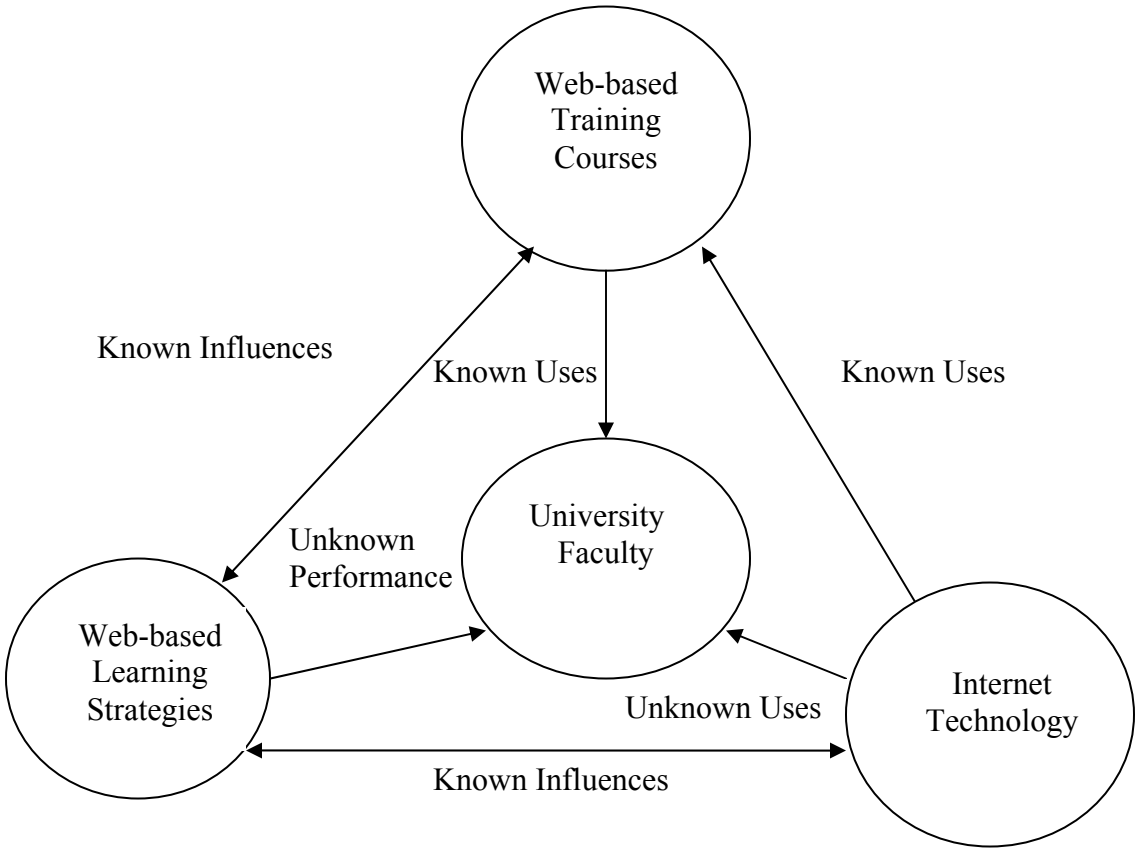

Figure 1. The concept map for identifying the problem.

Purpose of the Study

This study used a faculty survey about teaching strategies to investigate faculty members of a Taiwanese university to understand the impact of teaching strategies on students' performance. Additionally, this study used a survey of internet technologies usage by faculty to discover what teaching activities are used. The purpose of this study is to determine the validity and reliability of web-based teaching strategies and to use that as an instrument to conduct a survey to determine the level of current instructional practices by a Taiwanese university faculty and the degree to which Taiwanese university

faculty perceive their performance to internet technologies usage as measured by the faculty's response. This study examined the data returned from university faculty members' responses to a questionnaire regarding trends and differences among and between common factors and the independent variables of gender, served college, degree source, years of experience teaching web-based courses, and attendance at the web-based training courses.

Research Questions

Research questions were developed in order to guide the study. Each was represented in the following.

Research Question 1

Do the items contained in the survey of teaching strategies have face and content validity?

Research Question 2

Are the items contained in the survey of teaching strategies reliable?

Research Question 3

Can common factors be identified in the response of Taiwanese university faculty to the survey of teaching strategies and can those factors be used to reduce the number of survey questions while maintaining reliability?

Research Question 4

What are the summary statistics for internet technologies usage and performance to the teaching instructional strategies?

Research Question 5

What items best decide category membership?

Sub research question 5.1. Are there differences between internet technologies usage reported by Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses?

Sub research Question 5.2. Are there differences between teaching strategies reported by Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses?

Research Question 6

What cluster functions best discriminant by category membership?

Sub research question 6.1. Are there clusters of internet technologies usage items that discriminate when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses?

Sub research question 6.2. Are there clusters of teaching strategies items that discriminate when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses?

Null Hypotheses

There were six developed hypotheses to determine answers to the stated research questions. These hypotheses were described in the following:

H_o1. The items contained in the survey of teaching strategies for Taiwanese university faculty were not reliable.

H_o2. There are no common factors in the survey of teaching strategies for Taiwanese university faculty.

H_o3. There are no significant differences between internet technologies usage for Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses.

H_o4. There are no significant differences between teaching strategies for Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses.

H_o5. There are no clusters of internet technologies usage items that discriminate when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses.

H_o6. There are no clusters of teaching strategies items that discriminate when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses.

Limitations

This study focused on the experience of faculty in teaching web-based learning as well as their use of internet technologies in daily work in one of the Taiwanese universities. This study controlled some conditions to benefit a researcher conducting a quantitative approach. It was important to identify these limitations for guiding interpretations of this study:

1. This study focused on surveying faculty in one Taiwanese university and was a case study.
2. Since those samples were collected in a restricted population and in a limited period of time, the findings in this study were limited in their generalizability.

3. This study used a survey, based on a theory which was supported by Reeves' model of web based learning, which should limit participants' reporting behaviors when they have different perspectives.

Assumptions

Providing an assumption should clarify the meaning of language and prevent ambiguity in communication. To benefit effective communication, the following assumptions are provided:

1. It was assumed that the faculty understood the survey questions.
2. It was assumed that the faculty truthfully responded to the survey questions.
3. It was assumed that the questionnaires were a complete and accurate representation of teaching strategies and internet technologies competencies required of school faculty in teaching and learning.

Key Terms

This study used certain key terms to define the following research. The explanations should clarify the use of those terms.

Web-based learning. Web-based learning was defined as blended learning activities that merge the ideals of face-to-face learning and non face-to-face learning through internet use (Motteram, 2006).

Teaching strategies in web based learning. The constructivist model of teaching strategies theorized that the opportunity to obtain new knowledge was influenced by construct learning, task ownership, a sense of audience, collaborative support, and metacognitive support (Reeves, 1997).

Internet technologies. Technological tools which could be applied in web-based teaching environments included PowerPoint (Adams, 2006), video-based instruction (Zahn, et al., 2005), e-mail (Sheer & Fung, 2007; Waldeck, et al., 2001) and threaded discussion (Fox, 2001).

Summary

Chapter one presented an overview of the problem of internet technologies and teaching strategies integration into the higher education system. To merely apply internet technologies when teaching is to foster learning activities but not necessarily to drive actual learning. Teaching strategies should provide students with opportunities to learn by constructing their own knowledge. Students who learn to share their knowledge with other learners should enlarge their views of different standpoints. Group activities helped students learn to communicate and negotiate meanings of various perspectives and collaborate to solve problems. The role of teachers was to motivate students to participate in conversations and to discover their own knowledge.

Specifically, this study conducted a survey to establish a reliable and valid instrument of teaching strategies and internet technologies usage by Taiwan university faculty. It was hoped that this information can be used by colleges and universities to consistently improve in-service professional development activities for university faculty and integrate teaching strategies with application of internet technologies in web-based learning environments.

The remaining chapters provide further background information, present the data for the study, and outline the findings of the study. Chapter two provides a review of literature regarding teaching strategies and learning theories, internet technologies

characteristics necessary to identify teaching and learning, effective web-based learning, and conceptual underpinning for effective teaching strategies in web-based settings. Chapter three details the research design and methodology. Items included in this section are the research design, population, sampling techniques, data collection method, instrumentation, variables identification, and data analysis method. Chapter four demonstrates the findings regarding each research question. Face and content validity of the questionnaire are examined by experts to clarify the meaning of each question. Cronbach's alpha analyses are applied to identify the reliability of constructed items and factor analyses are performed to reduce large datasets into defined groups. MANOVA analyses are conducted to distinguish groups of faculty with regard to teaching strategies and internet technologies usage. Discriminant analyses are performed to identify clusters of teaching strategies and internet technologies usage best to discriminate between each demographic category. Chapter five explores the implications these findings hold for faculty members and universities. An introduction to the chapter is presented and an overview of the study is given, along with a review of the research design. Then, findings are discussed, conclusions are drawn and recommendations will be suggested. Finally a chapter summary is provided.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The following review of selected literature was focused on seven major areas of interest as they related to web-based teaching and learning in higher education systems. First, historical perspective on teaching and learning using internet technologies was presented. Background information of the Taiwanese education system and its influence on faculty beliefs about effective teaching strategies and their use of internet technologies were analyzed. Second, instructional strategies of learning theories were discussed. Specially, teacher-centered and learner-centered approaches were discussed pertaining to web-based learning activity. Third, attention was given to the idea of teaching with technology.

The study identified the role of internet technologies while teaching and discussed why internet technologies can support learning activities. Fourth, tools of technology used in web-based settings emphasized how faculties use internet technologies to support teaching and learning, including PowerPoint, video-based instruction, e-mail and threaded discussion. Fifth, web-based learning as a supplement to face-to-face teaching and its potential to promote students' learning was discussed. Sixth, current research in web-based learning discussed the needs for determining reliability and validity of faculty survey and identification of current web-based instructional practice and application of internet technologies in a Taiwanese university. Seventh, conceptual underpinnings for the study concentrated on discussing Reeves' model of effective web-based learning strategies for supporting conceptual underpinnings for the investigation.

Historical Perspective on Teaching and Learning Using Internet Technologies

In Taiwan's education system, university and college entrance examination scores decide the achievement of students who are allowed to study in higher education. To help students meet the examination criteria, teachers are responsible for clarifying and delivering learning topics to students (Shyu, 2000). Students are taught to memorize the facts efficiently and tend to be passive learners. Chang (2003) stated that "students in Taiwan are generally quiet and passive learners and not inclined to enjoy self-learning" (p.436), thus, teacher-centered instruction with intervention of technology in science class provides an efficient way for students to obtain high test scores. However, Chang and Mao (1999) found "instruction which incorporates both inquiry strategies and cooperative learning can lead to improve student achievement" (p.345). Furthermore, Tsai (2004) found that learners believe that "inquiry-based" instruction better established new knowledge than does "teacher-centered" instruction. Understanding faculty's perspectives on using different kinds of technology to promote learning and how they actually practice should benefit teachers who self-evaluate their performance as well as improve teaching performance.

Around 2003, the guideline of education reform of Taiwan illustrates that teachers should provide diverse teaching strategies integrated with technology to support students learning (Ministry of Education, 2007). To improve students' learning, much literature addressed students' use of technology merged with teacher-centered or student-centered approaches (Chang, 2001; Tsai, 2004; Chang, 2003; ChanLin, et al., 2006). Some researchers focused on studying how different teaching approaches embedded with technology have an effect on learners' achievement, while few studies examine how

faculty's implementation of teaching strategies related to applying internet technologies in practice (McKenzie, et al., 2000; Chen &Chen, 2006). Additionally, Lynch (2002) implied that instructors should understand instructional strategies and apply them to the use of internet technologies implementing web-based learning.

Few research studies focus on instructors' beliefs about which instructional strategies are effective when integrated with technology, or on how instructors actually apply computer technology in classroom activities (Demetriadis, et al., 2003; ChanLin, et al., 2006). Understanding the relationship between teachers' beliefs about effective instructional strategies with internet technologies and how they actually practice these beliefs when teaching should benefit instructors as they self-monitor and improve their performance. Instructional strategies can be based on learning theories of instructivists and constructivist pedagogies. Furthermore, Jougovich and Reeves (2006) argued that instructors need to understand "how to effectively incorporate the pedagogical application of the technology tools they are learning" (p. 60). To enhance effective teaching, instructors need to merge pedagogical strategies with internet technologies. Additionally, understanding teachers' beliefs of effective teaching strategies and how these beliefs align with internet technologies usage should promote effective teaching.

Instructional Strategies of Learning Theories

Learning theory can be classified as instructivist and constructivist approaches. Instructivism, a teacher-centered learning theory, emphasizes knowledge existing independent of the learner. The way for learners to obtain knowledge is through transferred knowledge from a knowledgeable teacher. Teachers are responsible for defining what learners should learn, controlling learning processes and distributing

knowledge to learners. This approach focuses on how teachers can distribute knowledge proficiently and what methods can dispense knowledge skillfully. Instructivism leads teachers to believe that knowledge can be transferred through lecture settings and those learners can learn through a passive learning experience. In instructivists' approach, communication tends to be in one direction, from the teacher or from content to students. The goal of the conversation was to find correct answers and these were supervised by the teacher. Both teachers and learners accept that knowledge is authorized by a person in authority, who knows the right or wrong answer, based on their knowledge of the subject. This tendency led to a consequence that students who were to become future teachers should replicate the way they have been taught (Diaz & Bontenbal, 2000) to teach their students.

Constructivism, a student-centered learning theory, focuses on the idea that learners obtain new knowledge through activities closer the learners' experience. Dewey (2004) stated that effective education occurs when "an individual shares or participates in some conjoint activity. By doing his share in the associated activity, the individual appropriates the purpose which actuates it, becomes familiar with its methods and subject matters" (p. 22). Furthermore, Dewey found learners who were interested in their topics applied more effort to their learning. Moreover, constructivists emphasize that individuals should connect current practice through dialogue with individuals and needs of the real world. Hansman (2001) supported the idea that real-world contexts, where there are social relationships and tools, are the best learning environments (pp. 45-46). These principles led to the idea that learners construct their own knowledge related to the real world with guidance from their instructors. Instead of passively receiving knowledge,

learners actively participate in learning processes to practice and to attain knowledge. From constructivists' perspectives, learners construct new knowledge through learning processes to connect prior knowledge from individuals with different perspectives. Furthermore, constructivists believe instruction requires considering learners' previous knowledge and encouraging dialogue among learners and instructors (Tsai, 2004). Additionally, constructivists assert that the role of the teacher is to foster students' participation in active learning rather than to merely guide students in passive learning through lecturing.

Teaching with Internet Technologies

There are absolute needs for instructors with adequate internet technologies skills to succeed in web-based learning (Levy, 2003; Osika, 2006). Internet technology is defined as software tools that can be used by instructors to communicate information through the internet. In daily teaching activities, instructors use internet technologies to support the practices way they believe most valuable for teaching and learning. Additionally, Motteram (2006) supported the idea that

> "we are involved in looking for ways in which we can have meaningful and deep interactions about subjects that interest the participants and ourselves, which make use of [internet] technologies in ways that do not impede the learning experience, but at the same time help to structure learning to make it more valid an experience and more accessible to a range of participants" (p. 19).

Instructors use internet technologies is to motivate students who join in the learning activity. Johnassen et al. (1995) argued that instructors usage of internet technologies is to foster learners who reshape the learning experience rather than merely demonstrating knowledge. Moreover, instructors beliefs about the approaches of their

instructional pedagogies influence the way they use internet technologies in teaching and learning (Fulton, 1999; Niederhauser & Stoddart, 2001).

Instructors beliefs about how students learn effectively influence how they use internet technologies to support teaching (Kim & Axelrod, 2005; Klemm, 2007; Magliaro, Lockee, & Burton, 2005; McKenna & Laycock, 2004; Niederhauser & Stoddart, 2001). Niederhauser and Stoddart further argued that instructors' beliefs in teaching and learning were consistent with the instructivist instructional approach. For example, instructors with beliefs tended to use didactic instructional methods while constructors with beliefs tended to use student-centered methods. Additionally, objectivist and constructivist approaches are complementary in situations when needed for a "series [of] interventions that are designed to reach a specified objective" (Cronjé, 2006, p. 393). Furthermore, Cronjé contended that instructors with ideals of integrating objectivist and constructivist concepts promote efficient and effective teaching and learning. Finally, McKenna and Laycock investigated three groups of students in multimedia courses with instructivist, constructivist, and hybrid designs and found a hybrid approach effective in "expressing their internal notions of what they thought it meant" (p. 169).

Niederhauser and Stoddart (2001) believed that "computer technology, in itself, does not embody a student-centered instructional paradigm" (p.16) or teacher-centered approach. Furthermore, Magliaro et al. (2005) focused on direct instruction strategies that merged with learner-centered approaches and suggested that direct instruction can be applied in asynchronous web-based learning. Furthermore, Magliaro et al. supported the idea that teaching with explicit strategies helped learners to understand concepts and to analyze them thoughtfully. Kim (2005) emphasized instructors' needs for direct

instruction when analyzing and determining "prerequisite knowledge explicitly while linking it to new material" (p.113). Additionally, it is important for instructors with teaching strategies to tutor students and master their prior knowledge explicitly before the instructors help learners to apply existing knowledge to construct new knowledge (Kim & Axelrod, 2005; Magliaro, et al., 2005; McKenna & Laycock, 2004).

To implement successful web-based learning, teachers need to "focus on how to create learning-centered environments supported by technology, not driven by it" (Petrides, 2002, p. 69). Instructors should focus on using internet technologies to facilitate learning activities in web-based environments rather than paying attention to merely designing attractive courses. Roper (2007) stated successful online learning requires that instructors encourage students to anticipate sharing knowledge through discussion.

However, Cook and Bacsich (2007) believed that successful online learning should focus on course design with innovation. Cook and Bacsich believed that instructors designing multimedia courses with fee access and delivering course content to learners conveniently is a successful example of online learning. This implies instructors should pay attention to how they design multimedia courses and, thus, teachers transmitted knowledge to learners efficiently. Moreover, instructors should combine effective teaching ideas with internet technologies and learning-centered instructional strategies to facilitate learners collaboration and shared understanding. Finally, Fisher, Bruhn, Gräsel and Mandl (2002) found that instructors who apply learner-centered instructional strategies with appropriate internet technologies promote learner understanding of course concepts, negotiation of meaning and construction of knowledge.

Technology Specific Tools of Technology Use in Web-based Learning Settings

Technology itself does not imply what kind of teaching strategies are most effective. It is teaching strategies that drives teachers use of technology to promote learning (Diaz & Bontenbal, 2000; Jougovich & Reeves, 2006). Additionally, faculty should have "the opportunity to set their own goals and objectives" by using various technology tools to benefit students' achievement (Kinuthia, 2005, p. 198). Moreover, when faculty use technology tools to teach, they need to emphasize learner-centered approaches to help learners construct their own knowledge (Kolbo & Turnage, 2002). The following sections introduced how teachers can apply technology in their teaching activities to enhance students' achievement. Four internet technologies that can be merged in a web-based learning environment were discussed, including one-way communication of PowerPoint, video-based instruction, two-way communication of e-mail, and threaded discussion.

Use of PowerPoint

PowerPoint is the most widespread tool for presenting course contents (Leffingwell, Thomas, & Elliott, 2007; ChanLin, et al., 2006) and for communicating and sharing knowledge (Adams, 2006). The advantage of PowerPoint software is that it provides an opportunity for instructors to "organize and present knowledge in a certain way" (Adams, p. 393). Furthermore, Kim (2005) supported the idea that "a clear and systematic presentation of knowledge" (p. 114) helps students learn. Using PowerPoint in learning activities provides an opportunity with "digital-rich media" (Leffingwell, et al., p. 58) that motivates students to learn about their learning topics. However, SussKind (2005) found that instructors use of PowerPoint while teaching did not directly impact students'

achievement. Kim pointed out that teachers use PowerPoint in structured instruction without paying attention to interactions with learners to promote higher-order thinking; rather, learners tend to merely memorize the contents of PowerPoint and become passive learners. Additionally, Klemm (2007) provided a key concept of effective use of PowerPoint in teaching and learning: that it should "clarify what needs to be learned, motivate students, point them to good reference material, illustrate and explain difficult concepts, and engage them in active thought and application of the information" (p. 122).

Huerta (2007) argued that for active learning, instructors should use presentation software to clarify learning objectives and to encourage learners to participate discussion. Adams (2006) found that meaningful learning occurs in process supported by "a thoughtful teacher to present a series of slides purposefully to invite dialogue" (2006, p. 403). This implies that teachers need to provide a break time during lecturing to encourage students to join in discussion to share their understanding and to ask questions. In PowerPoint instruction, feedback from questions helps learners to establish interaction with other individuals (ChanLin, et al., 2006). Teachers need to tolerate students' mistakes and provide an alternative way for students to learn. Finally, effective PowerPoint instruction clarifies learning objectives and provides learners with adequate time to reflect on their understanding of the material as well as to "engage them in active thought and application of the information" (Klemm, 2007, p. 122).

Use of Video-based Instruction

Video-based instruction refers to teaching using a presentation medium to deliver visualized knowledge to help learners to better understand concepts (Zahn, et al., 2005). It is a pre-recorded lecture, the contents of which are prepared by teachers and delivered

asynchronously to learners. Additionally, video-taped instruction allows students with adequate time to review lecture contents online (Goldberg, Haase, Shoukas, & Schramm, 2006). Choi and Johnson (2005) argued that video-based instruction provides standardized contents to present instruction. Furthermore, Choi and Johnson found that students who attend online courses with video-based instruction display more understanding and comprehension of course content than do students whose courses rely only on text-based instruction.

To implement effective video-based instruction, learners need to frequently communicate to receive personalized feedback from faculty and adjust learning strategies if necessary (Thurmond, 2003). Additionally, video-taped instruction provides more free time for faculty "to improve the quality of student-faculty contact time" (Goldberg, et al., 2006, p. 125). Furthermore, Goldberg et al. found that video-based instruction supported by followed-up discussion among students and faculty provided students with enhanced "retention of content" (p. 127) and application of knowledge in relevant fields. Moreover, the video medium provided an authentic environment which helped learners to discuss topics from different viewpoints and enabled them to collaboratively solve the problem (Johnassen, et al., 1995). In video-based instruction, students need the ability to identify problems from existing information and select various solution plans (Johnassen, et al.). To promote active learning in video-based instruction, teachers need to encourage students "to discuss in their group, experiment and formulate their own explanations" (Demetriadis, et al., 2003, p. 29). Additionally, video-based instruction supported by collaboration helped learners to focus their discussion on issues of concern and helped them understand the meaning of these issues (Hron, et al., 2007). Finally, instruction with

visualized effects helps students to understand concepts, to negotiate meaning, and to collaborate thus constructing new knowledge (Fischer, et al., 2002).

Use of E-mail

E-mail provides an effective method of communication for teachers and students to contact people who are off-campus (Duran, Kelly, & Keaten, 2005; Haworth, 1999; Sheer & Fung, 2007). E-mail provides teachers with an opportunity to contact students to share their understanding of course material and to discover their understanding about the learning experience (Sheer & Fung; Waldeck, et al., 2001). Moreover, Duran, Kelly and Keaten (2005) argued that e-mail provides an effective method for faculty to communicate with students to clarify course material and to assess students learning progress. Furthermore, e-mail communication provides shy students an alternative way of asking and clarifying questions about course contents through personalized contact with teachers (Duran, et al., 2005; Hassini, 2006). Additionally, faculty can ask students challenging questions through e-mail which helped them to rethink their viewpoints and clarify their understanding of the learning objectives (Doherty & Mayer, 2003; Hassini, 2006). This implies that e-mail provides teachers with an opportunity to enhance learners' sense of belonging to a learning community, to help them share their concepts with other individuals, and to negotiate understanding from different perspectives. Finally, when learners and teachers discuss the learning objectives through e-mail, learners are provided with the opportunity to apply concepts and put them into action (Kruger, et al., 2001).

Many researchers focus on the frequency of e-mail usage (Duran, et al., 2005; Haworth, 1999; Kruger, et al., 2001) or amount of messages sent (Hassini, 2006) between

faculty and students to determine the effectiveness of use of e-mail in learning activities. No research investigates what faculty believes about effective teaching strategies using e-mail relates to how they actually apply their knowledge in practice. Understanding the relationship between faculty beliefs and knowledge about their teaching strategies and their implementation practices should provide further information for teachers to self-evaluate their performance and to use internet technologies to foster students learning.

Threaded discussion

Threaded discussion (Mandernach, Gonzales, & Garrett, 2006) or online discussion (Kear, 2004; Wozniak & Silveira, 2007) is a communication tool for learners to share knowledge in an asynchronous way in an internet environment. Moreover, Fox (2001) argued that online discussion is a mixed dialogue of learning—a mix between face-to-face talking and online writing. The benefit of threaded discussion is that it provides an opportunity for individuals to reflect on their findings through written dialogue beyond the limitations of face-to-face learning (Petrides, 2002; Roper, 2007). Furthermore, Maurino (2007) found that threaded discussion provided more interaction and discussion than did the face-to-face classroom. However, without teachers engagement and guidance in threaded discussion, students tend to merely post messages that reduce the learners sense of belonging and causes a lack of reflective feedback (Gunawardena, Lowe, & Anderson, 1997; Maurino). Additionally, effective online learning is based on learners' participation in discussion to share their ideals in collaborative settings and to make them feel a "sense of community" (Rovai, 2002, p. 1).

It is critical that instructors provide opportunities for learners to construct knowledge and use deep thinking skills in online discussion situations (Christopher,

Thomas, & Tallent-Runnels, 2004). Additionally, teachers should support learners' ability to think deeply about the subject matter and to learn to "remember, understand, apply, analyze, evaluate, and create" (Christopher, et al., p. 167) their own knowledge and to construct their own thinking (Berge & Muelinburg, 2002). Online discussion calls for teachers to anchor guidelines and rationales for learning activities (Fox, 2001). From the perspectives of Christopher et al., learning to think critically involves three levels of thinking—including the lowest level of remembering or understanding, a medium level of application or analysis, and highest level of evaluation or creation. To leverage learners' thinking level and to help them construct their own knowledge, instructors should provide learners with critical thinking skills and implement critical thinking opportunities in threaded discussion to help learners apply, analyze, evaluate and create knowledge, in addition to merely remembering knowledge (Illowsky, 2007). Moreover, applying and analyzing knowledge involves using prior knowledge in a new way and breaking down knowledge into related parts (Anderson, 2001). Furthermore, evaluating knowledge involves judging the value of ideas in interrelated fields as described by Illowsky. Additionally, Anderson argued that creating knowledge is about synthesizing relevant ideas into a whole new meaning.

There is a need for instructors to promote active engagement in threaded discussion and to provide guidance for learners to share their understanding on related subjects and to negotiate meaning with different perspectives (Mandernach, et al., 2006; Maurino, 2007). To negotiate the meaning through discussion, learners are required to provide evidence and to make a judgment about their hypothesis (Bruffee, 1999). Instructors encourage students to provide meaningful reflection by asking questions and

sharing evidence; this is a way to help learners construct knowledge in a threaded discussion environment (Dennen & Wieland, 2007; Roper, 2007). Furthermore, Dennen and Wieland found that students with argumentative skills improve the quality of dialogue in online discussion. Meyer (2003) stated that threaded discussion benefits students because it provides the opportunity for more time than other forms of learning for students to rethink about their reasoning and to provide additional evidence for course topics.

Web-based Learning

Web-based learning has become an important learning tool in higher education and it continues to be around the world. The fast growth of online courses causes some educators to be concerned about the quality of the teaching experience and student learning experience in web-based settings. Web-based learning is defined as blended learning activities that merge the ideals of face-to-face learning and non face-to-face learning through the internet (Motteram, 2006). It is an alternative way of learning that allows learners to interact with other learners, teachers and content beyond the limitation of the need to be present at the same time and place (Rovai, 2002). Additionally, web-based learning serves as a supplementary way for teachers to provide opportunities to teach and for students to learn while off-campus (Wang, 2007). Web-based learning provides an alternative of learning beyond the limitation of physical appearance in a face-to-face classroom. The benefit of web-based learning is its flexibility in time and place for the needs of learners. A key difference between face-to-face learning and web-based learning is that online discussion provides learners increased opportunities to exchange

thoughtful feedback thoughtfully (Petrides, 2002) and increased flexibility in time to participate in discussion (Roper, 2007).

The quality of higher education should emphasize the learning outcome of conversation among learners and teachers (Bruffee, 1999). To achieve a quality of learning outcome, teachers and learners should understand that the role of technology is to support—but not to dominate—learning activities (Laurillard, 2002). This study focuses on how web-based learning should use constructivist approaches to provide learners with the opportunity to communicate their ideas using internet technologies and to establish their own knowledge through the guidance of instructors. Moreover, Garrison and Cleveland-Innes (2005) argued that effective online learning needs to provide learning activities with clear expectations and to encourage learners to participate in and respond thoughtfully to discussion.

Furthermore, in web-based learning settings, integrating technological tools such as threaded discussion, e-mail, PowerPoint and video-based instruction helped instructors to support their teaching strategies. With the integration of technological tools, students not only understand the course material but also have opportunities to share their understanding with other learners and to construct new knowledge. Although, several pieces of research literature argued that presentation tools, such as PowerPoint and video-based instruction, tend to have negative effects on learning and thinking, Hron et al.(2007) found video-based instruction with clarified content led to meaningful dialogue and had positive effects on individual and group knowledge gains. Moreover, Vallance and Towndrow (2007) argued that PowerPoint can be utilized to illustrate explicit content and to foster meaningful dialogue among learners and teachers with knowledge acquisition

Current Research in Web-based Learning

Many of researchers have investigated the effects of technological tools on students' learning by comparing the differences between teacher-centered or student-centered approaches in web-based learning settings (C. Y. Chang, 2001; Tsai, 2004; Chang, 2003; ChanLin, et al., 2006; Petrides, 2002). Their discoveries have contributed to the knowledge of the community and have influenced many researchers on related studies. Few studies examine the ways that faculty practice their teaching strategies and their application of internet technologies in web-based learning activities (Chen & Chen, 2006). There is a lack of knowledge about faculty's instructional practices and their application of internet technologies in higher education in Taiwan. It is critical to understand faculty's teaching strategies and their application of internet technologies to promote the success of web-based learning (Lynch, 2002).

Until now, there has been no empirical study determining the reliability and validity of a faculty survey about the identification of current web-based instructional practices and the application of internet technologies in a Taiwanese university. In the current research, the hypothesis of this study is that a focus on web-based learning using constructivist approaches is key to helping students learn to establish knowledge. Additionally, this study focuses on examining faculty teaching strategies and practices and their usage of internet technologies in web-based teaching settings. This study also investigates instructors' use of internet technologies—specifically, two technological tools for one-way communication: PowerPoint and video-based instruction, and two technological tools for two-way communication: e-mail and threaded discussion.

The success of web-based learning requires teachers to employ the ideas of constructivist approaches and the methods of teaching with technology (Petrides, 2002; Reeves, 1997; Woo & Reeves, 2007). Reeves pointed out that teachers need to adopt learner-centered approaches and help learners use the opportunity to establish their own knowledge. Additionally, Reeves' model of effective web-based learning provides a scaffold to help teachers plan their teaching strategies.

No studies or research instruments have been identified that would help teachers determine their own needs regarding their strategies and performance of web-based teaching with internet technologies. Understanding teachers' practices regarding teaching strategies for web-based learning and their methods for applying internet technologies helped them self-monitor their performance and improve their teaching strategies when applying internet technologies. There is a lack of a reliable and valid instrument to investigate the effectiveness of teaching strategies and their practice regarding internet technologies in web-based learning environments.

Conceptual Underpinnings for the Study

Teaching with technology has been required to effectively implement web-based learning into higher education systems (Jonassen, et al., 1999; O'Donnell, 2006). This study focuses on the constructivist learning theory that "knowledge is constructed, not transmitted" (Jonassen, et al., 1999, p. 3). Furthermore, Bruner (1990) emphasized that effective learning occurs when learners have the opportunity to actively discover new knowledge based on their current knowledge and reflect on those understandings. Web-based learning "guided by stronger learning theory and richer instructional models" helps teachers as they help learners obtain new knowledge (Reeves, 1997, p. 7).

It is critical for teachers and learners to identify the role of technology in web-based learning settings. From constructivists' perspective, the role of technology is to support learning activities and to provide learners with opportunities to establish their own knowledge (O'Donnell, 2006). "Learners have a variety of different characteristics" and the ways they learn are based on their beliefs, background and perspectives on reality (Merisotis & Phipps, 1999, p. 15). However, from the assumption of instructivists' perspectives, technology plays a role as a teacher and delivers knowledge to learners in an efficient way. Moreover, they assume that knowledge can be transmitted from teachers' lectures to learners' minds. Additionally, learners' ability to become knowledgeable relies on how much information they can digest. Moreover, knowledge is a product that can be delivered and accumulated in an efficient way.

Effective Teaching Strategies in Web-based Learning

Reeves (1997) provided a model of teaching strategies in web-based learning including three parts: inputs, processes, and outcomes, and suggested that further research is required to evaluate its effectiveness (see Figure 2). I have focused on the "process" component, which is an actual learning activity, as theoretical framework to support this study.

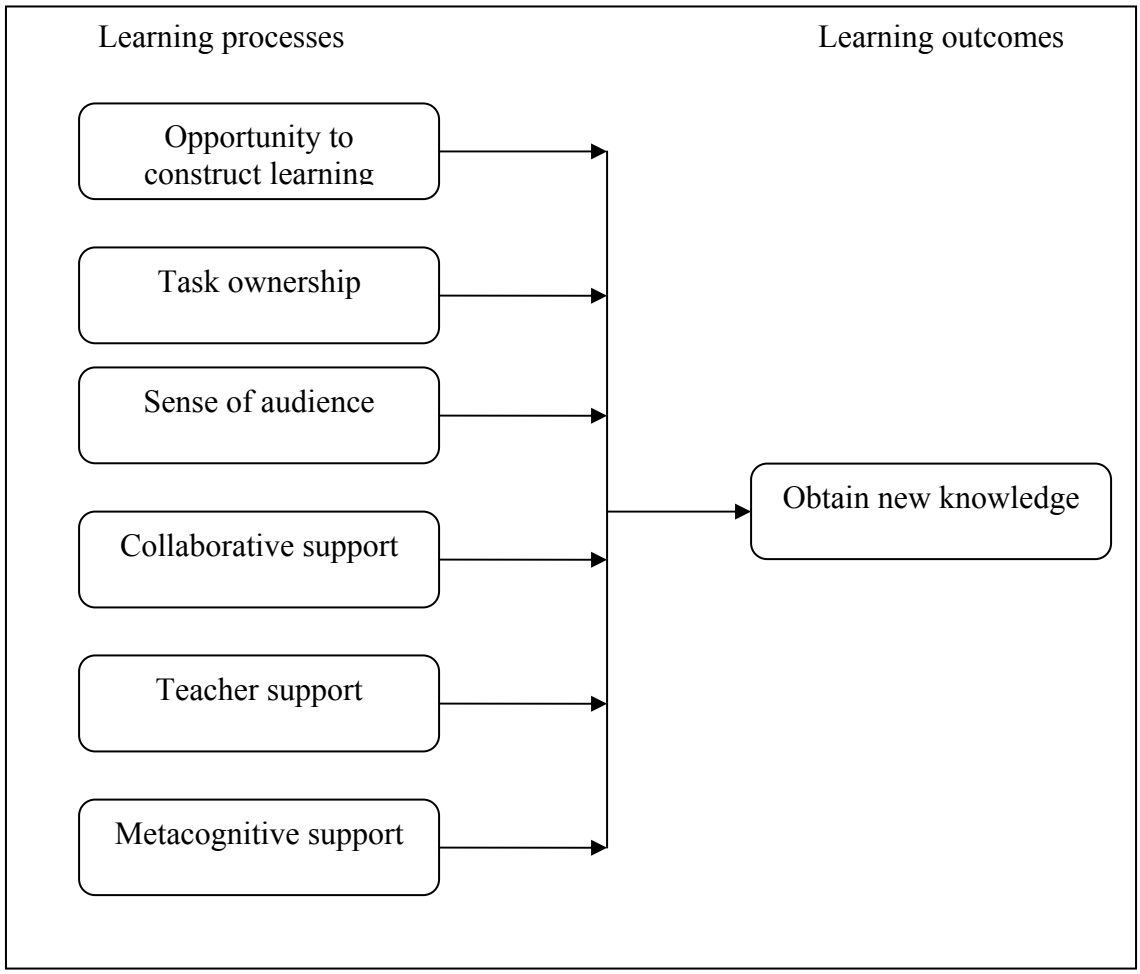

Figure 2. A description of learning processes as related to students' achievement and this study (inspired by Reeves, 1997).

The model of effective web-based learning including six processes; these include "opportunity to construct learning," "task ownership," "sense of audience," "collaborative support," "teacher support," and "metacognitive support" (Reeves, pp. 5-7). These six processes were investigated in following study. Teachers' instructional strategies are embedded with each of six processes, which are interrelated, and teachers with a deep understanding of effective teaching strategies can implement these strategies in web-based teaching settings to help learners to establish new knowledge. This

dimension of a web-based learning model should provide supporting theories for teachers to conduct effective teaching strategies in web-based environments.

Opportunity to Construct Learning

Constructivists argue that it is impractical for teachers to make all the current decisions and dump the information to students without involving students in the decision process (Johnassen, et al., 1995). Constructivists believe students have the ability to construct their new knowledge with support of teachers, who provide a "big picture" of the subject. Dewey (2004) stated that learners are motivated by the topics which are related to their understanding and interest. When learning objectives are close to learners experiences and interests, they were motivated and had confidence in learning. However, instructivists believe learning is in a sequential order and that the objective is not based on learners' individual experience.

Teachers provide learners with the opportunity to do further research on topics related to the teaching objectives and related to learners' interests (Yorks, 2005). The role of teacher is changed from instructing the material "far" from learners to addressing learners' needs based on the learners' experience. Teachers arrange learning activities and encourage students to reflect on what they have discovered. Also, teachers benefit through learning activities with students and become learners. Bruner (1990) supported the idea that when instructors engage in a conversation with students, they, as well as the students, build upon existing knowledge structures.

Problem-based learning activities involve solving a problem related to learners' experience instead of memorizing the content teachers provided (Chang, 2001). In a problem solving activity, the focus of learning is shifted from teachers delivering

knowledge to students participating in discussions with other students and with teachers to share understanding. Moreover, problem-based learning is a learner-centered approach emphasizing learners discovering the relationship of learning objectives and their impact on context (Chang).

Task Ownership

Task ownership focuses on the idea that learning should reflect the reality in learners' experiences. Constructivists emphasize that individuals should connect current practice with the needs of the real world. Dewey (2004) found that learners who were interested in their topics applied more effort to their learning. Jonassen (1999) said that "the key to meaningful learning is ownership of a problem or learning goal" (p. 196). For effective online learning, learners need opportunities to define the issue closer to their experiences and to practice and become familiar with the method to solve problems in reality (McLoughlin & Luca, 2002). Jonassen argued that learners tend to be motivated to obtain knowledge while they are authorized to define the problems with which they are concerned.

Learning should connect existing knowledge with a relevant context for obtaining new knowledge. Learners are acculturated by previous experience which frames their knowledge base and influences their perspective in reality (Brown, et al., 1989). Additionally, learning activities embedded with theory and practice benefit learners, transforming experience into their own knowledge (Reeves, 1997) and learners have opportunities to create new knowledge (Nonaka, 1994).

Teachers need to introduce theories for learners and encourage them to apply knowledge to practical activities in order to discover new knowledge. It is necessary to

understand what outside world is thinking and to develop new ways to meet the demands and opportunities that outside world offers (Bielaczyc & Collins, 2006). Through the processes of learning activities, learners gain knowledge and make it their own, enabling them to apply this newfound knowledge in other contexts.

The rubric provides a guideline for learners to achieve learning goals as well as to support learners focusing on major learning topics and to enable learners to have a sense of ownership in web-based learning environments (Illowsky, 2007). Moreover, Jonassen (1999) stated a rubric is a criterion for teachers to evaluate the learning performance. Additionally, for monitoring learning achievement, teachers need to establish a rubric at the beginning of the course to evaluate the quality of students' work (Mandernach, et al., 2006; Zahn, et al., 2005). Introducing a rubric for learning activities should provide a way for learners to self-evaluate their participation in learning and for teachers to monitor students' learning progress (Rovai, 2004).

Sense of Audience

Sense of audience is a learning process of making meaning through interaction with others (Many & Henderson, 2005). Senses of audience refers to learners' need to have audiences that understand what they have expressed and share their understanding with a large community of other learners and teachers (Bruffee, 1999; Many & Henderson). A large community means people who have knowledge about a related interest and who have the ability to negotiate the meanings of individual knowledge. It is important that students have the ability to communicate what they have learned and for them and others to have a feeling of belonging during learning activities (Blanchard, 2007; Ouzts, 2006).

Through the interaction of sharing their knowledge and receiving feedback, learners tend to increase their interest and motivation regarding their learning progress (Bruffee, 1999). Sharing knowledge refers to conversation among learners, who provide meaningful feedback and make an individual feel a sense of belonging. Additionally, the advantage of conversation is that it provides learners with opportunities to internalize and to externalize their knowledge as well as to change their thinking (Bruffee; Nonaka, 1994; Nonaka & Takeuchi, 1995). This change motivates them to be "ready to write and interested in what [she/he] had to say" (Bruffee, p.11). Moreover, learners participate in discussion and discover their learning goals should lead them to master their knowledge, gain expertise, and promote learning achievement (Bradshaw, Powell, & Terrell, 2005).

Furthermore, Tsai (2004) suggested that sharing knowledge between learners and teachers helps them reshape their prior knowledge into new knowledge. Moreover, Bolman and Deal (2003) stated that “a frame is a set of ideas [which] ... help you understand and negotiate a particular [topic]" (p. 12). Bolman and Deal implied that effective problem solvers focus on framing issues so that they may communicate it with same language. Discussion within a framed topic helps learners to reason about their stance. Teachers provided a norm of discussion which helped learners share their knowledge in an effective way. Moreover, for establishing students’ sense of audience, discussion with effective critiques and presentation of projects needed to be included in learning activities (Many & Henderson, 2005).

Additionally, learners with argumentative skills learn to demonstrate an important norm—the ability to "speak the same language" (Bruffee, 1999, p.118) and have opportunities to explain their findings and to deepen their understanding (Hewitt, 2005).

Furthermore, learners with argumentative skills develop the ability to evaluate evidence and construct meaningful explanations about their findings (Simon, Erduran, & Osborne, 2006) and have a sense of belonging. While sharing knowledge among learners, argumentative skills "focus on the same issues and negotiate about the meaning of each other's information" (Andriessen, 2006, p. 199). Finally, learning to use argumentative skills should provide learners with opportunities to analyze information, to reshape their knowledge and to debate their findings with other individuals (Marttunen, Laurinen, Litosseliti, & Lund, 2005).

Teachers provide forums for learners to express their thoughts in an organized way and to improve effective conversation. Also, in writing tasks, teachers evaluate and judge the quality of knowledge that the learners produced. This process helps learners become responsible for their arguments "so that others in the community can understand what they have written" (Bruffee, 1999, p. 50). Bruffee further argued that there are degrees of difference in the authority of knowledge within individual, groups and community. Finally, Tsai (2004) argued that knowledgeable communities have the authority to encompass the effectiveness of knowledge shared by individuals and groups.

Collaborative Support

Collaborative learning is a learner-centered approach that focuses on learners working together in groups to establish their knowledge and to achieve a common goal (Hron & Friedrich, 2003). Bruffee (1999) stated that "collaborative learning ... [is] a nonfoundational understanding of knowledge" (p. xiv). Additionally, collaborative learning provides the group of members with opportunities to search and share ideas about their topic of interest (Fischer & Mandl, 2005). The goal of collaboration focuses

on learners having abilities to research and exploit new knowledge and to share knowledge outside of their individual community (Yorks, 2005) and to build consensus within groups (Nonaka & Takeuchi, 1995).

Additionally, Tsai (2004) argued that learners should shift from individual knowledge gains to sharing understanding with other learners, to discuss issues and to collaborate to discover new knowledge. Furthermore, Woo and Reeves (2007) stated that web-based learning provides an interaction among learners with collaborative activities based on principles of social constructivism. Bruffee (1999) argued that "knowledge is a social construction, a consensus among the members of a community of knowledgeable peers" (p. xiv) and needs to be established through collaboration. Additionally, collaborative learning emphasizes that learners in groups share existing knowledge and negotiate meaning from different perspectives to promote thoughtful thinking (McLoughlin & Luca, 2002). To negotiate meaning is to request "for clarification or confirmation checks" (Ellis, 1999, p. 286) on present or new knowledge. Furthermore, to achieve a shared goal, collaborative learning calls for group activities that should emphasize consistent dialogue to reach an agreement among group members and instructors. For the success of collaborative learning, it is necessary for instructors to clarify learning goals in advance and among learning activities to foster groups learning (Salmon, 2004).

It is critical for learners to communicate and justify their beliefs among individuals, group members, teachers and contexts. Richards (2001) stated that the "internet is invaluable in the dissemination of information and materials as well as communication" (p. 374). However, in instructivists' perspectives, teachers authorize the

domain of knowledge and transmit material for students to learn. Students passively accept content without reflection and judgment. Teachers and students are limited to interactions based on the content teachers provided. In constructivists' perspectives, knowledge is a social and a constructing process through collaborative learning among knowledgeable members to reach an agreement.

Bruffee (1999) argued that knowledge is learned through conversation to reach an agreement among knowledgeable peers. The role of teachers is to guide and to facilitate the learning activity. It is important for teachers to discover a way to transform students' beliefs and learning culture, if students have a tendency to only memorize all the facets of an issue. Teachers should change the learning culture of students from passively receiving knowledge to actively discovering their own knowledge.

Teachers must set up groups and clarify individuals' responsibilities within groups in web-based learning environments. It is important to organize group members and understand their experience. Additionally, clarifying the goal of the team is a critical beginning for successful collaborative learning (Salmon, 2004). In task assignment, teachers provide a criterion for group success and introduce technological tools to help groups discover and share knowledge. In web-based learning settings, a group of students' ability to share their knowledge is based on how they use technological tools (Jones & Rice, 2000). Moreover, Bruffee (1999) said that group success is based on students' abilities to discover the issue, share understandings and reach an agreement.

Authority in knowledge is based on an agreement in group members (Bruffee, 1999). With project team learning, local culture influences the way groups reach the authority of knowledge that is caused by freedom of inquiry (Jameson, et al., 2006).

Authority of knowledge transferred from teachers to group members causes teachers to pay attention to negotiate the conflict of meaning among team members with disagreements related to their different perspectives. To solve the conflict, it is necessary for team members to redefine their prior assumptions and to provide better, sounder reasoning (Marttunen, et al., 2005). Teachers must emphasize that learners need to provide reasoning and evidence as a rationale for their stance with collaborative effort. When there is a disagreement based on differing perspectives in a group, Nonaka (1994) implied that teachers and group members require positive thinking and the belief that a disagreement provides an opportunity for a further research. Bruffee supported the idea that different perspectives of group members are derived from their culture, background and knowledge base, thus, these factors may lead to different beliefs. Bielaczyc and Collins (2006) suggested that communication among different groups provided opportunities for referencing others' experience and expanding their viewpoints. Furthermore, Bruffee stated a disagreement of beliefs in a group may be an agreement in other groups. A contradiction of beliefs within a team provides an opportunity for further references for creating new knowledge (Nonaka & Takeuchi, 1995).

Teacher Support

It is critical to identify the roles and responsibilities of teachers, learners and technologies to promote effective learning in web-based learning settings (Reeves, 1997). Teachers need to understand their pedagogical approaches, either by didactic teaching or by constructivist teaching, to promote students' achievement. Additionally, didactic teaching focuses on the declaration of knowledge with facts and concepts to demand learners' understanding and memorization of knowledge, which are relatively "low levels

of thinking" (Roskos, Jarosewich, Lenhart, & Collins, 2007). Moreover, unless teaching material interests learners, the learning outcome tends to be a lack of motivation and memorization (Scardamalia & Bereiter, 1999).

From constructivist perspectives of teaching and learning, teachers are responsible for collaboration with learners to guide and facilitate learners' learning processes and to help them utilize the opportunities to establish knowledge. Additionally, teachers must establish learning activities for learners to discover their knowledge through problem solving experience (Hmelo-Silver, 2006) and for learners to explain their findings (Scardamalia & Bereiter, 1999). To help a learning activity to successfully construct students' knowledge, teachers need to foster learners' participation in discussion, sharing their understanding and negotiating the meaning with other learners.

Instead of passive learning to receive organized knowledge from teachers, learners are responsible for the active participation which enables them to construct their own knowledge (Jonassen, et al., 1999; Reeves, 1997). Learners need to search, analyze, and judge the reliability of information before transforming it into their own knowledge and sharing it with other learners. While sharing knowledge, learners need to understand and respect the idea that culture differences and related perspectives influence the way people view the world and their beliefs making meaning (Bolman & Deal, 2003). Additionally, as "group meaning" are established, individuals and groups gain knowledge (Peters & Armstrong, 1998).

Furthermore, teachers and learners should clarify the role of internet technology as a tool to foster learning activity, but not to drive learning. The advantage of internet technologies is that it supports learners obtaining information in an efficient way,

anywhere and any time. In web-based learning settings, instructors usage of internet technologies is to foster learners' reshaping of the learning experience, rather than merely to foster a demonstration (Johnassen, et al., 1995). Moreover, instructors beliefs about the approaches of their instructional pedagogies influence how they use internet technologies in web-based teaching (Fulton, 1999; Niederhauser & Stoddart, 2001). Also, internet technology provides the ability to calculate data and analyze it quickly and accurately. Goal in using internet technologies in web-based learning environments is to motivate students to join in a learning activity.

Metacognitive Support

In web-based learning settings, teachers' instructional strategies employ metacognitive guidance to help learners implement their learning activities and discover their own knowledge (Dabbagh & Kitsantas, 2005; Zion, Michalsky, & Mevarech, 2005). Metacognitive learning refers to learners with the ability to self-regulate about understanding existing knowledge, identifying the needs of the assigned task, adapting effective action, and monitoring learning progress to achieve their goals (Flavell, 1979) and can be effective with the intervention of technology (Azevedo, 2005). Efklides (2006) said that learners with metacognitive skills not only regulate themselves to regulate their ability to understand the learning task in advance but also formulate strategic plans as they learn and evaluate what they have learned after completing the task. Furthermore, learners with metacognitive skills have the abilities to plan and monitor their own learning strategies (Paris & Winograd, 1999; Zion, et al., 2005). Moreover, metacognition refers to learners understanding their own thinking and displaying the ability to complete their learning activity, as well as understanding how to look for help

(White, 1999). Finally, metacognitive learning theory suggests that learners need to experience the context, to construct their own knowledge and to discuss their learning progress with teachers (Paris & Winograd).

Furthermore, in metacognitive support, teachers should provide learners with an opportunity to discuss their plan and monitor their performance during learning activities (Pintrich, 2002). While discussing topics with teachers, metacognitive skills help learners understand individual strengths and weaknesses as they implement different learning plans to accomplish the assigned task. Additionally, Aleven and Koedinger (2002) argued that learners who can explain their own learning progress to themselves perform better than those who merely receive. To help students learn the skills of self-monitoring, teachers need to provide "guidance through the exercise of error detection and correction skills" (Mathan & Koedinger, 2005, p. 257). Learners with metacognitive ability should self-evaluate their own learning progress and should be able to effectively make decisions to help themselves achieve their learning goals (Anderson, Oates, Chong, & Perlis, 2006).

The advantage of metacognitive learning is that it develops in learners the abilities to examine individual understanding, to monitor individual learning progress and to reflect on their own actions (Paris & Winograd, 1999). Additionally, teachers need to introduce teaching strategies including the logical thinking processes of inductive and deductive reasoning and encourage students to apply those kinds of approaches to evaluate their reasoning (Pintrich, 2002). Furthermore, teachers need to provide learners with opportunities to reason about their findings, although the process of reasoning may be erroneous, and to ensure lessons learned from mistakes are shared with conceptual underpinnings (Beatty, Gerace, Leonard, & Dufresne, 2006; Mathan & Koedinger, 2005).

Summary

The deficiencies of school faculty regarding web-based teaching should be identified and rectified if the educational system is to move forward and provide its students the best opportunity to obtain new knowledge. Faculty members must understand the strengths and weaknesses of various forms of internet technologies merged with an awareness of effective teaching strategies in order to solve real problems in students' learning activities and lead reform efforts to effectively integrate internet technologies into web-based learning (Diaz & Bontenbal, 2000). To promote successful web-based learning, university faculty need to provide students with the opportunity to learn in the broad areas of "(1) opportunity to construct learning, (2) task ownership, (3) sense of audience, (4) collaborative support, (5) teacher support and (6) metacognitive support" (Reeves, 1997, pp. 5-7). Questionnaires regarding effective web-based teaching strategies were established as provided by Reeves. These questionnaires should address many web-based teaching strategies, since these are issues of importance to colleges and universities who strive to provide faculty with the tools to be effective in web-based teaching. Four internet technological tools including PowerPoint, video-based instruction, e-mail and threaded discussion were investigated in this study to support the use of constructivist teaching strategies in web-based setting.

The previous review of selected literature was focused on the five major areas of interest as they related to the integration of internet technologies into web-based learning. First, the study reviewed background information about Taiwanese education system and how it influences faculty's beliefs about effective teaching strategies and their use of internet technologies. Second, the study included a discussion of different learning

theories and how teaching strategies influence learning activities. Third, the study identified the role of internet technologies in teaching and discussed why internet technologies can support learning activities. Fourth, the study discussed how faculties use internet technologies to support teaching and learning. Finally, the study discussed the development of effective web-based teaching strategies to support students' opportunities to learn.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

University faculty need to create learner-centered environments in web-based learning and to support students as they construct their own knowledge (Beck & Schornack, 2004; Rovai, 2004). It is critical for teachers to merge the idea of integrating internet technologies to support teaching and to foster learners' learning (Jonassen, et al., 1999; Thompson, 2007). Moreover, it is important for teachers to integrate internet technologies into web-based learning activities to help learners obtain new knowledge (O'Donnell, 2006; Petrides, 2002). Reeves (1997) provided a model of effective web-based learning and points out that teaching strategies should emphasize learner-centered experiences when teaching with technology to support learners as they construct their own knowledge. It is time for teachers to rethink current practices and to support a new dimension of web-based teaching strategies embedded with internet technologies.

Problem and Purposes Overview

The review of literature has developed themes emphasizing the needs for faculty in higher education to use constructivist approaches in web-based teaching strategies to provide students with opportunities to construct their own knowledge (Fink, 2003; Rovai, 2004). Additionally, Osika (2006) and Levy (2003) have stated that teachers need to combine adequate internet technologies skills with the effective teaching strategies to facilitate successful web-based learning.

No studies have been identified that measure internet technologies and its relationship to web-based teaching strategies by faculty in a Taiwanese university and no

instrument has been found for collecting data on internet technologies usage and its relationship to web-based teaching strategies by faculty in a Taiwanese university.

This study established a valid and reliable instrument that should be used to assess self-reported performance of university faculty regarding their instructional practice and applications of internet technologies. Data analysis provided trends and differences that should be used by university faculty to examine how they and their peers were performing with regard to established instruments of instructional practice and internet technologies application. Universities and in service training programs should be able to use the results to identify current weaknesses in programs that prepare faculty to teach effectively in web- based settings. The validated instrument should be used by other researchers to expand this research to other universities or an international population.

Statement of the Problem

There is no known instrument that measures the performance of faculty in regard to teaching strategies and its relationship to internet technologies usage in a Taiwanese university. Additionally, there is a lack of knowledge about trends and differences regarding internet technologies usage and its relationship to teaching strategies when faculty are grouped by gender, served college, degree source, years of experience teaching in web-based learning courses, and attendance at the web-based training courses.

Purpose of the Study

The purpose of this study was to determine the validity and reliability of web-based teaching strategies for use as an instrument to conduct a survey to determine current instructional practices by the faculty of a Taiwanese university and the degree to

which the faculty of this Taiwanese university believed the different practices related to internet technologies usage as measured by the faculty's response. This study also examined the data returned from faculty responses to determine trends and differences among and between common factors and the independent variables of gender, served college, degree source, years of experience teaching in web-based learning courses, and attendance at the web-based training courses.

Research Questions

Research questions were developed in order to guide the study. Each was represented in the following.

Research Question 1

Do the items contained in the survey of teaching strategies have face and content validity?

Research Question 2

Are the items contained in the survey of teaching strategies reliable?

Research Question 3

Can common factors be identified in the response of Taiwanese university faculty to the survey of teaching strategies and can those factors be used to reduce the number of survey questions while maintaining reliability?

Research Question 4

What are the summary statistics for internet technologies usage and performance to the teaching instructional strategies?

Research Question 5

What items best decide category membership?

Sub research question 5.1. Are there differences between internet technologies usage reported by Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses?

Sub research question 5.2. Are there differences between teaching strategies reported by Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses?

Research Question 6

What cluster functions as best discriminant by category membership?

Sub research question 6.1. Are there clusters of internet technologies usage items that discriminate when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses?

Sub research question 6.2. Are there clusters of teaching strategies items that discriminate when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses?

Null Hypotheses

There were six developed hypotheses to determine answers to the stated research questions. These hypotheses were described in the following:

H_o1. The items contained in the survey of teaching strategies for Taiwanese university faculty were not reliable.

H_o2. There are no common factors in the survey of teaching strategies for Taiwanese university faculty.

H_o3. There are no significant differences between internet technologies usage for Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses.

H_o4. There are no significant differences between teaching strategies for Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses.

H_o5. There are no clusters of internet technologies usage items that discriminate when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses.

H_o6. There are no clusters of teaching strategies items that discriminate when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses.

Population and Sample

The population in this study consisted of approximately 320 full-time faculty members at a selected Taiwanese university. Written permission to survey these faculty members was attained from the president of the university. Faculty members granting permission for the study have answered the survey questionnaire about teaching instructional practices and applications of internet technologies.

The process of selecting participants produced a non-probability sample of respondents who are willing to participate in the survey (Fink, 2006). Data from the returned surveys were entered into SPSS software for data analysis.

Research Design

Fink (2006) stated that a survey is a scientific method to collect information from individuals to understand their value and knowledge about particular programs or activities. Fink further indicated that surveys are good tools to evaluate a program that must be planned, to measure the effectiveness of program and to assist researchers for knowledge gains. Additionally, surveys have been used to measure individuals' past and current knowledge in particular programs for providing information to improve program effectiveness.

The data acquired to determine individuals' behaviors should be supported by a good survey instrument. To develop a reliable instrument, researchers must consider asking questions which include related topics and content. Additionally, Ury (2003) argued that good instruments need to be designed with the goals of mutual exclusivity and closed-endedness. Additionally, from a quantitative perspective, each question often becomes the name of a variable name and can be divided into independent or demographic variables and dependent variables (Morgan, 2004). These natures of independent variables are used to predict or describe individual knowledge measured by behavior questions (Fink, 2006).

Research questions needed to be supported by survey questions (Ury, 2003). The survey of "Current Teaching Instructional Practice and Application of Internet technologies for University Faculty" was developed based on theoretical concepts to collect faculty perspectives on students' achievement and faculty internet technologies usage. This study adopted quantitative methodology to establish a reliable and valid instrument and then use this instrument to discover the differences between independent variables and dependent variables. Additionally, this study was a case study because data

collection was from only one group (Patton, 1997), the participating faculty in one Taiwanese university. Furthermore, this study was a cross-sectional study that emphasized that participants would respond to a one-shot survey (Fink, 2006, Ury). Therefore, this study was a one-shot quantitative non-experimental survey.

Instrumentation

The survey focused on teaching strategies and internet technologies usage applied by faculty in web-based teaching settings. The first section of the survey is designed to develop some basic demographic information such as gender, served college, degree source, years of experience teaching web-based courses, years in higher education, attendance at the web-based training courses, and college encouragement to attend web-based training courses. Respondents would select categories that define attributes about themselves and their teaching experience.

The second section of the survey asks the respondent to select the frequency of use for specific internet technologies applications. Four questions were established with the support of literature that suggested faculty need to integrate internet technologies into teaching activities. The final forty-eight questions are designed to gather university faculty opinions about their students' proficiency levels in five general areas of teaching strategies supported by Reeves (1997). A 9-point Likert type scale with possible responses of always, sometimes and never was used on the survey instrument. The respondents' answers were converted to a nominal scale from 1, representing strongly never, to 5, representing sometimes, and to 9, representing always. The five areas of teaching strategies and their item numbers were (a) construct learning, item 12-19, (b) task ownership, item 20-29, (c) sense of audience, item 30-39, (d) collaborative support,

40-49, and (e) metacognitive support, item 50-59. A copy of this preliminary version of the instrument can be found in Appendix A.

Data Collection and Analysis

The preliminary plans were to distribute the survey to the faculty by placing them in their personal faculty mailbox by a university employee. A paper-and-pencil method was planned to be used in which participants answer a survey questionnaire accompanied by a faculty explanatory letter and a consent statement. A copy of the explanatory letter to the potential respondents could be found in Appendix B. A copy of the consent statement can be found in Appendix C. However, the chairperson of the Taiwanese university suggested using web page technology to more efficiently distribute and collect the data, instead of a paper and pencil questionnaire, to increase the practicality of the survey process by eliminating the need for a departmental secretary to put a paper and pencil questionnaire in each faculty member's mailbox and then collect the completed questionnaires. Because of the increased efficiency and practicality offered by an online questionnaire, the initial plan of a paper-and-pencil questionnaire was modified to an online questionnaire. After examining several online questionnaire websites to find an effective site which met the requirement of character encoding in the Chinese language so that the faculty members could answer the questions, the FreeOnlineSurveys.com website was selected to construct the online questionnaire and collect data (FreeOnlineSurveys). Once the Chinese language version of the instrument was completed by the respondents, the instrument was translated into an English language version. A copy of the English version of the instrument can be found in Appendix E.

Data received from the survey responses were transformed into nominal data type within seven demographic categories of gender, served college, degree source, years of experience teaching web-based courses, years in higher education, attendance at the web-based training courses, and college encouragement to attend web-based training courses and within fifty-two measured categories of teaching strategies and internet technologies usage. Additionally, the SPSS statistical software program (SPSS statistical software package, Version 14.0) was used to organize information and analyze data. The study used methods of Cronbach's alpha and Principle Components Analysis to examine the validity and reliability of the questionnaire. MANOVA analysis was applied to investigate differences between each demographic variable regarding to teaching strategies and internet technologies usage. Discriminant Analysis was conducted to identify clusters predictors of teaching strategies and internet technologies usage that can best discriminate between each demographic category.

Survey Variables and Items Identified

Variables used in this study are summarized in Table 1. The variables consist of seven independent variables that grouped respondents by common characteristics. The independent variables consisted of gender, served college, degree source, years of experience teaching web-based courses, years in higher education, attendance at the web-based training courses, and college encouragement to attend web-based training courses.

There were four dependent variables that measure reported frequency of internet technologies usage in teaching activities by Taiwanese university faculty. The dependent variables for internet technologies usage in teaching activities included the following areas: (a) use PowerPoint to support teaching; (b) use video-based instruction to support

teaching; (c) use e-mail to communicate with students; and (d) encourage students to participate in threaded discussion.

The forty-eight dependent variables that measure perceived performance of university faculty regarding their teaching strategy and its relationships to students' achievement included: establish understanding based on their experience, understand the big picture of the learning topic, research further on the topics related to teaching objectives, be motivated about learning topics that interest them, reflect on what they have discovered with me, converse with me about the topic of learning, have confidence in learning activities, converse with other learners about topic, connect current practice that is close to students' experience, define learning topics that are "close" to their experience, practice and demonstrate a familiarity with methods used to solve problems in reality, employ theory and practice in learning activities, solve a problem regarding the topic with ill-defined problem statements, apply their knowledge in other contexts, focus on major learning topics with the support of a scoring rubric, demonstrate a sense of ownership in learning activities with the support of a scoring rubric, self-evaluate their participation in learning activities with the support of a scoring rubric, self-evaluate their quality of learning achievement with the support of a scoring rubric, express what they have learned to other learners, share their knowledge and receive meaningful feedback from other learners or me, change their thinking through conversation, master their knowledge and discover learning goals through conversation, communicate and frame issues effectively, communicate effectively with the support of a norm of discussion, present their project that is supported with critiques by me or other learners, evaluate evidence and construct meaningful explanations about their findings with other learners,

analyze information and debate about their findings with other learners, express their thoughts in an organized way, work together in groups to establish their knowledge, work together in groups to share knowledge and reach an agreement on learning, build consensus within groups, negotiate meaning from different perspectives with groups, clarify individual responsibility within groups, understand the criterion of group success, research further about teaching topics within groups, redefine their prior assumptions while conflict occurred within groups, demonstrate positive thinking about disagreement within groups providing chances for further research and results, understand the idea that different perspectives of group members are derived from their culture and background, understand the status of their current knowledge, identify the needs of the assigned task, adapt effective learning action, monitor their own learning progress, understand their own thinking and know how to look for help, understand individual strengths and weaknesses to implement different learning plans, explain learning progress, detect error and correction skills, evaluate their performance with the support of logical thinking, and ensure lessons learned from mistakes are shared.

Table 1

Summary Listing of Dependent and Independent Variables as Found Within the Survey

Independent Variable (N=7)	Internet technologies Usage Dependent Variables Frequency of use (N = 4)	Teaching strategies Dependent Variables Likert scale (N= 48)
Gender	Use PowerPoint to support teaching	• Establish understanding based on their experience
Served college	Use video-based instruction to support teaching	• Understand the big picture of the learning topic.
Years of experience teaching web- based courses	Use e-mail to communicate with students	• Research further on the topics related to teaching objectives
Degree source	Encourage students to participate in threaded discussion	• Be motivated about learning topics that interests them
Years in higher education		• Reflect on what they have discovered with me
Attendance at web-based training courses		• Converse with me about the topic of learning
College encouragement to attend web-based training courses		• Have confidence in learning activity
		• Converse with other learners about the topic
		• Connect current practice with the needs of real life
		• Define learning topics that are "close" to students' existing experience
		• Practice and demonstrate a familiarity with methods used to solve problems in reality
		• Employ theory and practice in learning activities
		• Solve a problem regarding the topic with ill-defined problem statements
		• Apply their knowledge in other contexts
		• Focus on major learning topics with the support of a scoring rubric
		• Demonstrate a sense of ownership in learning activities with the support of a scoring rubric
		• Self-evaluate their participation in learning activities with the support of a scoring rubric
		• Self-evaluate their quality of learning achievement with the support of a scoring rubric
		• Express what they have learned to other learners
		• Share their knowledge and receive meaningful feedback from other learners or me
		• Change their thinking through conversation
		• Master their knowledge and discover learning goals through conversation

- Communicate and frame issues effectively
- Communicate effectively with the support of a norm of discussion
- Present their project that is supported with critiques by me or other learners
- Evaluate evidence and construct meaningful explanations about their findings with other learners
- Analyze information and debate about their findings with other learners
- Express their thoughts in an organized way
- Work together in groups to establish their knowledge
- Work together in group to share knowledge and reach an agreement on learning subject
- Build consensus within groups
- Negotiate meaning from different perspectives with groups
- Clarify individual responsibility within groups
- Understand the criterion of group success
- Research further about teaching topics within groups
- Redefine their prior assumptions while conflict occurred within groups
- Demonstrate positive thinking about disagreement within groups providing chance for further research and results
- Understand the idea that different perspectives of group members are derived from their culture and background
- Understand the status of their current knowledge
- Identify the needs of the assigned task
- Adapt effective learning action
- Monitor their own learning progress
- Understand their own thinking and know how to look for help
- Understand individual strengths and weaknesses to implement different learning plans
- Explain their learning progress
- Detect their error and correction skills
- Evaluate their performance with the support of logical thinking
- Ensure lessons learned from mistakes are shared

Statistical Tests to be Applied

Statistical analysis methods were applied to the survey data for data analysis and interpretation of findings. These statistical analysis methods were included in four sections: a) Descriptive Statistics of Survey Items, b) Survey Reliability and Validity, c) MANOVA Analysis, d) Discriminant Analysis. Table 2 illustrated a summary of data sources and measures applied for research questions.

Descriptive Statistics of Survey Items

Descriptive statistics were calculated for each dependent variable of internet technologies usage and teaching strategies and each independent variable of gender, served college, degree source, years of experience teaching web-based courses, years in higher education, attendance at the web-based training courses, and college encouragement to attend web-based training courses. Frequency and percentage were measured on demographic variables and dependent variables (Morgan, 2004). Mean (M) and standard deviation (SD) were examined on each dependent variable to find out the presentability of the survey data (Field, 2005).

Survey Reliability and Validity

This study used quantitative methodology to construct a reliable and valid instrument. There were three validity examinations required to be investigated including face, content and construct validity. The face and content validity involved the identification of questions supported by experts to clarify the meaning of each question related to a knowledge area (Ladouceur, et al., 2004). Furthermore, Cronbach's alpha was applied to examine the validity and internal consistency of the questionnaire. Field (2005) argued that Cronbach's alpha statistic exceeding 0.8 for each parameter provides the

evidence of internal consistency. After Cronbach's alpha is examined, Principle Components Analysis (PCM) was conducted to examine the reliability of the questionnaire by reducing large items into classified datasets. Field stated that PCM was grouping variables of the questionnaire into a manageable data set, which preserved the original information and suggested Eigenvalues levels equal to or greater than 1.

MANOVA Analysis

MANOVA analyses was conducted to find out whether groups of faculty can be distinguished on the basis of teaching strategies and internet technologies usage. Field (2005) argued that the purpose of MANOVA analysis was to discover differences between one or several independent variables related to several correlated dependent variables. One-way MANOVA was applied to examine differences of perspectives between each group of gender, served college, degree source, years of experience teaching web-based courses, and attendance at the web-based training courses regarding teaching strategies and internet technologies usage (Field). Additionally, significant (*Sig.)* levels equal to or lower than 0.05 were applied to identify significant effects on each group. Follow-up univariate ANOVA was conducted to find out whether each group can be differentiated.

Discriminant Analysis

Field (2005) argued that the purpose of a follow up discriminant analysis (DA) was to identify clusters of predictors that can best discriminate between a set of groups. Furthermore, DA analyzed several observed behaviors for each faculty member to build a predictive model of group differences (Leech, Barrett, & Morgan, 2005). Therefore,

predictors of teaching strategies and internet technologies usage were conducted to identify and define differences between each group of independent variables under study.

Eigenvalues with *Sig.* levels equal to or lower than 0.05 are applied to identify significant discrimination between each group (Field, 2005). Standardized discriminant function coefficients were conducted to examine "relative contribution of each [predictor] to the variates" (Field, p. 610). Additionally, each predictor with a relatively heavier degree of weight contributed most to discriminate between each group (Leech, et al., 2005).

Table 2
Summary of Data Sources, Types and Measures Applied by Research Question

Research Question #	Data Source Title	Number of Items	Response Type	Data Type	Analysis Applied
1	Survey Responses	52	Likert Scale	Nominal	Summary
2	Survey Responses	52	Likert Scale	Nominal	Cronbach's alpha
3	Survey Responses	52	Likert Scale	Nominal	Factor Analysis
4	Survey Responses	52	Likert Scale	Nominal	Summary
5.1	Survey Responses	4	Likert Scale	Nominal	MANOVA
5.2	Survey Responses	48	Likert Scale	Nominal	MANOVA
6.1	Survey Responses	4	Likert Scale	Nominal	Discriminant Analysis
6.2	Survey Responses	48	Likert Scale	Nominal	Discriminant Analysis

Summary

A survey integrating teaching strategies and internet technologies usage questions was conducted with faculty of one Taiwanese university to determine the participants' perceived performance regarding an established instrument. Responses were grouped by demographic characteristics, teaching strategies, and internet technologies usage. Face and content validity of the questionnaire were examined by experts to clarify the meaning

of each question. Cronbach's alpha analyses were proposed to identify the reliability of constructed items and factor analysis was performed to reduce large datasets into defined groups. MANOVA analyses were proposed to distinguish groups of faculty with regard to teaching strategies and internet technologies usage. Discriminant analyses were proposed to identify clusters of teaching strategies and internet technologies usage best to discriminate between each demographic category.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

University faculty should provide learner-centered teaching strategies for students to construct their own knowledge in web-based learning environments (Rovai, 2004). By applying the idea of applying internet technology in teaching, teachers have an opportunity to provide alternative teaching methods to foster learners' achievement (Thompson, 2007). This study utilized Reeves' (1997) web-based teaching strategies as the theoretical base to examine how teachers externalize their knowledge to support students' learning experience. The study's purpose was to establish a valid and reliable instrument that can be used to assess self-reported performance of university faculty regarding their instructional practice and applications of internet technology. Additionally, this study sought to discover the relationships between demographic information of Taiwanese university faculty members regarding their internet technology usage and their teaching strategies. Furthermore, this study was to determine what combinations of teaching strategies and internet technologies usage can best discriminate among demographic information. The study should inform university policy regarding effective web-based learning by investigating faculty teaching strategies and their application of internet technology.

Review of Research Design

This study utilized a one-shot, quantitative, and non-experimental study design to investigate six research questions identified previously. This study was non-experimental because it utilized a survey instrument without manipulating independent variables to find out change in dependent variables (Charles, 1998) and was a one-shot case study

because data were gathered in a one-time fashion from only full-time faculty members in a Taiwanese university (Fink, 2006). Once data were collected, quantitative methodologies were applied to analyze and discover findings (Field, 2005; Heppner & Heppner, 2004).

Population and Sample

The population in this project consisted of 320 full-time faculty members employed at four colleges of a selected Taiwanese university. Each of the 320 participants was sent an e-mail with an informed consent statement on June 20th, 2008 (see Appendix D) and directed to subsequent instrument (see Appendix E). On June 23, 2008 and June 27, 2008 follow-up messages were sent (see Appendix F) redirecting participants who completed the survey or had problems in hyperlinking the survey back to the web-based instrument. This method of selecting participants produced a non-probability and convenience sample in which faculty members were willing to answer questions based on their enthusiasm for participation in the study (Fink, 2006).

No data were rejected due to lack of informed consent since all respondents had to acknowledge an informed consent statement through email before being directed to the survey instrument. Results were collected electronically providing 104 useable surveys, for a 32.5% return rate with 320 faculty members.

The sample size of 104 is appropriate to represent the population with a certainty of 90-95% (Schwalbe, 2006). Schwalbe argued a sample size of 68 reflects the population with 90% certainty; moreover, 384 samples represent a certainty of 95%. Additionally, Fink (2006) stated that "a confidence interval is a range of values within

which the true value lies" and this range is considered when determining the degree to which one assumes survey results to reliably represent the larger population (p.77).

This study utilized a formula provided by the Creative Research Systems website (Creative Research Systems), which states that "Sample Size Calculator" is used "to determine how many people you need to respond in order to get results that reflect the target population as precisely as needed. You can also find the level of precision you have in an existing sample." To determine one's degree of certainty about a survey's results, one must discover the survey's "confidence interval." Creative Research Systems states, "The confidence interval is the plus-or-minus figure usually reported in newspaper or television opinion poll results. For example, if you use a confidence interval of 4 and 47% percent of your sample picks an answer you can be 'sure' that if you had asked the question of the entire relevant population between 43% (47-4) and 51% (47+4) would have picked that answer." The accuracy of a survey is also correlated with how many people choose any given answer. Creative Research Systems continues, "Your accuracy also depends on the percentage of your sample that picks a particular answer. If 99% of your sample said 'Yes' and 1% said 'No, the chances of error are remote, irrespective of sample size. However, if the percentages are 51% and 49% the chances of error are much greater. It is easier to be sure of extreme answers than of middle-of-the-road ones. When determining the sample size needed for a given level of accuracy you must use the worst case percentage (50%). You should also use this percentage if you want to determine a general level of accuracy for a sample you already have. To determine the confidence interval for a specific answer your sample has given, you can use the percentage picking that answer and get a smaller interval."

Additionally, a small sample of a population can yield valid and reliable results; for example, election exit polls consistently predict the outcomes of elections, even though only a small percentage of a large population is polled (Creative Research Systems). As Creative Research Systems observes, "The mathematics of probability proves the size of the population is irrelevant unless the size of the sample exceeds a few percent of the total population you are examining. This means that a sample of 500 people is equally useful in examining the opinions of a state of 15,000,000 as it would a city of 100,000."

According to a formula provided by the Creative Research Systems website (Creative Research Systems), this study's sample size of 104, a population of 320, and a percentage of 50%, and a confidence level of 95% yield a confidence interval of 7.91.

Statistical Analyses

Analysis methods were applied to the survey data for data analysis and interpretation of findings. The results of the analyses were described within four sub-sections. The first section addressed reliability and internal consistency tests performed and on the responses to research questions one, two, and three. This section reported descriptive measures represented by demographic values and emphasized the survey items pertaining to teaching strategies. The second section demonstrated descriptive statistics about survey items for values of demographic variables (IV) and of internet technology usage (DV) and teaching strategies (DV) reported as answers to research question four. The third section explored research question five by examining differences between groups of faculty members regarding their teaching strategies and internet technology usage. The next section looks at research question six. Section four

emphasized investigating predictors of teaching strategies and internet technology usage to identify differences between each group of faculty members.

Section 1 – Survey Reliability and Validity - Research Questions One, Two, and Three

Before any consideration was given to findings within the data, three reliability tests were performed. These reliability tests were described first, followed by descriptive measures that address research question one. Research question one was given as "Do the items contained in the survey of teaching strategies have face and content validity?"

Face and content validity was examined by four expert panels to identify the meaning of each survey item. During the proposal defense process, the dissertation committee made recommendations about the content and format instrument revisions. This was the initial step in the instrument refinement. A four member expert panel also provided input regarding face and content validity. One member has expertise in research and psychometric properties of instrument development. One panel expert has assisted with instrument development. Another panel member developed and tested an instrument for his dissertation. Another expert panel member came from the cultural perspective under study that of a selected Taiwanese university. The instrument was translated into a Chinese language version for faculty members in Taiwan to review and make further suggestions.

Patton (1997) argued that examinations of face validity are important processes for developing reliable instrument and researchers need to communicate well with experts to make sure faculty members understand the questions they have been asked. When discussing with one expert to ensure that the survey participants understood the questions, experts, including other faculty members at the Taiwanese university being

studied, were consulted for three weeks, examining each question to determine the faculty members' level of understanding, so that their answers could be reliably generalized and applied in their college with different characteristics. Also, questions phrased in English needed to be translated and scrutinized to ensure that they aligned with meanings as nearly as possible in the Chinese language and culture. After direct communication with one expert, who had examined the content meaning with the other colleagues, the researcher decided that several questions needed to be deleted or merged to make sense to faculty members in the Chinese culture. The preliminary idea of a 9-point Likert scale in the proposal was changed in favor of a 7-point (1= never, 4=sometimes, and 7=always). Also, the section investigating teaching strategies and instruments, 48 questions were reduced to 34 questions. The updated questionnaire of teaching strategies was established as agreed by the researcher and experts (see Table 3). Sixteen of the proposed questions were crossed out as indicated after examination by experts in the Taiwanese university.

Table 3
Face and Content Validity of Teaching Strategies Check

Theoretical frame work	Examined by experts in a Taiwanese university	After examined by experts in a Taiwanese university
5 themes	Teaching Strategy Dependent Variables Likert scale (N= 48)	Teaching Strategy Dependent Variables Likert scale (N= 34)
Opportunity to Construct Learning	Establish understanding based on their experience	Establish understanding based on their experience
	Understand the big picture of the learning topic.	Understand the big picture of the learning topic.
	Research further on the topics related to teaching objectives	Research further on the topics related to teaching objectives
	Be motivated about learning topics that interest them	Be motivated about learning topics that interest them
	Reflect on what they have discovered with me	Reflect on what they have discovered with me
	~~Converse with me about the topic of learning~~	
	Have confidence in learning activities	Have confidence in learning activities
	Converse with other learners about	Converse with other learners about

	topic	topic
Task Ownership	Connect current practice that is close to students' experience	Connect current practice that is close to students' experience
	~~Define learning topics that are close to their experience~~	
	Practice and demonstrate a familiarity with methods used to solve problems in reality	Practice and demonstrate a familiarity with methods used to solve problems in reality
	Employ theory and practice in learning activities	Employ theory and practice in learning activities
	~~Solve a problem regarding the topic with ill-defined problem statements~~	
	Apply their knowledge in other contexts	Apply their knowledge in other contexts
	~~Focus on major learning topics with the support of a scoring rubric~~	
	~~Demonstrate a sense of ownership in learning activities with the support of a scoring rubric~~	
	Self-evaluate their participation in learning activities with the support of a scoring rubric	Self-evaluate their participation in learning activities with the support of a scoring rubric
	Self-evaluate their quality of learning achievement with the support of a scoring rubric	Self-evaluate their quality of learning achievement with the support of a scoring rubric
Sense of Audience	~~Express what they have learned to other learners~~	
	Share their knowledge and receive meaningful feedback from other learners or me	Share their knowledge and receive meaningful feedback from other learners or me
	Change their thinking through conversation	Change their thinking through conversation
	Master their knowledge and discover learning goals through conversation	Master their knowledge and discover learning goals through conversation
	~~Communicate and frame issues effectively~~	
	Communicate effectively with the support of a norm of discussion	Communicate effectively with the support of a norm of discussion
	Present their project that is supported with critiques by me or other learners	Present their project that is supported with critiques by me or other learners
	~~Evaluate evidence and construct meaningful explanations about their findings with other learners~~	
	~~Analyze information and debate about their findings with other learners~~	
	Express their thoughts in an organized way	Express their thoughts in an organized way
Collaborative Support	Work together in groups to establish their knowledge	Work together in groups to establish their knowledge
	Work together in groups to share knowledge and reach an agreement on learning subjects	Work together in groups to share knowledge and reach an agreement on learning subjects
	~~Build consensus within groups~~	
	Negotiate meaning from different perspectives with groups	Negotiate meaning from different perspectives with groups
	~~Clarify individual responsibility within groups~~	

	~~Understand the criterion of group success~~	
	Research further about teaching topics within groups	Research further about teaching topics within groups
	~~Redefine their prior assumptions while conflict occurred within groups~~	
	Demonstrate positive thinking about disagreement within groups providing chances for further research and results	Demonstrate positive thinking about disagreement within groups providing chances for further research and results
	Understand the idea that different perspectives of group members are derived from their culture and background	Understand the idea that different perspectives of group members are derived from their culture and background
Metacognitive Support	Understand the status of their current knowledge	Understand the status of their current knowledge
	Identify the needs of the assigned task	Identify the needs of the assigned task
	Adapt effective learning action	Adapt effective learning action
	Monitor their own learning progress	Monitor their own learning progress
	Understand their own thinking and know how to look for help	Understand their own thinking and know how to look for help
	Understand individual strengths and weaknesses to implement different learning plans	Understand individual strengths and weaknesses to implement different learning plans
	~~Explain their learning progress~~	
	Detect their error and correction skills	Detect their error and correction skills
	Evaluate their performance with the support of logical thinking	Evaluate their performance with the support of logical thinking
	Ensure lessons learned from mistakes are shared	Ensure lessons learned from mistakes are shared

To increase the practicality of the survey process by eliminating the need for a departmental secretary to put a paper and pencil questionnaire in each faculty member's mailbox and then collect the completed questionnaires, the chairperson of the Taiwanese university suggested using web page technology to more efficiently distribute and collect the data, instead of a paper and pencil questionnaire. Once the online questionnaire was established, the chairperson would encourage faculty members to answer those questions. Because of the increased efficiency and practicality offered by an online questionnaire, the initial plan of a paper-and-pencil questionnaire was modified to an online questionnaire. After examining several online questionnaire websites to find an effective site which met the requirement of character encoding in the Chinese language so that the faculty members could answer the questions, the FreeOnlineSurveys.com website was

selected to construct the online questionnaire and collect data (FreeOnlineSurveys). Once the Chinese language version of the instrument was completed by the respondents, the instrument was translated into an English language version. A copy of the English version instrument can be found in appendix E.

Once data were collected, internal consistency was followed to examine survey items that address question two. Research question two was given as "Are the items contained in the survey of teaching strategy reliable?"

Internal reliability of survey items of teaching strategies was tested using a Cronbach alpha (Cronbach, 1951). Field (2005) argued that Cronbach's alpha statistic exceeding 0.8 for each parameter provides the evidence of internal consistency. The teaching strategies items Cronbach alpha analysis results using Field recommendations were found to good internal consistency reliability at $\alpha = 0.94$ (see *Table 4*).

Table 4
Reliability Statistics of Teaching Strategies Items

Cronbach's Alpha	N of Items
.940	34

After internal consistency reliability with Cronbach's alpha method was examined, factor analysis using the principle components method (PCM) was conducted to examine the reliability of the questionnaire by reducing large items into classified datasets. Field (2005) stated that the purpose of PCM is to group variables of the questionnaire into a manageable data set, which preserves the original information and suggests Eigenvalues levels equal to or greater than 1. Research question three was given as "Can common factors be identified in the response of Taiwanese university faculty to the survey of teaching strategy and can those factors be used to reduce the number of survey questions while maintaining reliability?"

At the beginning stage of constructed examination, Principle Components factor analysis method was applied to discover whether mathematical factors produced by Varimax Rotation methods reflect the real-world construct (Field, 2005). Shown in Table 5, the Principle Components factor analysis method yielded a solution with eight components. Eight uncorrelated components with Eigenvalues greater than 1.0 were identified; therefore the null hypothesis was rejected. The content of each question that loads crossed components were examined to identified whether the differences between the loading values of components are similar. If loading value of each question crossed components is similar, this question was a strikeout because it may confuse faculty members' understanding the content of the question (see Table 5). Also, a loading value larger than .4 was selected to represent significant value and help researchers interpret findings (Field). Additionally, at least three questions per component are maintained (Comrey, 1988). As mentioned earlier, this instrument was developed under five theoretical frameworks of Constructive Learning (CL), 7 items; Task Ownership (TO), 6 items; Sense Ownership (SA), 6 items; Collaboration (COLL), 6 items; and Meta-cognition (Meta), 9 items; therefore the meaning of new components needed to be supported by conceptual underpinnings.

Table 5
Rotated Component Extracted from Data with Highly Loading Questions

Variable Name (Source)	Component 1	2	3	4	5	6	7	8
• COLL-groups in agreement	.885							
• COLL-research further in groups	.843							
• COLL-positive at disagreement	.816							
• COLL-negotiating	.777							

ideas												
• COLL-groups for establishing own knowlege	.743	.402										
• Meta-mistakes shared	.690											
• COLL-background and beliefs	.559											
• ~~Meta-strengths and weaknesses~~	~~.499~~								~~.424~~			
• ~~SA-criticizing project~~	~~.457~~								~~.419~~			
• CL-reflecting with teacher		.772										
• CL-confidence in learning		.719										
• SA-organizational expressions of ideas		.630										
• SA-sharing learning with me or others		.599										
• ~~SA-framing conversation~~		~~.574~~	~~.487~~									
• Meta-identifying needs of assignment			.777									
• Meta-understanding how to look for help			.725									
• ~~Meta-adapting effective learning~~			~~.545~~			~~.489~~						
• ~~TO-employing theory & practice~~			~~.497~~								~~.413~~	
• SA-mastering knowlege by conversation				.795								
• SA-sharing thinking by conversation				.738								
• ~~Meta-monitoring own learning~~	~~.433~~			~~.514~~								
• TO-using methods to solve problems				.415								
• ~~Meta-logical thinking~~												
• CL-big picture						.726						
• CL-prior experience						.703						
• CL-research further on topics						.658						

• TO-topics are close to experience					.688		
• ~~CL-conversing with other learners~~		~~.524~~			~~.561~~		
• ~~Meta-detecting errors skills~~	~~.439~~			~~.433~~	~~.515~~		
• TO-self evaluation with a rubric						.882	
• TO-sense of ownership with a rubric						.792	
• CL-interesting topic							.640
• ~~TO-applying knowlege in contexts~~			~~.466~~				~~.520~~
• Meta-understanding current knowledge							.502

After Varimax Rotation methods were applied, a number of cross-loaded questions were deleted prior to interpretation (see Table 5). It was found (see Table 6) that all Components were unipolar and the Component 1 construct held seven teaching strategies variables (Groups Agreement, 0.885; Groups Research Further, 0.843; Groups Positive, 0.816; Groups Negotiate Ideas; 0.777; Groups Own Knowledge; 0.743; Mistakes Shared; 0.69; and Groups Background; 0.559). Component 2 had four teaching strategies variables (Reflection with Teachers, 0.772; Confidence in Learning, 0.719; Organizational Express, 0.63; and Shared Learning, 0.599). Component 3 had two teaching strategies variables (Identify Assignment, 0.777; and Learning for Help, 0.725). Component 4 had three teaching strategies variables (Master Knowledge by Conversation, 0.795; Change Thinking by Conversation, 0.738; and Solve Problems, 0.412). Component 5 had three teaching strategies variables (Big Picture, 0.726; Prior Experience, 0.703; and Research further on Topics, 0.658). Component 6 had only one teaching strategy variable (Close to Experience, 0.668). Component 7 had two teaching

strategies variables (Self Performance Rubrics, 0.882 and Self Participation Rubrics, 0.792). Component 8 had two teaching strategies variables (Interesting Topics, 0.640; and Understand Current Knowledge, 0.502); where, one item of self-evaluation in logical thinking was deleted, with an absolute value less than 0.4.

Preliminary component names were then constructed (Component 1, "Collaborative learning," Component 2, "Conversation;" Component 4, "Learning by doing;" and Component 5, "Theory and research"). Components 3, 6, 7 and 8 did not measure for new components because each component was less than 3 items (Comrey, 1988). Since items with low correlation were eliminated, it was decided to rerun factor analysis to extract only four components (Field, 2005).

Table 6
Preliminary Identification of Rotated Component Extracted from Data with Highly Loading Questions

Variable Name (Source)	Preliminary Component Name	Component 1	2	3	4	5	6	7	8
• COLL-groups in agreement	Collaborative Learning	.885							
• COLL-research further in groups		.843							
• COLL-positive at disagreement		.816							
• COLL-negotiating ideas		.777							
• COLL-groups for establishing own knowlege		.743							
• Meta-mistakes Shared		.69							
• COLL-background and beliefs		.559							
• CL-reflecting with teacher	Conversation		.772						
• CL-confidence in learning			.719						
• SA-organizational expressions of ideas			.63						

• SA-sharing learning with me or others	.599					
• Meta-identifying needs of assignment		.777				
• Meta-understanding how to look help		.725				
• SA-mastering knowlege by conversation	Learning by Doing		.795			
• SA-sharing thinking by conversation			.738			
• TO-using methods to solve problems			.412			
• CL-big picture	Theory & Research			.726		
• CL-prior experience				.703		
• CL-research further on topics				.658		
• TO-topics are close to experience					.668	
• TO-self evaluation with a rubric						.882
• TO-sense of ownership with a rubric						.792
• CL-interesting topic						
• Meta-understanding current knowledge						

After repeating factor analysis with only four factors, the result of Rotated component Matrix was represented (See Table 7). A number of items with similar values (Meta-mistakes shared, SA-mastering knowledge by conversation, TO-self evaluation with a rubric, SA-sharing thinking by conversation and Meta-adapting effective Learning) were deleted prior to interpretation. One item of "TO-topics are close to experience" was deleted, with an absolute value less than 0.4.

Table 7

Four Themes of Rotated Component Extracted from Data with Highly Loading Questions

Variable Name (Source)	Component			
	1	2	3	4
• Meta-strengths and weaknesses	.737			
• Meta-detecting errors skills	.688	.406		
• TO-using methods to solve problems	.686			
• TO-applying knowlege in contexts	.669			
• Meta-understanding how to look for help	.637			
~~• Meta-mistakes shared~~	~~.623~~	~~.571~~		
• Meta-logical thinking	.608			
• Meta-monitoring own learning	.604			
• Meta-understanding current knowledge	.599			
• TO-sense of ownership with a rubric	.569			
~~• SA-mastering knowlege by conversation~~	~~.529~~		~~.507~~	
• Meta-identifying needs of assignment	.484			
~~• TO-self evaluation by scoring rubric~~	~~.424~~			~~.421~~
• COLL-groups in agreement		.862		
• COLL-groups for establishing own knowlege		.832		
• COLL-research further in groups	.432	.755		
• COLL-positive at disagreement	.437	.751		
• COLL-negotiating ideas		.740		
• SA-criticizing project		.564		
• COLL-background and beliefs		.478		
• CL-reflecting with teacher			.741	
• CL-confidence in learning			.714	
• SA-sharing learning with me or others			.662	
• SA-organizational expressions of ideas			.622	
• CL-conversing with other learners			.621	
• SA-framing conversation			.596	
~~• SA-sharing thinking by conversation~~	~~.449~~		~~.478~~	

• CL-interesting topic			.478		
~~• TO-topics are close to experience~~					
• CL-big picture					.719
• CL-research further on topics					.630
• CL-prior experience					.604
~~• Meta-adapting effective learning~~					
		~~.485~~			~~.531~~
• TO-employing theory & practice					.506

New component names were constructed as following (see Table 8). Component 1 contained ten items that clearly reflect the learning by doing for teaching strategy, and was thus labeled Learning by Doing. Component 2 contained seven items that reflect groups' activities for teaching strategy, and was labeled Collaborative Learning. Component 3 contains seven items that reflect conversation between learners and teachers for teaching strategy, and was labeled Conversation. Component 4 contains four items that reflect theory and practice for teaching strategy, and was labeled Theory and Practice. This four-component model represented the combination of the preliminary eight components, and appeared to reflect adequately the underlying twenty-eight items of teaching strategies.

Table 8

Identification of Rotated Component Extracted from Data with Highly Loading Questions

		Component			
Variable Name (Source)	New Component Name	1	2	3	4
• Meta-strengths and weaknesses	Learning by Doing	.737			
• Meta-detecting errors skills		.688			
• TO-using methods to solve problems		.686			
• TO-applying knowlege in contexts		.669			
• Meta-understanding how to look for help		.637			
• Meta-logical thinking		.608			
• Meta-monitoring own learning		.604			
• Meta-understanding current knowledge		.599			

• TO-sense of ownership with a rubric				
		.569		
• Meta-identifying needs of assignment				
		.484		
• COLL-groups in agreement				
	Collaborative Learning		.862	
• COLL-groups for establishing own knowlege				
			.832	
• COLL-research further in groups				
			.755	
• COLL-positive at disagreement				
			.751	
• COLL-negotiating ideas			.740	
• SA-criticizing project			.564	
• COLL-background and beliefs				
			.478	
• CL-reflecting with teacher	Conversation			.741
• CL-confidence in learning				
				.714
• SA-sharing learning with me or others				
				.662
• SA-organizational expressions of ideas				
				.622
• CL-conversing with other learners				
				.621
• SA-framing conversation				.596
• CL-interesting topic				.478
• CL-big picture	Theory and Practice			.719
• CL-research further on topics				.630
• CL-prior experience				.604
• TO-employing theory & practice				
				.506

After twenty-eight items were identified into four new components, Cronbach's alpha statistic method was applied to examine the internal consistency of teaching strategies as described on the questionnaire. The twenty-eight items about teaching strategies in Cronbach alpha analysis results were found to demonstrate good internal consistency reliability at $\alpha = 0.928$ (see Table 9).

Table 9

Reliability Statistics of Teaching Strategies Items

Cronbach's Alpha	N of Items
.928	28

Section II – Descriptive Statistics of Survey Items - Research Question Four

Data were calculated and analyzed with regard to demographics, internet technology usage, and teaching strategies. Research question four was given as "What are the summary statistics for internet technology usage and performance to the teaching instructional strategies?" This section provided both narrative and tables in order to illustrate details of reported frequencies by each variable. The seven demographic variables highlighted in the following narrative were gender, served college, degree source, years of experience teaching web-based courses, years in higher education, attendance at the web-based training courses, and college encouragement to attend web-based training courses. Four variables were usage of internet technology to support instruction as power point, video-based instruction, e-mail communication and encouragement of students to participate in threaded discussion.

The twenty-eight teaching strategies included: establish understanding based on their experience, understand the big picture of the learning topic, research further on the topics related to teaching objectives, be motivated about learning topics that interest them, reflect on what they have discovered with me, have confidence in learning activities, converse with other learners about the topic, ~~connect current practice that is close to students' experience~~, practice and demonstrate a familiarity with methods used to solve problems in reality, employ theory and practice in learning activities, apply their knowledge in other contexts, ~~self-evaluate their participation in learning activities with the support of a scoring rubric~~, self-evaluate their quality of learning achievement with the support of a scoring rubric,-share their knowledge and receive meaningful feedback from other learners or me, ~~change their thinking through conversation~~, ~~master their~~

~~knowledge and discover learning goals through conversation~~, communicate effectively with the support of a norm of discussion, present their project that is supported with critiques by me or other learners, express their thoughts in an organized way, work together in groups to establish their knowledge, work together in groups to share knowledge and reach an agreement on learning subjects, negotiate meaning from different perspectives with groups, research further about teaching topics within groups, demonstrate positive thinking about disagreement within groups providing chances for further research and results, understand the idea that different perspectives of group members are derived from their culture and background, understand the status of their current knowledge, identify the needs of the assigned task, ~~adapt effective learning action~~, monitor their own learning progress, understand their own thinking and know how to look for help, understand individual strengths and weaknesses to implement different learning plans, detect their error and correction skills, evaluate their performance with the support of logical thinking, ~~and ensure lessons learned from mistakes are shared~~.

Gender. An important variable in this study is gender. Of the respondents, males outnumbered females by a difference of nearly 14% more of the respondents than females (see Table 10).

Table 10
Frequency of Responses- Gender

Variable	N	%
Male	59	56.7
Female	45	43.3
Total	104	100.0

Served college. The college with the greatest representation among the respondents was that of Management, while the college with the least representation was

that of Service Industries (see Table 11). College of Humanities, Social and Natural Sciences refers to college of (HSNS). This sample distribution of four colleges above was represented at a rate similar to that of the overall faculty population.

Table 11
Frequency of Responses- Served College

Variable	N	%
Management	35	33.7
HSNS	30	28.8
Engineering	23	22.1
Service Industries	16	15.4
Total	104	100.0

Degree source. Although the faculty members surveyed taught at a Taiwanese university, many of these faculty members were educated in western universities. The numbers of responding faculty members who graduated from eastern and western education systems were represented nearly equally (see Table 12).

Table 12
Frequency of Responses- Degree Source

Variable	N	%
Eastern	53	51.0
Western	51	49.0
Total	104	100.0

Years of experience teaching web-based courses. Most respondents (86.5% of faculty members who responded) had experience teaching web-based courses. Specifically, 46.2 % of faculty members had above 4 years experience teaching web-based courses (see Table 13). To perform statistical analyses, data were recoded and were combined into small groups of 0 year and 0-1 year with value 1, 1-2 years and 2-3 years with value 2, and 4 years and more with value 3 (see Table 14).

Table 13

Frequency of Responses- Years of Experience Teaching Web-based Courses

Variable	N	%
0	14	13.5
0-1	8	7.7
1-2	9	8.7
2-3	25	24.0
4 Above	48	46.2
Total	104	100.0

Table 14

Frequency of Responses- Years of Experience Teaching Web-based Courses (Recoded)

Variable	N	%
0 Years and 0-1 Years	22	21.2
1-2 Years and 2-3 Years	34	32.7
4 Years and More	48	46.2
Total	104	100.0

Years in higher education. The majority of respondents (97.1% of the faculty members who responded) had more than one year of teaching experience in higher education. Specifically, 26.9% of faculty members had five to ten years teaching experience in higher education (see Table 15).

Table 15

Frequency of Responses- Years in Higher Education

Variable	N	%
0 -1	3	2.9
1-5	17	16.3
5-10	28	26.9
10-15	25	24.0
15-20	20	19.2
20 and More	11	10.6
Total	104	100.0

Attendance at the web-based courses training courses. Respondents indicated that 50% of faculty members had attended web-based courses training. However, the other 50% of faculty members did not attend web-based training courses (see Table 16).

Table 16

Frequency of Responses- Attendance at the Web-based Course Training Courses

Variable	N	%
Yes	52	50.0
No	52	50.0
Total	104	100.0

College encouragement to attend web-based training courses. The majority of respondents (89.5% of faculty members) reported that the served college "always," "usually," "often," or "sometimes" encouraged them to attend web-based training courses. Lessen than 3% of faculty members reported that the served college "never" encouraged them to attend web-based training courses (see Table 17).

Table 17

Frequency of Responses- College Encouragement to Attend Web-based Training Courses

	College Encouragement	
Frequency	N	%
1=Never	3	2.9
2=Rarely	1	1.0
3=Seldom	7	6.7
4=Sometimes	44	42.3
5=Often	24	23.1
6=Usually	11	10.6
7=Always	14	13.5
Total	104	100.0

Internet technology usage. Respondents indicated the amount of internet technology usage to support students' learning activities; PowerPoint, video-based instruction, e-mail communication, and threaded discussion. PowerPoint was reportedly used more frequently than any other method with over 80% of respondents using PowerPoint "always," "usually," or "often." E-mail was the second most frequently used internet technology with 75% of respondents using E-mail "always," "usually," or "often." Threaded discussion was used less frequently than any other reported internet

technology usage with under 30% of respondents using threaded discussion "always," "usually," or "often" (see Table 18).

Table 18
Frequency of Responses – Internet Technologies Usage

	PowerPoint		Video-based		E-mail		Threaded Discussion	
Frequency	N	%	N	%	N	%	N	%
1=Never	5	4.8	3	2.9	4	3.8	27	26.0
2=Rarely	2	1.9	9	8.7	3	2.9	15	14.4
3=Seldom	3	2.9	1	1.0	2	1.9	13	12.5
4=Sometimes	9	8.7	23	22.1	17	16.3	19	18.3
5=Often	12	11.5	14	13.5	11	10.6	9	8.7
6=Usually	14	13.5	19	18.3	17	16.3	8	7.7
7=Always	59	56.7	35	33.7	50	48.1	13	12.5
Total	104	100.0	104	100.0	104	100.0	104	100.0

Teaching strategies. Respondents indicated the amount of use for the following variable names of teaching strategies: prior experience, big picture, research further on topics, interesting topics, reflecting with teachers, confidence in learning, conversing with other learners, using methods to solve problems, employing theory and practice, applying knowledge in contexts, sense of ownership with a rubric, sharing learning with me or others, framing conversation, criticizing project, organizational expressions of ideas, groups for establishing own knowledge, groups in agreement, negotiating ideas, positive at disagreement, research further in groups, background and beliefs, understanding current knowledge, identifying needs of assignment, monitoring own learning, understanding how to look for help, strengths and weaknesses, detecting errors skills, and logical thinking.

The variable of "big picture" was reportedly used more frequently than any other method with 86.5% of respondents providing the big picture "always,", "usually", or "often." The variable of "confidence in learning" was the second most-frequently used teaching strategy with 85.5% of respondents providing confidence in learning "always,"

"usually," or "often." The variable of "criticizing project" was used less frequently than any other reported teaching strategy with 50% of respondents providing "criticizing project" "always," "usually," or "often" (see Tables 19-23).

Table 19

Frequency of Responses – Teaching Strategies, Part 1

	Prior Experience		Big Picture		Research Further on Topics		Interesting Topics		Reflecting with Teachers		Confidence in Learning		Conversing with Other Learners	
Frequency	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1=Never	2	1.9	1	1.0	1	1.0	1	1.0	3	2.9				
2=Rarely	5	4.8	10	9.6	1	1.0								
3 =Seldom	3	2.9	17	16.3	1	1.0	5	4.8					1	1.0
4=Sometimes	32	30.8			12	11.5	13	12.5	17	16.3	12	11.5	23	22.1
5=Often	20	19.2	17	16.3	20	19.2	24	23.1	12	11.5	17	16.3	14	13.5
6=usually	24	23.1	23	22.1	25	24.0	27	26.0	33	31.7	34	32.7	23	22.1
7=Always	15	14.4	50	48.1	41	39.4	31	29.8	35	33.7	38	36.5	40	38.5
Sub=Total	101	97.1	101	97.1	101	97.1	101	97.1	100	96.2	101	97.1	101	97.1
Missing	3	2.9	3	2.9	3	2.9	3	2.9	4	3.8	3	2.9	3	2.9
Total	104	100.0	104	100.0	104	100.0	104	100.0	104	100.0	104	100.0	104	100.0

Table 20

Frequency of Responses – Teaching Strategies, Part 2

	Using Methods to Solve Problems		Employing Theory and practice		Applying Knowledge in Contexts		Sense of Ownership with a Rubric		Sharing Learning with Me or Others		Framing Conversation		Criticizing Project	
Frequency	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1=Never							1	1.0			2	1.9	3	2.9
2=Rarely	3	2.9	2	1.9			2	1.9			4	3.8	12	11.5
3 =Seldom	4	3.8	2	2.9	12	11.5	8	7.7	5	4.8	11	10.6	10	9.6
4=Sometimes	33	31.7	13	12.5	25	24.0	29	27.9	17	16.3	14	13.5	24	23.1
5=Often	17	16.3	18	17.3	19	18.3	18	17.3	15	14.4	26	25.0	15	14.4
6=usually	21	20.2	32	30.8	27	26.0	23	22.1	35	33.7	31	29.8	22	21.2
7=Always	22	21.2	33	31.7	18	17.3	20	19.2	29	27.9	13	12.5	15	14.4
Sub=Total	100	96.2	101	97.1	101	97.1	101	97.1	101	97.1	101	97.1	101	97.1
Missing	4	3.8	3	2.9	3	2.9	3	2.9	3	2.9	3	2.9	3	2.9
Total	104	100.0	104	100.0	104	100.0	104	100.0	104	100.0	104	100.0	104	100.0

Table 21

Frequency of Responses – Teaching Strategies, Part 3

	Organizational Expressions of Ideas		Groups for Establishing Own knowledge		Groups in Agreement		Negotiating Ideas		Positive at Disagreement		Research Further in Groups		Background and Beliefs	
Frequency	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1=Never									1	1.0			1	1.0
2=Rarely	1	1.0	3	2.9	2	1.9	2	1.9	3	2.9	3	2.9	5	4.8
3 =Seldom	2	1.9	2	1.9	5	4.8	4	3.8	10	9.6	7	6.7	5	4.8
4=Sometimes	19	18.3	19	18.3	25	24.0	17	16.3	25	24.0	26	25.0	32	30.8
5=Often	23	22.1	19	18.3	19	18.3	25	24.0	21	20.2	17	16.3	19	18.3
6=usually	34	32.7	22	21.2	22	21.2	25	24.0	20	19.2	27	26.0	19	18.3
7=Always	20	19.2	35	33.7	26	25.0	25	24.0	18	17.3	19	18.3	18	17.3
Sub=Total	99	95.2	100	96.2	99	95.2	98	94.2	98	94.2	99	95.2	99	95.2
Missing	5	4.8	4	3.8	5	4.8	6	5.8	6	5.8	5	4.8	5	4.8
Total	104	100.0	104	100.0	104	100.0	104	100.0	104	100.0	104	100.0	104	100.0

Table 22

Frequency of Responses – Teaching Strategies, Part 4

	Understanding Current knowledge		Identifying Needs of Assignment		Monitoring Own Learning		Understanding How to Look for Help		Strengths and Weaknesses		Detecting Errors Skills		Logical Thinking	
Frequency	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1=Never											1	1.0		
2=Rarely	1	1.0			2	1.9			2	1.9	4	3.8	2	1.9
3 =Seldom	7	6.7	6	5.8	6	5.8	3	2.9	10	9.6	7	6.7	8	7.7
4=Sometimes	27	26.0	16	15.4	33	31.7	21	20.2	31	29.8	31	29.8	16	15.4
5=Often	23	22.1	20	19.2	20	19.2	22	21.2	19	18.3	21	20.2	25	24.0
6=usually	24	23.1	27	26.0	23	22.1	28	26.9	21	20.2	20	19.2	28	26.9
7=Always	17	16.3	30	28.8	14	13.5	24	23.1	14	13.5	13	12.5	19	18.3
Sub=Total	99	95.2	99	95.2	98	94.2	98	94.2	97	93.3	97	93.3	98	94.2
Missing	5	4.8	5	4.8	6	5.8	6	5.8	7	6.7	7	6.7	6	5.8
Total	104	100.0	104	100.0	104	100.0	104	100.0	104	100.0	104	100.0	104	100.0

Table 23

Regularity of Teaching Strategies Provided Always, Ranked by N

Variable Name	N	%
Big Picture	50	48.1
Research Further on Topics	41	39.4
Conversing with Other Learners	40	38.5
Confidence in Learning	38	36.5
Reflecting with Teachers	35	33.7
Groups for Establishing Own Knowledge	35	33.7
Employing Theory and practice	33	31.7
Interesting Topics	31	29.8
Identifying Needs of Assignment	30	28.8
Sharing Learning with Me or Others	29	27.9
Groups in Agreement	26	25
Negotiating Ideas	25	24
Understanding How to Look for Help	24	23.1
Using Methods to Solve Problems	22	21.2
Sense of Ownership with a Rubric	20	19.2
Organizational Expressions of Ideas	20	19.2
Logical Thinking	19	18.3
Research Further in Groups	19	18.3
Applying Knowledge in Contexts	18	17.3
Positive at Disagreement	18	17.3
Background and Beliefs	18	17.3
Understanding Current knowledge	17	16.3
Prior Experience	15	14.4
Criticizing Project	15	14.4
Monitoring Own Learning	14	13.5
Strengths and Weaknesses	14	13.5
Framing Conversation	13	12.5
Detecting Errors Skills	13	12.5

Section III – MANOVA Analysis – Research Questions Five

This section reports on the analysis of dependent variables that can best decide category memberships. Research question five contained two sub-questions including research question 5.1 as "Are there differences between internet technology usage reported by Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching in web-based courses, or attendance at the web-based training courses?" and research question 5.2 as "Are there differences between teaching strategies reported by Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching in web-based courses, or attendance at the web-based training courses?"

This section was divided into three distinct sub-sections. The first sub-section identified the dependent and independent variables used to answer research question 5.1 and 5.2. The second sub-section provided results from the multivariate analysis of variance (MANOVA) and followed by analysis of variance (ANOVA) tests performed of internet technology usage. The third sub-section provided results from the multivariate analysis of variance (MANOVA) and followed by analysis of variance (ANOVA) tests performed of teaching strategies. Field (2005) argued that when dependent variables are correlated, a MANOVA can be applied to examine the effects of inter-correlated dependent variables on independent variables. Therefore, a one way MANOVA was used to investigate the differences between dependent variables and each group of the independent variables. Follow-up univariate ANOVA tests were then conducted to confirm these findings.

Dependent and Independent Variables

There were four dependent variables of internet technologies usage and twenty-eight dependent variables of teaching strategies under this study. The four dependent variables were usage of internet technologies to support instruction as PowerPoint, video-based instruction, e-mail communication and threaded discussion. These variables were used in order to answer research question 5.1 (see Table 24).

Table 24
Dependent Variables – Research Question 5.1

Variable Name	Scale
PowerPoint	Likert (1-7)
Video-based Instruction	Likert (1-7)
E-mail	Likert (1-7)
Threaded Discussion	Likert (1-7)

After examining the reliability and validity of teaching strategies of the instrument on research question three, twenty-eight dependent variables of teaching strategies were identified: prior experience, big picture, research further on topics, interesting topics, reflecting with teachers, confidence in learning, conversing with other learners, using methods to solve problems, employing theory and practice, applying knowledge in contexts, sense of ownership with a rubric, sharing learning with me or others, framing conversation, criticizing project, organizational expressions of ideas, groups for establishing own knowledge, groups in agreement, negotiating ideas, positive at disagreement, research further in groups, background and beliefs, understanding current knowledge, identifying needs of assignment, monitoring own learning, understanding how to look for help, strengths and weaknesses, detecting errors skills, and logical thinking. These variables were used in order to answer research question 5.2 (see Table 25).

Table 25
Dependent Variables – Research Question 5.2

Variable Name	Scale
Prior experience	Likert (1-7)
Big picture	Likert (1-7)
Research further on topics	Likert (1-7)
Interesting topics	Likert (1-7)
Reflecting with teachers	Likert (1-7)
Confidence in learning	Likert (1-7)
Conversing with other learners	Likert (1-7)
Using Methods to solve problems	Likert (1-7)
Employing theory and practice	Likert (1-7)
Applying knowledge in contexts	Likert (1-7)
Sense of ownership with a rubric	Likert (1-7)
Sharing learning with me or others	Likert (1-7)
Framing conversation	Likert (1-7)
Criticizing project	Likert (1-7)
Organizational expressions of ideas	Likert (1-7)
Groups for establishing own knowledge	Likert (1-7)
Groups in agreement	Likert (1-7)
Negotiating ideas	Likert (1-7)
Positive at disagreement	Likert (1-7)
Research further in groups	Likert (1-7)
Background and beliefs	Likert (1-7)
Understanding current knowledge	Likert (1-7)
Identifying needs of assignment	Likert (1-7)
Monitoring own learning	Likert (1-7)
Understanding how to look for help	Likert (1-7)
Strengths and weaknesses	Likert (1-7)
Detecting errors skills	Likert (1-7)
Logical thinking.	Likert (1-7)

The independent variables were gender, served college, degree source, years of experience teaching web-based courses, years in higher education, attendance at the web-based training courses, and college encouragement to attend web-based training courses. These variables were also used in order to answer research questions 5.1 and 5.2 (see Table 26).

Table 26
Independent Variables – Research Question 5.1 and 5.2

Variable Name	Data Type
Gender	Nominal
Served college	Nominal
Degree source	Nominal
Years of experience teaching web-based courses	Ordinal
Years in higher education	Ordinal
Attendance at the web-based training courses	Nominal
College encouragement to attend web-based training courses	Ordinal

MANOVA Tests Performed of Internet Technology Usage

When processing the analysis of research question 5.1, MANOVA results showed that years of experience teaching web-based courses (Wilks' Lambda (104) = 0.651, Sig. =0.000) and attendance at the web-based training courses (Wilks' Lambda (104) = 0.776, *Sig.* =0.00) significantly affected results, however gender (Wilks' Lambda (104) = 0.957, Sig. =0.349), served college (Wilks' Lambda (104)= 0.854, Sig. =0.210), and degree source (Wilks' Lambda (104)= 0.985, Sig. =0.823), did not affect the combined dependent variables of PowerPoint, video-based instruction, e-mail communication and encouragement of students to participate in threaded discussion. Follow-up univariate ANOVA tests were then conducted to confirm these findings. Summary results and tables are presented to interpret the findings.

Gender. A one-way MANOVA was calculated to examine differences between the genders regarding internet technology usage items. A significant effect was not found (Wilks' Lambda (104) = 0.957, Sig. =0.349). The null hypothesis was not rejected. Follow-up univariate ANOVAs were then conducted to confirm these findings, as shown in Table 27, none of the internet technology usage items significantly differentiated (i.e., *Sig.* levels equal or lower than 0.05 Alpha) between the genders.

Additionally, as presented in Table 27, it was noted that no items had significant p-values and power values of 0.8 or larger (Field, 2005). A review of Eta Squared values indicated that the effect size was in all items lower than value of 0.2. The findings of power values and Eta Squared values indicated no significant difference between the genders for any of the internet technology items.

Table 27
Summary Statistics for Internet Technology Usage Items and Gender with Effect Size and Power Estimates

Internet Technology Usage	Gender	Mean	SD	N	F	Sig.	Eta^2	Power
PowerPoint	Female	5.64	1.798	45				
	Male	6.05	1.569	59	1.508	0.222	0.015	0.229
Video	Female	5.40	1.657	45				
	Male	5.12	1.792	59	0.672	0.414	0.007	0.128
Email	Female	5.62	1.749	45				
	Male	5.73	1.606	59	0.104	0.748	0.001	0.062
Discussion	Female	3.49	2.191	45				
	Male	3.37	1.982	59	0.080	0.778	0.001	0.059

Note 1: Significance Level =<0.05.
Note 2: Eta Squared values of 0.2 or higher.
Note 3: Power values of 0.80 or higher.

Served college. A one-way MANOVA was calculated to examine differences between the gender regarding internet technology usage items. A significant effect was not found (Wilks' Lambda (104) = 0.854, Sig. =0.210). The null hypothesis was not rejected. Follow-up univariate ANOVAs were then conducted to confirm these findings, as shown in Table 28, three of four internet technology usage items were not significantly differentiated (i.e., *Sig.* levels equal or lower than 0.05 Alpha) among the served colleges. Only one item (PowerPoint), with (*Sig.* =< 0.05), significantly differentiated between the served colleges.

Table 28
Summary Statistics for Internet Technology Usage Items and Served College with Effect Size and Power Estimates

Internet Technology Usage	Served college	Mean	SD	N	F	Sig.	Eta^2	Power
PowerPoint	HSNS	5.00	2.051	30				
	Engineering	6.22	1.043	23				
	Management	6.26	1.521	35				
	Service industries	6.19	1.471	16	4.194	.008*	.112	.843
Video	HSNS	5.13	1.756	30				
	Engineering	5.26	1.685	23				
	Management	5.11	1.875	35				
	Service industries	5.69	1.493	16	.449	.718	.013	.137
Email	HSNS	5.13	1.943	30				
	Engineering	5.87	1.290	23				
	Management	5.89	1.586	35				
	Service industries	6.00	1.633	16	1.584	.198	.045	.406
Discussion	HSNS	3.07	2.033	30				
	Engineering	3.65	2.166	23				
	Management	3.63	2.059	35				
	Service industries	3.31	2.089	16	.516	.673	.015	.152

Note 1: *Significance Level =<0.05.
Note 2: Eta Squared values of 0.2 or higher.
Note 3: Power values of 0.80 or higher.

Additionally, as presented in Table 29, it was noted that only one item had significant p-values and power values of 0.8 or larger (Field, 2005). These observations suggested that one item (PowerPoint) should be considered for further study. A review of Eta Squared values indicated that the effect size was in all items lower than value of 0.2.

Table 29
Summary Table of Internet Technology Usage with P-values of 0.05 or less and Power Values of 0.8 or Greater

PowerPoint

Degree source. A one-way MANOVA was calculated to examine differences between the degree source regarding internet technology usage items. A significant effect was not found (Wilks' Lambda (104) = 0.985, Sig. =0.823). The null hypothesis was not rejected. Follow-up Univariate ANOVA were then conducted to confirm these findings,

as shown in Table 30; none of the internet technology usage items significantly differentiated (i.e., *Sig.* levels equal or lower than 0.05 Alpha) among the degree sources.

Additionally, as presented in Table 30, it was noted no items had significant p-values and power values of 0.8 or larger (Field, 2005). A review of Eta Squared values indicated that the effect size was in four items lower than value of 0.2.

Table 30
Summary Statistics for Internet Technology Usage Items and Degree Source with Effect Size and Power Estimates

Internet Technology Usage	Gender	Mean	SD	N	F	Sig.	Eta^2	Power
PowerPoint	Eastern	5.85	1.725	53				
	Western	5.90	1.640	51	.026	.873	.000	.053
Video	Eastern	5.06	1.813	53				
	Western	5.43	1.640	51	1.219	.272	.012	.194
Email	Eastern	5.58	1.737	53				
	Western	5.78	1.591	51	.372	.543	.004	.093
Discussion	Eastern	3.34	1.860	53				
	Western	3.51	2.275	51	.175	.677	.002	.070

Note 1: Significance Level =<0.05.
Note 2: Eta Squared values of 0.2 or higher.
Note 3: Power values of 0.80 or higher.

Years of experience teaching web-based courses. A one-way MANOVA was calculated to examine differences between years of experience teaching web-based courses regarding internet technology usage items. A significant effect was found (Wilks' Lambda (104) = 0.651, Sig. =0.000). The null hypothesis was rejected. Follow-up univariate ANOVAs were then conducted to confirm these findings, as shown in Table 31; four internet technology usage items significantly differentiated (i.e., *Sig.* levels equal or lower than 0.05 Alpha) between the years of experience teaching web-based courses.

Table 31

Summary Statistics for Internet Technology Usage Items and Years of Experience Teaching Web-based Courses with Effect Size and Power Estimates

Internet Technology Usage	Years of Experience Teaching Web-based Courses	Mean	SD	N	F	Sig.	Eta^2	Power
PowerPoint	1=less than one yr	4.27	2.434	22				
	2=less than four yrs and more than one yrs	5.91	1.111	34				
	3=four yrs and more	6.58	.964	48	19.499	.000*	.279	1.000
Video	1=less than one yr	4.14	1.885	22				
	2=less than four yrs and more than one yrs	5.18	1.403	34				
	3=four yrs and more	5.79	1.650	48	7.844	.001*	.134	.947
Email	1=less than one yr	4.50	2.241	22				
	2=less than four yrs and more than one yrs	5.82	1.424	34				
	3=four yrs and more	6.13	1.231	48	8.463	.000*	.144	.961
Discussion	1=less than one yr	1.86	1.490	22				
	2=less than four yrs and more than one yrs	3.53	2.048	34				
	3=four yrs and more	4.06	1.961	48	10.146	.000*	.167	.984

Note 1: *Significance Level =<0.05.
Note 2: Eta Squared values of 0.2 or higher.
Note 3: Power values of 0.80 or higher.

As presented in Table 32, it was noted that four items had significant p-values and power values of 0.8 or larger (Field, 2005). These observations suggested that four items (PowerPoint, video, email, and discussion) should be considered for further study.

Table 32

Summary Table of Internet Technology Usage Items with P-values of 0.05 or less and Power Values of 0.8 or Greater

PowerPoint
Video
Email
Discussion

A review of Eta Squared values indicated that the effect size was in most cases with correlations of less than the value of 0.3 (Field, 2005). However, since the sample size of this study was 104, effect sizes of at least 0.2 were noted (Field). It was found that one item (PowerPoint) had effect sizes of at least 0.2 (see Table 33) and therefore is considered to the most powerful item that differentiated between years of experience teaching web-based courses among respondents.

Table 33
Summary Table of Internet Technology Usage Items with Effective Size Values of 0.2 or Greater

PowerPoint

Attendance at the web-based training courses. A one-way MANOVA was calculated to examine differences between attendances at the web-based training courses regarding internet technology usage items. A significant effect was found (Wilks' Lambda (104) = 0.776, *Sig.* = 0.00). The null hypothesis was not rejected. Follow-up univariate ANOVA were then conducted to confirm these findings; as shown in Table 34, four internet technology usage items significantly differentiated (i.e., *Sig.* levels equal or lower than 0.05 Alpha) between attendance at the web-based training courses.

Table 34
Summary Statistics for Internet Technology Usage Items and Attendance at the Web-based Training Courses with Effect Size and Power Estimates

Internet Technology Usage	Attendance at the Web-based Training Courses	Mean	SD	N	F	Sig.	Eta^2	Power
PowerPoint	1=Yes	6.19	1.314	52				
	2=No	5.56	1.934	52	3.829	.053	.036	.491
Video	1=Yes	5.92	1.266	52				
	2=No	4.56	1.873	52	18.978	.000*	.157	.991
Email	1=Yes	6.23	1.215	52				
	2=No	5.13	1.869	52	12.581	.001*	.110	.940
Discussion	1=Yes	4.02	2.044	52				
	2=No	2.83	1.927	52	9.368	.003*	.084	.858

Note 1: *Significance Level =<0.05.

Note 2: Eta Squared values of 0.2 or higher.
Note 3: Power values of 0.80 or higher.

As presented in Table 35, it was noted three items had significant p-values and power values of 0.8 or larger (Field, 2005). These observations suggested that three items (video, email, and discussion) should be considered for further study. A review of Eta Squared values indicated that the effect size was in four items lower than the value of 0.2.

Table 35
Summary Table of Internet Technology Usage Items with P-values of 0.05 or less and Power Values of 0.8 or Greater

Video
Email
Discussion

MANOVA Tests Performed of Teaching Strategies

When processing the analysis of research question 5.2 , MANOVA results showed that gender (Wilks' Lambda (91) = 0.715, *Sig.* = 0.632), served college (Wilks' Lambda (91) = 0.327, *Sig.* = 0.550), degree source (Wilks' Lambda (91) = 0.603, *Sig.* = 0.111), years of experience teaching web-based courses (Wilks' Lambda (91) = 0.414, *Sig.* = 0.196), and attendance at the web-based training courses (Wilks' Lambda (91) = 0.746, *Sig.* = 0.792) did not affect the combined dependent variables of prior experience, big picture, research further on topics, interesting topics, reflecting with teachers, confidence in learning, conversing with other learners, using methods to solve problems, employing theory and practice, applying knowledge in contexts, sense of ownership with a rubric, sharing learning with me or others, framing conversation, criticizing project, organizational expressions of ideas, groups for establishing own knowledge, groups in agreement, negotiating ideas, positive at disagreement, research further in groups, background and beliefs, understanding current knowledge, identifying needs of

assignment, monitoring own learning, understanding how to look for help, strengths and weaknesses, detecting errors skills, and logical thinking. Follow-up univariate ANOVA tests were then conducted to confirm these findings. Summary results and tables are presented to interpret the findings.

Gender. A one-way MANOVA was applied to examine differences of opinion between the gender regarding to teaching strategies items. A significant effect was not found (Wilks' Lambda (91) = 0.715, *Sig.* = 0.632). The null hypothesis was not rejected. Follow-up univariate ANOVA tests were then conducted to confirm these findings, as shown in Table 36, twenty-seven of twenty-eight teaching strategies items did not significantly differentiate (i.e., *Sig.* levels equal to or lower than 0.05 alpha) between the genders. Only one item (Meta-Understand how to look for help), with (*Sig.* =< 0.05), significantly differentiated between the gender.

Additionally, it was noted that no items had significant p-values and power values of 0.8 or larger (Field, 2005). A review of Eta Squared values indicated no items with an effect size higher than the value of 0.2.

Table 36
Summary Statistics for Teaching Strategies Items and Gender with Effect Size and Power Estimates

Dependent Variable	Gender	Mean	SD	N	F	Sig.	Eta^2	Power
CL-prior experience	Female	4.952	1.447	42				
	Male	4.918	1.351	49	.013	.908	.000	.052
CL-big picture	Female	6.000	1.059	42				
	Male	6.306	.940	49	2.133	.148	.023	.304
CL-research further on topics	Female	5.762	1.303	42				
	Male	6.000	1.080	49	.908	.343	.010	.156
CL-interesting topics	Female	5.786	1.406	42				
	Male	5.510	1.120	49	1.081	.301	.012	.177
CL-reflecting with teachers	Female	5.833	1.146	42	.005	.943	.000	.051

	Male	5.816	1.112	49				
CL-confidence in Learning	Female	5.881	1.109	42				
	Male	6.041	.957	49	.545	.462	.006	.113
CL-conversing with other learners	Female	5.810	1.273	42				
	Male	5.837	1.124	49	.012	.914	.000	.051
TO-using Methods to solve problems	Female	4.905	1.303	42				
	Male	5.367	1.270	49	2.930	.090	.032	.395
TO-employing theory & practice	Female	5.500	1.254	42				
	Male	5.959	1.098	49	3.467	.066	.037	.453
TO-applying knowlege in contexts	Female	4.857	1.336	42				
	Male	5.367	1.185	49	3.728	.057	.040	.480
TO-sense of ownership with a rubric	Female	5.048	1.378	42				
	Male	5.224	1.263	49	.408	.525	.005	.097
SA-sharing learning with me or others	Female	5.690	1.179	42				
	Male	5.694	1.122	49	.000	.989	.000	.050
SA-framing conversation	Female	4.810	1.234	42				
	Male	5.245	1.347	49	2.551	.114	.028	.352
SA-criticizing project	Female	4.357	1.650	42				
	Male	4.735	1.630	49	1.199	.276	.013	.192
SA-organizational expressions of ideas	Female	5.357	1.186	42				
	Male	5.612	.975	49	1.268	.263	.014	.200
COLL-groups for establishing own knowledge	Female	5.452	1.365	42				
	Male	5.796	1.274	49	1.539	.218	.017	.233
COLL-groups in agreement	Female	5.286	1.384	42				
	Male	5.347	1.332	49	.046	.830	.001	.055
COLL-negotiating ideas	Female	5.357	1.284	42				
	Male	5.531	1.293	49	.410	.524	.005	.097
COLL-positive at disagreement	Female	4.857	1.372	42				
	Male	5.020	1.407	49	.312	.578	.003	.086
COLL-research further in groups	Female	5.000	1.325	42				
	Male	5.347	1.362	49	1.504	.223	.017	.228
COLL-background and	Female	4.762	1.284	42	1.904	.171	.021	.276

beliefs								
	Male	5.163	1.463	49				
Meta-understanding current knowledge	Female	4.976	1.220	42				
	Male	5.184	1.286	49	.617	.434	.007	.122
Meta-identifying needs of assignment	Female	5.452	1.273	42				
	Male	5.633	1.270	49	.455	.502	.005	.102
Meta-monitoring own learning	Female	4.857	1.317	42				
	Male	5.122	1.218	49	.995	.321	.011	.167
Meta-understanding how to look for help	Female	5.167	1.167	42				
	Male	5.714	1.118	49	5.211	.025*	.055	.617
Meta-strengths and weaknesses	Female	4.810	1.330	42				
	Male	5.000	1.323	49	.467	.496	.005	.104
Meta-detecting errors skills	Female	4.714	1.384	42				
	Male	4.878	1.394	49	.312	.578	.003	.086
Meta-logical thinking	Female	5.167	1.305	42				
	Male	5.306	1.342	49	.251	.618	.003	.079

Note 1: *Significance Level =<0.05.
Note 2: Eta Squared values of 0.2 or higher.
Note 3: Power values of 0.80 or higher.

Served college. A one-way MANOVA was calculated to examine differences of perspective among the served colleges regarding the teaching strategies items. A significant effect was not found (Wilks' Lambda (91) = 0.327, *Sig.* = 0.550). The null hypothesis was not rejected. Follow-up univariate ANOVA were then conducted to confirm these findings. As shown in Table 37, none of the teaching strategies items significantly differentiate (i.e., *Sig.* levels equal or lower than 0.05 alpha) among the served colleges.

Additionally, as presented in Table 37, it was noted that no items had significant p-values and power values of 0.8 or larger (Field, 2005). A review of Eta Squared values indicated that the effect size was in twenty-eight items lower than the value of 0.2.

Table 37
Summary Statistics for Teaching Strategies Items and Served College with Effect Size and Power Estimates

Dependent Variable	T-College	Mean	SD	N	F	Sig.	Eta^2	Power
CL-prior experience	HSNS	4.85	1.405	26				
	Engineering	4.90	1.375	21				
	Management	5.24	1.327	29				
	Service industries	4.53	1.506	15	.925	.432	.031	.246
CL-big picture	HSNS	5.88	.993	26				
	Engineering	6.10	1.136	21				
	Management	6.41	.867	29				
	Service industries	6.27	1.033	15	1.374	.256	.045	.354
CL-research further on topics	HSNS	5.65	1.231	26				
	Engineering	6.29	.784	21				
	Management	5.86	1.407	29				
	Service industries	5.80	1.082	15	1.160	.330	.038	.302
CL-interesting topics	HSNS	5.58	1.301	26				
	Engineering	5.57	1.165	21				
	Management	5.62	1.399	29				
	Service industries	5.87	1.125	15	.201	.896	.007	.086
CL-reflecting with teachers	HSNS	5.65	1.198	26				
	Engineering	6.05	.921	21				
	Management	5.79	1.146	29				
	Service industries	5.87	1.246	15	.484	.694	.016	.144
CL-confidence in learning	HSNS	6.08	.935	26				
	Engineering	5.95	1.117	21				
	Management	6.00	1.035	29				
	Service industries	5.73	1.100	15	.362	.781	.012	.118
CL-conversing with other learners	HSNS	5.73	1.218	26				
	Engineering	6.00	1.140	21				
	Management	5.86	1.156	29				
	Service industries	5.67	1.345	15	.297	.827	.010	.105
TO-using methods to solve problems	HSNS	5.35	1.231	26				

	Engineering	4.95	1.024	21				
	Management	5.10	1.496	29				
	Service industries	5.20	1.424	15	.371	.774	.013	.120
TO-employing theory & practice	HSNS	5.81	1.132	26				
	Engineering	5.90	1.044	21				
	Management	5.62	1.265	29				
	Service industries	5.67	1.397	15	.271	.846	.009	.100
TO-applying knowlege in contexts	HSNS	5.35	1.198	26				
	Engineering	5.24	1.136	21				
	Management	5.10	1.423	29				
	Service industries	4.67	1.291	15	.962	.415	.032	.255
TO-sense of ownership with a rubric	HSNS	5.46	1.392	26				
	Engineering	5.24	1.221	21				
	Management	5.00	1.363	29				
	Service industries	4.73	1.163	15	1.154	.332	.038	.301
SA-sharing learning with me or others	HSNS	5.58	1.238	26				
	Engineering	5.76	1.179	21				
	Management	5.90	.976	29				
	Service industries	5.40	1.242	15	.745	.528	.025	.203
SA-framing conversation	HSNS	4.96	1.148	26				
	Engineering	5.29	1.419	21				
	Management	4.90	1.291	29				
	Service industries	5.13	1.506	15	.412	.745	.014	.129
SA-Criticizing project	HSNS	4.42	1.653	26				
	Engineering	4.67	1.683	21				
	Management	4.59	1.783	29				
	Service industries	4.60	1.404	15	.092	.964	.003	.066
SA-organizational expressions of ideas	HSNS	5.58	1.102	26				
	Engineering	5.86	.793	21				
	Management	5.28	1.131	29				
	Service industries	5.27	1.223	15	1.485	.224	.049	.380
COLL-groups for establishing own knowledge	HSNS	5.65	1.198	26				
	Engineering	5.95	1.244	21				
	Management	5.52	1.503	29				
	Service	5.40	1.298	15	.633	.596	.021	.178

	industries							
COLL-groups in agreement	HSNS	5.46	1.240	26				
	Engineering	5.38	1.203	21				
	Management	5.17	1.605	29				
	Service industries	5.27	1.280	15	.227	.877	.008	.091
COLL-negotiating ideas	HSNS	5.58	1.102	26				
	Engineering	5.38	1.244	21				
	Management	5.28	1.437	29				

Note 1: *Significance Level =<0.05.
Note 2: Eta Squared values of 0.2 or higher.
Note 3: Power values of 0.80 or higher.

Degree source. A one-way MANOVA was applied to examine differences of perspective between the genders regarding the teaching strategies items. A significant effect was not found (Wilks' Lambda (91) = 0.603, *Sig.* = 0.111). The null hypothesis was not rejected. Follow-up univariate ANOVAs were then conducted to confirm these findings. As shown in Table 38, twenty-four of twenty-eight teaching strategies items did not significantly differentiate (i.e., *Sig.* levels equal or lower than 0.05 alpha) between the degree source. Four items with (*Sig.* =< 0.05) significantly differentiated between the degree source (CL-interesting topics, CL-confidence in Learning, COLL-background and beliefs, and Meta-understanding how to look for help).

Additionally, as presented in Table 38, it was noted that no items had significant p-values and power values of 0.8 or larger (Field, 2005). A review of Eta Squared values indicated that no item with effect size higher than value of 0.2.

Table 38
Summary Statistics for Teaching Strategies Items and Degree source with Effect Size and Power Estimates

Dependent Variable	Degree source	Mean	SD	N	F	Sig.	Etz^2	Power
CL-prior experience	Eastern	5.00	1.398	46				
	Western	4.87	1.392	45	.208	.650	.002	.074
CL-big picture	Eastern	6.22	1.031	46				
	Western	6.11	.982	45	.253	.616	.003	.079

CL-research further on topics	Eastern	5.85	1.316	46				
	Western	5.93	1.053	45	.117	.733	.001	.063
CL-interesting topics	Eastern	5.37	1.388	46				
	Western	5.91	1.062	45	4.354	.040*	.047	.541
CL-reflecting with teachers	Eastern	5.67	1.156	46				
	Western	5.98	1.076	45	1.683	.198	.019	.250
CL-confidence in learning	Eastern	5.74	1.104	46				
	Western	6.20	.894	45	4.774	.032*	.051	.580
CL-conversing with other learners	Eastern	5.98	1.238	46				
	Western	5.67	1.128	45	1.573	.213	.017	.237
TO-using methods to solve problems	Eastern	5.30	1.364	46				
	Western	5.00	1.225	45	1.252	.266	.014	.198
TO-employing theory & practice	Eastern	5.61	1.406	46				
	Western	5.89	.910	45	1.267	.263	.014	.200
TO-applying knowlege in contexts	Eastern	5.00	1.366	46				
	Western	5.27	1.176	45	.994	.321	.011	.167
TO-sense of ownership with a rubric	Eastern	4.98	1.308	46				
	Western	5.31	1.311	45	1.470	.229	.016	.224
SA-sharing learning with me or others	Eastern	5.59	1.107	46				
	Western	5.80	1.179	45	.790	.377	.009	.142
SA-framing conversation	Eastern	4.91	1.330	46				
	Western	5.18	1.284	45	.932	.337	.010	.159
SA-criticizing project	Eastern	4.72	1.721	46				
	Western	4.40	1.558	45	.849	.359	.009	.149
SA-organizational expressions of ideas	Eastern	5.50	1.070	46				
	Western	5.49	1.100	45	.002	.961	.000	.050
COLL-groups for establishing own knowledge	Eastern	5.59	1.423	46				
	Western	5.69	1.221	45	.134	.715	.002	.065
COLL-groups in agreement	Eastern	5.33	1.367	46				
	Western	5.31	1.345	45	.003	.958	.000	.050
COLL-negotiating ideas	Eastern	5.48	1.378	46				
	Western	5.42	1.196	45	.043	.837	.000	.055
COLL-positive at disagreement	Eastern	5.04	1.505	46				
	Western	4.84	1.261	45	.467	.496	.005	.104

COLL-research further in groups	Eastern	5.04	1.414	46				
	Western	5.33	1.279	45	1.051	.308	.012	.174
COLL-background and beliefs	Eastern	4.70	1.443	46				
	Western	5.27	1.286	45	3.964	.050*	.043	.504
Meta-understanding current knowledge	Eastern	4.93	1.289	46				
	Western	5.24	1.209	45	1.395	.241	.015	.215
Meta-identifying needs of assignment	Eastern	5.43	1.241	46				
	Western	5.67	1.297	45	.760	.386	.008	.139
Meta-monitoring own learning	Eastern	4.91	1.297	46				
	Western	5.09	1.240	45	.437	.510	.005	.100
Meta-understanding how to look for help	Eastern	5.22	1.263	46				
	Western	5.71	1.014	45	4.215	.043*	.045	.528
Meta-strengths and weaknesses	Eastern	4.89	1.251	46				
	Western	4.93	1.405	45	.023	.880	.000	.053
Meta-detecting errors skills	Eastern	4.89	1.337	46				
	Western	4.71	1.440	45	.383	.538	.004	.094
Meta-logical thinking	Eastern	5.17	1.387	46				
	Western	5.31	1.258	45	.244	.623	.003	.078

Note 1: *Significance Level =<0.05.
Note 2: Eta Squared values of 0.2 or higher.
Note 3: Power values of 0.80 or higher.

Years of experience teaching web-based courses. A one-way MANOVA was applied to examine differences of perspective between the genders regarding the teaching strategies items. A significant effect was not found (Wilks' Lambda (91) = 0.414, *Sig.* = 0.196). The null hypothesis was not rejected. Follow-up univariate ANOVA were then conducted to confirm these findings. As shown in Table 39, seventeen of twenty-eight teaching strategies items did not significantly differentiate (i.e., *Sig.* levels equal or lower than 0.05 alpha) between the years of experience teaching web-based courses. Nine items with (*Sig.* =< 0.05) significantly differentiated between the years of experience teaching web-based courses (CL-research further on topics, CL-interesting topics, TO-employing

theory & practice, TO-sense of ownership with a rubric, COLL-positive at disagreement, COLL-research further in groups, COLL-background and beliefs, Meta-understanding current knowledge, and Meta-strengths and weaknesses).

Table 39

Summary Statistics for Teaching Strategies Items and Years of Experience Teaching Web-based Courses with Effect Size and Power Estimates

Dependent Variable	Years of experience teaching web-based courses	Mean	SD	N	F	Sig.	Eta^2	Power
CL-prior experience	1=less than one yr	4.53	1.611	19				
	2=less than four yrs and more than one yr	5.13	1.008	32				
	3=four yrs and more	4.98	1.527	40	1.142	.324	.025	.245
CL-big picture	1=less than one yr	6.21	1.032	19				
	2=less than four yrs and more than one yr	6.06	1.045	32				
	3=four yrs and more	6.23	.974	40	.254	.776	.006	.089
CL-research further on topics	1=less than one yr	5.11	1.595	19				
	2=less than four yrs and more than one yr	6.22	.870	32				
	3=four yrs and more	6.00	1.038	40	6.186	.003*	.123	.882
CL-interesting topics	1=less than one yr	5.05	1.471	19				
	2=less than four yrs and more than one yr	5.47	1.270	32				
	3=four yrs and more	6.05	1.011	40	4.856	.010*	.099	.789
CL-reflecting with teachers	1=less than one yr	5.53	1.073	19				
	2=less than four yrs and more than one yr	5.75	1.078	32				
	3=four yrs and more	6.03	1.165	40	1.394	.254	.031	.292
CL-confidence in learning	1=less than one yr	5.95	.970	19				
	2=less than four yrs and more than one yr	5.72	1.170	32				

	3=four yrs and more	6.18	.903	40	1.790	.173	.039	.365
CL-conversing with other learners	1=less than one yr	5.63	1.116	19				
	2=less than four yrs and more than one yr	5.88	1.338	32				
	3=four yrs and more	5.88	1.114	40	.310	.734	.007	.098
TO-using methods to solve problems	1=less than one yr	5.21	1.398	19				
	2=less than four yrs and more than one yr	4.97	1.282	32				
	3=four yrs and more	5.28	1.281	40	.511	.601	.011	.132
TO-employing theory & practice	1=less than one yr	5.21	1.619	19				
	2=less than four yrs and more than one yr	5.66	1.004	32				
	3=four yrs and more	6.08	.997	40	3.769	.027*	.079	.674
TO-applying knowlege in contexts	1=less than one yr	4.95	1.393	19				
	2=less than four yrs and more than one yr	4.84	1.167	32				
	3=four yrs and more	5.45	1.260	40	2.326	.104	.050	.460
TO-sense of ownership with a rubric	1=less than one yr	4.68	1.565	19				
	2=less than four yrs and more than one yr	4.94	1.105	32				
	3=four yrs and more	5.53	1.261	40	3.419	.037*	.072	.629
SA-sharing learning with me or others	1=less than one yr	5.32	1.204	19				
	2=less than four yrs and more than one yr	5.56	1.216	32				
	3=four yrs and more	5.98	1.000	40	2.550	.084	.055	.498
SA-framing conversation	1=less than one yr	4.63	1.212	19				
	2=less than four yrs and more than one yr	5.06	1.343	32				
	3=four yrs and more	5.23	1.310	40	1.342	.267	.030	.283

SA-criticizing project	1=less than one yr	4.42	1.539	19				
	2=less than four yrs and more than one yr	4.44	1.501	32				
	3=four yrs and more	4.73	1.811	40	.354	.703	.008	.105
SA-organizational expressions of ideas	1=less than one yr	5.26	1.046	19				
	2=less than four yrs and more than one yr	5.50	.984	32				
	3=four yrs and more	5.60	1.172	40	.623	.539	.014	.151
COLL-groups for establishing own knowledge	1=less than one yr	5.32	1.493	19				
	2=less than four yrs and more than one yr	5.78	1.184	32				
	3=four yrs and more	5.68	1.347	40	.765	.468	.017	.176
COLL-groups in agreement	1=less than one yr	5.11	1.524	19				
	2=less than four yrs and more than one yr	5.16	1.247	32				
	3=four yrs and more	5.55	1.339	40	1.059	.351	.024	.230
COLL-negotiating ideas	1=less than one yr	5.26	1.522	19				
	2=less than four yrs and more than one yr	5.19	1.091	32				
	3=four yrs and more	5.75	1.276	40	2.003	.141	.044	.404
COLL-positive at disagreement	1=less than one yr	4.63	1.422	19				
	2=less than four yrs and more than one yr	4.59	1.292	32				
	3=four yrs and more	5.38	1.353	40	3.644	.030*	.076	.658
COLL-research further in groups	1=less than one yr	5.05	1.393	19				
	2=less than four yrs and more than one yr	4.75	1.244	32				
	3=four yrs and more	5.60	1.317	40	3.880	.024*	.081	.688
COLL-background and beliefs	1=less than one yr	4.68	1.455	19				
	2=less than four yrs and	4.53	1.047	32				

	more than one yr 3=four yrs and more	5.48	1.467	40	5.049	.008*	.103	.805
Meta-understanding current knowledge	1=less than one yr	4.68	1.250	19				
	2=less than four yrs and more than one yr	4.69	1.030	32				
	3=four yrs and more	5.60	1.257	40	6.718	.002*	.132	.908
Meta-identifying needs of assignment	1=less than one yr	5.21	1.134	19				
	2=less than four yrs and more than one yr	5.44	1.190	32				
	3=four yrs and more	5.80	1.363	40	1.608	.206	.035	.332
Meta-monitoring own learning	1=less than one yr	4.68	1.293	19				
	2=less than four yrs and more than one yr	5.00	1.368	32				
	3=four yrs and more	5.15	1.167	40	.871	.422	.019	.196
Meta-understanding how to look for help	1=less than one yr	5.16	1.214	19				
	2=less than four yrs and more than one yr	5.47	1.164	32				
	3=four yrs and more	5.60	1.150	40	.923	.401	.021	.205
Meta-strengths and weaknesses	1=less than one yr	4.58	1.465	19				
	2=less than four yrs and more than one yr	4.63	1.040	32				
	3=four yrs and more	5.30	1.381	40	3.233	.044*	.068	.603
Meta-detecting errors skills	1=less than one yr	4.74	1.408	19				
	2=less than four yrs and more than one yr	4.63	1.314	32				
	3=four yrs and more	4.98	1.441	40	.590	.557	.013	.145
Meta-logical thinking	1=less than one yr	4.95	1.177	19				
	2=less than four yrs and more than one yr	5.13	1.314	32				

	3=four yrs and more	5.48	1.377	40	1.229	.297	.027	.262

Note 1: *Significance Level =<0.05.
Note 2: Eta Squared values of 0.2 or higher.
Note 3: Power values of 0.80 or higher.

Additionally, as presented in Table 40, it was noted that three items had significant p-values and power values of 0.8 or larger (Field, 2005). These observations suggested that these three items (CL-research further on topics, COLL-background and beliefs, and Meta-understanding current knowledge) should be considered for further study. A review of Eta Squared values indicated no items with an effect size higher than the value of 0.2.

Table 40
Summary Table of Years of Experience Teaching Web-based Courses with P-values of 0.05 or less and Power Values of 0.8 or Greater

CL-research further on topics
COLL-background and belief
Meta-understanding current knowledge

Attendance at the web-based training courses. A one-way MANOVA was calculated to examine differences of perspective between attendances at the web-based training courses regarding the teaching strategies items. A significant effect was not found (Wilks' Lambda (91) = 0.746, *Sig.* = 0.792). The null hypothesis was not rejected. Follow-up univariate ANOVA were then conducted to confirm these findings. As shown in Table 41, none of teaching strategies items significantly differentiate (i.e., *Sig.* levels equal or lower than 0.05 alpha) between attendance at the web-based training courses.

Additionally, as presented in Table 41, it was noted that no items had significant p-values and power values of 0.8 or larger (Field, 2005). A review of Eta Squared values indicated that the effect size was in all items lower than the value of 0.2.

Table 41

Summary Statistics for Teaching Strategies Items and Attendance at the Web-based Training Courses with Effect Size and Power Estimates

Dependent Variable	Attend web training	Mean	SD	N	F	Sig.	Eta^2	power
CL-prior experience	1=Yes	4.96	1.476	45				
	2=No	4.91	1.314	46	.021	.885	.000	.052
CL-big picture	1=Yes	6.07	1.074	45				
	2=No	6.26	.929	46	.852	.359	.009	.150
CL-research further on topics	1=Yes	5.82	1.284	45				
	2=No	5.96	1.095	46	.289	.592	.003	.083
CL-interesting topics	1=Yes	5.71	1.392	45				
	2=No	5.57	1.128	46	.302	.584	.003	.085
CL-reflecting with teachers	1=Yes	5.87	1.217	45				
	2=No	5.78	1.031	46	.127	.723	.001	.064
CL-confidence in learning	1=Yes	6.02	1.158	45				
	2=No	5.91	.890	46	.255	.615	.003	.079
CL-conversing with other learners	1=Yes	5.93	1.268	45				
	2=No	5.72	1.109	46	.748	.389	.008	.137
TO-using methods to solve problems	1=Yes	5.07	1.452	45				
	2=No	5.24	1.139	46	.398	.530	.004	.096
TO-employing theory & practice	1=Yes	5.62	1.284	45				
	2=No	5.87	1.087	46	.985	.324	.011	.166
TO-applying knowlege in contexts	1=Yes	5.07	1.388	45				
	2=No	5.20	1.167	46	.231	.632	.003	.076
TO-sense of ownership with a rubric	1=Yes	5.22	1.396	45				
	2=No	5.07	1.237	46	.323	.571	.004	.087
SA-sharing learning with me or others	1=Yes	5.64	1.264	45				
	2=No	5.74	1.021	46	.155	.695	.002	.068
SA-framing conversation	1=Yes	5.00	1.523	45				
	2=No	5.09	1.071	46	.100	.753	.001	.061
SA-criticizing project	1=Yes	4.76	1.848	45				
	2=No	4.37	1.404	46	1.262	.264	.014	.199
SA-organizational expressions of ideas	1=Yes	5.62	1.211	45				
	2=No	5.37	.928	46	1.251	.266	.014	.198
COLL-groups for establishing own	1=Yes	5.51	1.576	45				

knowledge								
	2=No	5.76	1.015	46	.812	.370	.009	.145
COLL-groups in agreement	1=Yes	5.29	1.547	45				
	2=No	5.35	1.140	46	.043	.836	.000	.055
COLL-negotiating ideas	1=Yes	5.24	1.384	45				
	2=No	5.65	1.159	46	2.325	.131	.025	.326
COLL-positive at disagreement	1=Yes	5.00	1.581	45				
	2=No	4.89	1.178	46	.139	.710	.002	.066
COLL-research further in groups	1=Yes	5.16	1.507	45				
	2=No	5.22	1.191	46	.047	.828	.001	.055
COLL-background and beliefs	1=Yes	5.07	1.483	45				
	2=No	4.89	1.303	46	.359	.550	.004	.091
Meta-understanding current knowledge	1=Yes	5.02	1.438	45				
	2=No	5.15	1.053	46	.243	.624	.003	.078
Meta-identifying needs of assignment	1=Yes	5.58	1.323	45				
	2=No	5.52	1.225	46	.044	.834	.000	.055
Meta-monitoring own learning	1=Yes	4.91	1.311	45				
	2=No	5.09	1.226	46	.437	.510	.005	.100
Meta-understanding how to look for help	1=Yes	5.36	1.246	45				
	2=No	5.57	1.088	46	.732	.395	.008	.135
Meta-strengths and weaknesses	1=Yes	4.93	1.483	45				
	2=No	4.89	1.159	46	.023	.880	.000	.053
Meta-detecting errors skills	1=Yes	4.87	1.575	45				
	2=No	4.74	1.182	46	.191	.663	.002	.072
Meta-logical thinking	1=Yes	5.24	1.525	45				
	2=No	5.24	1.099	46	.000	.985	.000	.050

Note 1: *Significance Level =<0.05.
Note 2: Eta Squared values of 0.2 or higher.
Note 3: Power values of 0.80 or higher.

Section IV – Discriminant Analysis – Research Questions Six

This section reports on the analysis of predictor variables that can best discriminate group membership. Research question six contained two sub-questions including research question 6.1 as "Are there clusters of internet technology usage items that discriminate when grouped by gender, served college, degree source, years of experience teaching in web-based courses, or attendance at the web-based training courses?" and research question 6.2 as "Are there clusters of teaching strategy items that discriminate when grouped by gender, served college, degree source, years of experience teaching in web-based courses, or attendance at the web-based training courses?"

This section was divided into two distinct sub-sections. The first sub-section provided results from the Discriminant analysis (DA) of internet technology usage to answer research question 6.1. The second sub-section provided results from the Discriminant analysis (DA) of teaching strategies to answer research question 6.2.

Field (2005) argued that when dependent variables are correlated, a DA can be conducted to identify predictors that can best discriminate group membership. Furthermore, Dillon and Goldstein (1984) argued that conducting the stepwise method in DA was a popular method used to determine important predictors into analysis when many predictor variables are presented. The discriminant stepwise method was utilized to select variables one by one based on a cutoff F-value to decide important predictors (Dillon & Goldstein).

Field (2005) argued that discriminant analyses were conducted to further illustrate the significant differences found in the MANOVA tests performed and report the findings of research question 6.1. However, Field did not imply if the results of MANOVA were

not significant, discriminant analyses, especially the stepwise method, should not be conducted. The following study utilized the stepwise method in discriminant analyses to explore further findings on research question 6.1 and 6.2.

Discriminant Analyses Performed on Internet Technology Usage

Discriminant analyses were conducted to further explore findings on research question 6.1. These descriptive discriminant analyses were conducted to determine if PowerPoint, video-based instruction, email communication, and threaded discussion could predict gender, served college, degree source, years of experience teaching in web-based courses, or attendance at the web-based training courses.

When processing the analysis of research question 6.1, discriminant analysis results of served college (Wilks' Lambda (104) = 0.888, Sig. =0.08), years of experience teaching web-based courses (Wilks' Lambda (104) = 0.721, Sig. =0.000), and attendance at the web-based training courses (Wilks' Lambda (104) = 0.800, Sig. =0.000) indicated that the function of predictors, the combined dependent variables of power point, video-based instruction, e-mail communication, and encouragement of students to participate in threaded discussion, significantly discriminated among group memberships. Gender and degree source can not be discriminated because no predictors qualified for the discriminant function analysis, a cutoff F-value (3.84). Therefore, discriminant analyses were conducted on three significant variables of served college, years of experience teaching web-based courses, and attendance at the web-based training courses.

Served college. A significant discriminate function (see Table 42) was found (Wilks' Lambda (104) = 0.888, Sig. =0.08). Only one factor (Eigen value = 0.126) was identified. It accounted for 100% of the variance. The null hypothesis was rejected. It was

determined that a significant cluster of variables could be constructed to discriminate among faculty members who served in the colleges of HSNS, engineering, management and service industries on the internet technology usage dimension. One variable was entered into the function: PowerPoint. The variables of video-based instruction, email, and threaded discussion were excluded. The function was labeled *PowerPoint*.

Table 42
Test of Significance from Discriminate Statistics for Served College

Factor	Eigen value	% of Variance	Wilks' Lambda	Chi square	p-value
1	.126	100.0	.888	11.910	.008

Classification results showed that the original grouped cases were classified with 43.3% overall accuracy. Accuracy for each group was 82.9% for the college of management, 53.3% for the college of HSNS, 0% for the college of engineering, and 0% for the college of service industries. Cross-validation derived 43.3% accuracy for the total sample. Group means for *PowerPoint* indicated that faculty members who served in the college of HSNS had a function mean of -0.532, those who served in the college of engineering had a function mean of 0.214, those who served in the college of management had a function mean of 0.238, and those who served in the college of service industries had a function mean of 0.195 (see Table 43 and Figure 3).

Table 43
Centroid Coefficients – Attendance at the Web-based Training Courses

	Centroid Coefficient
HSNS	-0.546
Engineering	0.214
Management	0.238
Service Industries	0.195

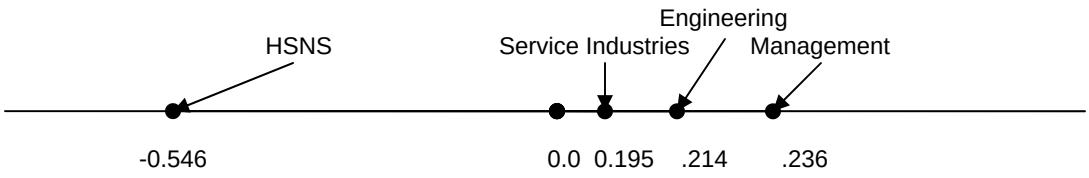

Figure 3. A presentation of centroid coefficients for faculty members who served at college of HSNS, service industries, engineering, and management.

Table 44 presents the correlation coefficients and standardized canonical discriminant function coefficients. These results indicated that faculty members who served in the college of HSNS were less likely to use PowerPoint to support their teaching activities. Faculty members from the other three colleges likely used e-mail, video-based instruction, and threaded discussion with the same frequency.

Table 44
Correlation Coefficients and Standardized Canonical Discriminant Function Coefficients – Served College

	Correlation Coefficients with Discriminant Function	Standardized Canonical Discriminant Function Coefficients
PowerPoint	1	1
Email Communication	0.654	x
Video-based Instruction	0.459	x
Threaded Discussion	0.408	x

Note: x Indicates this item not included.

Years of experience teaching web-based courses. A significant discriminate function (see Table 45) was found (Wilks' Lambda (104) = 0.721, Sig. =0.000). Only one factor (Eigen value = 0.126) was identified. It accounted for 100% of the variance. The null hypothesis was rejected. It was determined that a significant cluster of variables could be constructed to discriminate between faculty members who had years of

experience of less than one years, more than one years but less than four years, and four years and more teaching web-based courses on the internet technology usage dimension. One variable was entered into the function: PowerPoint. Three variables of video-based instruction, email, and threaded discussion were excluded. The function was labeled *PowerPoint2*.

Table 45
Test of Significance from Discriminate Statistics for Served College

Factor	Eigen value	% of Variance	Wilks' Lambda	Chi square	p-value
1	0.386	100.0	0.721	32.978	.000

Classification results showed that the original grouped cases were classified with 57.7% overall accuracy. Accuracy for each group was 54.5% for less than one year, 20.6% for more than one years but less than four years, and 85.4% for four years and more, of experience teaching web-based courses. Cross-validation derived 57.7% accuracy for the total sample. Group means for *PowerPoint* indicated that faculty members who had less than one year's experience teaching web-based courses had a function mean of -1.114, more than one year but less than four years experience teaching web-based courses had a function mean of 0.026, and those with four years and more experience teaching web-based courses had a function mean of 0.495 (see Table 46 and Figure 4).

Table 46
Centroid Coefficients – Years of Experience Teaching Web-based Courses

	Centroid Coefficient
Less Than One Year (1)	-1.114
More Than One Year but Less Than Four Years (2)	0.026
Four Years and More (3)	0.493

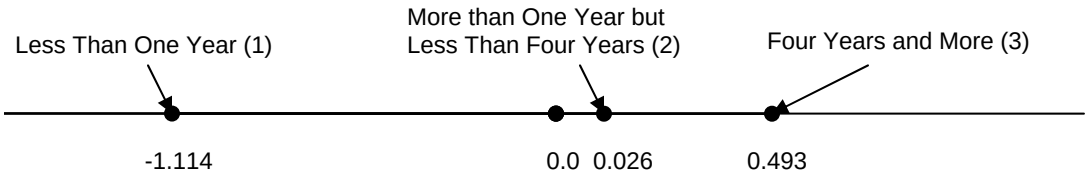

Figure 4. A representation of centroid coefficients for faculty members who had years of experience teaching web-based courses with 1 for less than one year, 2 for more than one year but less than four years, and 3 for four years and more. Only function 1 was significant.

Table 47 presents the correlation coefficients and standardized canonical discriminant function coefficients. These results indicated that faculty members having less than one year of experience teaching web-based courses were less likely to use PowerPoint to support their teaching activities.

Table 47
Correlation Coefficients and Standardized Canonical Discriminant Function Coefficients – Years of Experience Teaching Web-based Courses

	Correlation Coefficients with Discriminant Function	Standardized Canonical Discriminant Function Coefficients
PowerPoint	1	1
Email Communication	0.603	x
Video-based Instruction	0.315	x
Threaded Discussion	0.263	x

Note: x Indicates this item not included.

Attendance at the web-based training courses. A significant discriminate function (see Table 48) was found (Wilks' Lambda (104) = 0.800, Sig. =0.000). Only one factor (Eigen value = 0.251) was identified. It accounted for 100% of the variance. The null

hypothesis was rejected. It was determined that a significant cluster of variables could be constructed to discriminate between faculty members who attended and who did not attend web-based training courses on the internet technology usage dimension. Two variables were entered into the function: video-based instruction and threaded discussion. The variables of PowerPoint and email communication were excluded. The function was labeled *Video-based Instruction and conversation*.

Table 48
Test of Significance from Discriminate Statistics for Attendance at the Web-based Training Courses

Factor	Eigen value	% of Variance	Wilks' Lambda	Chi square	p-value
1	0.251	100.0	0.800	22.587	.000

Classification results showed that the original grouped cases were classified with 70.2% overall accuracy. Accuracy for each group was 75% for faculty members who attended the web-based training courses and 65.4% for faculty members who did not attend the web-based training courses. Cross-validation derived 67.3% accuracy for the total sample. Group means for *Video-based Instruction and conversation* indicated that faculty members who had attended web-based training courses had a function mean of 0.496, while faculty members who did not attend web-based training courses had a function mean of -0.496 (see Table 49 and Figure 5).

Table 49
Centroid Coefficients – Attendance at the Web-based Training Courses

	Centroid Coefficient
Attendance	0.496
Non-attendance	-0.496

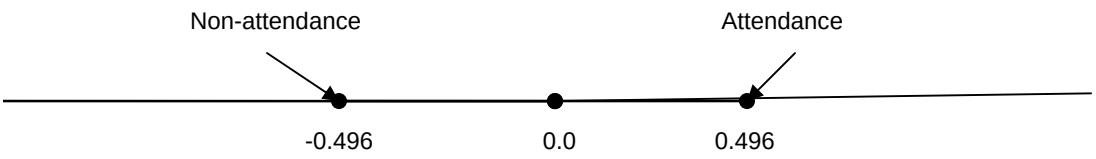

Figure 5. A representation of centroid coefficients for faculty members who had attended web-based training courses and who had not attended web-based training courses is described. Only function 1 was significant.

Table 50 presents the correlation coefficients and standardized canonical discriminant function coefficients. These results indicated that faculty members having attended web-based training courses were more likely to have used video-based instruction and threaded discussion in their teaching activities.

Table 50
Correlation Coefficients and Standardized Canonical Discriminant Function Coefficients – Attendance at the Web-based Training Courses

	Correlation Coefficients with Discriminant Function	Standardized Function Coefficients
Video-based Instruction	0.832	0.801
Threaded Discussion	0.605	0.511
PowerPoint	0.524	x
Email Communication	0.518	x

Note: x Indicates this item not included.

Discriminant Analyses Performed on Teaching Strategies

Discriminant analyses were conducted to explore further findings on research question 6.2. These descriptive discriminant analyses were conducted to determine predictors variables: prior experience, big picture, research further on topics, interesting topics, reflecting with teachers, confidence in learning, conversing with other learners, using methods to solve problems, employing theory and practice, applying knowledge in contexts, sense of ownership with a rubric, sharing learning with me or others, framing

conversation, criticizing project, organizational expressions of ideas, groups for establishing own knowledge, groups in agreement, negotiating ideas, positive at disagreement, research further in groups, background and beliefs, understanding current knowledge, identifying needs of assignment, monitoring own learning, understanding how to look for help, strengths and weaknesses, detecting errors skills, and logical thinking, could predict gender, served college, degree source, years of experience teaching in web-based courses, or attendance at the web-based training courses.

When processing the analysis of research question 6.2, discriminant analysis results of gender (Wilks' Lambda (91) = 0.945, Sig. =0.25), degree source (Wilks' Lambda (91) = 0.904, Sig. =0.12), and years of experience teaching web-based courses (Wilks' Lambda (91) = 0.762, Sig. =0.000 and Wilks' Lambda (91) = 0.880, Sig. =0.001) indicated that the function of predictors, the combined dependent variable of prior experience, big picture, research further on topics, interesting topics, reflecting with teachers, confidence in learning, conversing with other learners, using methods to solve problems, employing theory and practice, applying knowledge in contexts, sense of ownership with a rubric, sharing learning with me or others, framing conversation, criticizing project, organizational expressions of ideas, groups for establishing own knowledge, groups in agreement, negotiating ideas, positive at disagreement, research further in groups, background and beliefs, understanding current knowledge, identifying needs of assignment, monitoring own learning, understanding how to look for help, strengths and weaknesses, detecting errors skills, and logical thinking, significantly discriminated among group memberships. Served college and attendance at the web-based training courses can not be discriminated because no predictors qualified for the

discriminant function analysis, a cutoff F-value (3.84). Therefore, discriminant analyses were conducted on three significant variables of gender, degree source, and years of experience teaching web-based courses.

Gender. A significant discriminate function (see Table 51) was found (Wilks' Lambda (91) = 0.945, Sig. =0.25). Only one factor (Eigen value = 0.126) was identified. It accounted for 100% of the variance. The null hypothesis was rejected. It was determined that a significant cluster of variables could be constructed to discriminate between men and women faculty members on the teaching strategies dimension. One variable was entered into the function: understanding how to look for help. The variables of prior experience, big picture, research further on topics, interesting topics, reflecting with teachers, confidence in learning, conversing with other learners, using methods to solve problems, employing theory and practice, applying knowledge in contexts, sense of ownership with a rubric, sharing learning with me or others, framing conversation, criticizing project, organizational expressions of ideas, groups for establishing own knowledge, groups in agreement, negotiating ideas, positive at disagreement, research further in groups, background and beliefs, understanding current knowledge, identifying needs of assignment, monitoring own learning, strengths and weaknesses, detecting errors skills, and logical thinking were excluded. The function was labeled *Self regulation*.

Table 51
Test of Significance from Discriminate Statistics for Gender

Factor	Eigen value	% of Variance	Wilks' Lambda	Chi square	p-value
1	0.059	100.0	0.945	5.036	0.25

Classification results showed that the original grouped cases were classified with 59.2% overall accuracy. Accuracy for each group was 56.8% for women, 61.1% for men. Cross-validation derived 59.2% accuracy for the total sample. Group means for *Self regulation* indicated that women had a function mean of -0.258 and men had a function mean of 0.222 (see Table 52 and Figure 6).

Table 52
Centroid Coefficients –Gender

	Centroid Coefficient
Women	-0.258
Men	0.222

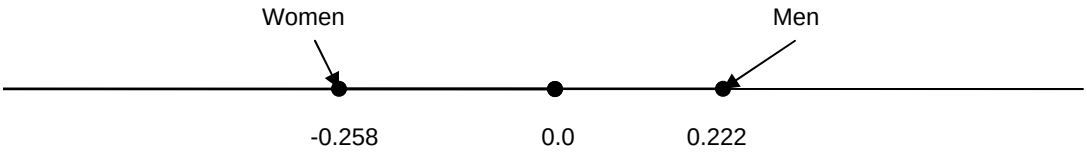

Figure 6. A representation of centroid coefficients for women faculty members and for men faculty members is described. Only function 1 was significant.

Table 53 presents the correlation coefficients and standardized canonical discriminant function coefficients. These results indicated that women faculty members in their teaching strategies were less likely to provide students with the methods to help them understand their own thinking and know how to look for help.

Table 53
Correlation Coefficients and Standardized Canonical Discriminant Function Coefficients – Gender

	Correlation Coefficients with Discriminant Function	Standardized Canonical Discriminant Function Coefficients
Meta-understanding how to look for help	1.000	1
Meta-monitoring own learning(a)	.512	x
Meta-identifying needs of assignment(a)	.501	x
Meta-strengths and weaknesses(a)	.500	x
TO-applying knowlege in contexts(a)	.479	x
Meta-detecting errors skills(a)	.441	x
Meta-logical thinking(a)	.402	x
SA-framing conversation(a)	.401	x
TO-sense of ownership with a rubric(a)	.387	x
Meta-understanding current knowledge(a)	.382	x
TO-employing theory and practice(a)	.377	x
COLL-background and beliefs(a)	.377	x
TO-using methods to solve problems(a)	.366	x
COLL-research further in groups(a)	.350	x
CL-interesting topics(a)	.325	x
SA-criticizing project(a)	.323	x
COLL-positive at disagreement(a)	.299	x
CL-prior experience(a)	.283	x
COLL-negotiating ideas(a)	.229	x
CL-research further on topics(a)	.213	x
SA-organizational expressions of ideas(a)	.193	x
CL-confidence in learning(a)	.186	x
CL-reflecting with teachers(a)	.180	x
CL-big picture(a)	.171	x
COLL-groups for establishing own knowlege(a)	.164	x
COLL-groups in agreement(a)	.137	x
SA-sharing learning with me or others(a)	.068	x
CL-conversing with other learners(a)	.058	x

Note 1: a Indicates this variable not used in the analysis.
Note 2: x Indicates this item not included.

Source degree. A significant discriminate function (see Table 54) was found (Wilks' Lambda (91) = 0.904, Sig. =0.012). Only one factor (Eigen value = 0.107) was identified. It accounted for 100% of the variance. The null hypothesis was rejected. It was determined that a significant cluster of variables could be constructed to discriminate

between faculty members who obtained their degrees in eastern or western educational systems on teaching strategies dimension. Two variables were entered into the function: confidence in learning and conversing with other learners. The variables of prior experience, big picture, research further on topics, interesting topics, reflecting with teachers, using methods to solve problems, employing theory and practice, applying knowledge in contexts, sense of ownership with a rubric, sharing learning with me or others, framing conversation, criticizing project, organizational expressions of ideas, groups for establishing own knowledge, groups in agreement, negotiating ideas, positive at disagreement, research further in groups, background and beliefs, understanding current knowledge, identifying needs of assignment, monitoring own learning, understanding how to look for help, strengths and weaknesses, detecting errors skills, and logical thinking were excluded. The function was labeled *Practice and Conversation*.

Table 54
Test of Significance from Discriminate Statistics for Gender

Factor	Eigen value	% of Variance	Wilks' Lambda	Chi square	p-value
1	0.107	100.0	0.904	8.923	0.012

Classification results showed that the original grouped cases were classified with 59.2% overall accuracy. Accuracy for each group was 58.0% for faculty with degrees from eastern colleges, and 60.3% for faculty with degrees from western colleges. Cross-validation derived 59.4% accuracy for the total sample. Group means for *Practice and Conversation* indicated that those who had an eastern degree displayed with a function mean of -0.320 and those who had a western degree displayed with a function mean of 0.327 (see Table 55 and Figure 7).

Table 55

Centroid Coefficients – Degree Source

	Centroid Coefficient
Eastern	-0.320
Western	0.327

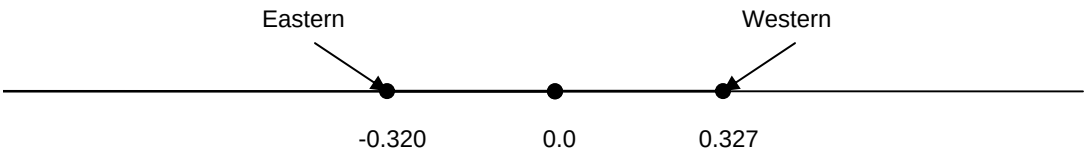

Figure 7. A representation of centroid coefficients for faculty members who had eastern degrees and for faculty members who had western degrees is described. Only function 1 was significant.

Table 56 presents the correlation coefficients and standardized canonical discriminant function coefficients. These results indicated faculty members with western degrees were more likely in their teaching strategies to provide students confidence in their learning activities and less likely to provide students conversation with other learners about learning topics.

Table 56
Correlation Coefficients and Standardized Canonical Discriminant Function Coefficients – Degree Source

	Correlation Coefficients with Discriminant Function	Standardized Canonical Discriminant Function Coefficients
CL-confidence in learning	.709	0.977
CL-conversing with other learners	-.407	-0.755
TO-employing theory & practice(a)	.286	x
CL-reflecting with teachers(a)	.277	x
CL-big picture(a)	.253	x
TO-applying knowlege in contexts(a)	.251	x
SA-framing conversation(a)	.240	x
Meta-identifying needs of assignment(a)	.227	x
COLL-negotiating ideas(a)	.209	x
COLL-background and beliefs(a)	.202	x
CL-interesting topics(a)	.179	x
COLL-groups for establishing own knowlege(a)	.167	x
COLL-groups in agreement(a)	.157	x
COLL-research further in groups(a)	.150	x
TO-sense of ownership with a rubric(a)	.149	x
Meta-understanding current knowledge(a)	.145	x
Meta-detecting errors skills(a)	-.132	x
CL-research further on topics(a)	.128	x
SA-sharing learning with me or others(a)	.109	x
TO-using methods to solve problems(a)	.088	x
Meta-understanding how to look for help(a)	.086	x
Meta-logical thinking(a)	.082	x
COLL-positive at disagreement(a)	.072	x
Meta-monitoring own learning(a)	-.063	x
SA-organizational expressions of ideas(a)	.059	x
CL-prior experience(a)	.053	x
SA-criticizing project(a)	.033	x
Meta-strengths and weaknesses(a)	.022	x

Note 1: a Indicates this variable not used in the analysis.
Note 2: x Indicates this item not included.

Years of experience teaching web-based courses. Two significant discriminate functions (see Table 57) were found (Wilks' Lambda (91) = 0. 762, Sig. =0.000) and (Wilks' Lambda (91) = 0.880, Sig. =0.001). Two factors (Eigen value = 0.154) and (Eigen value = 0.137) were identified. It accounted for 53.0% of the variance for function

one and 47.0% for function two. The null hypothesis was rejected. It was determined that a significant cluster of variables could be constructed to discriminate between faculty members who had less than one year, more than one year but less than four years, and four years and more, of experience teaching web-based courses on the teaching strategies dimension. Two variables were entered into the function: research further on topics and understanding current knowledge. The variables of prior experience, big picture, interesting topics, reflecting with teachers, confidence in learning, conversing with other learners, using methods to solve problems, employing theory and practice, applying knowledge in contexts, sense of ownership with a rubric, sharing learning with me or others, framing conversation, criticizing project, organizational expressions of ideas, groups for establishing own knowledge, groups in agreement, negotiating ideas, positive at disagreement, research further in groups, background and beliefs, identifying needs of assignment, monitoring own learning, understanding how to look for help, strengths and weaknesses, detecting errors skills, and logical thinking were excluded. The function was labeled: *Research and Self-regulation.*

Table 57
Test of Significance from Discriminate Statistics for Years of Experience Teaching Web-based Courses

Factor	Eigen value	% of Variance	Wilks' Lambda	Chi square	p-value
1	0.154	53.0	0.762	23.752	0.00
2	0.137	47.0	0.880	11.200	0.001

Classification results showed that the original grouped cases were classified with 55.6% overall accuracy. Accuracy for each group was 33.3% for less than one year, 55.9% for more than one year but less than four years, and 65.9% for four years and more, of experience teaching web-based courses. Cross-validation derived 55.4%

accuracy for the total sample. Group means for *Research and Self-regulation* indicated about function one that faculty members who had less than one year of experience teaching web-based courses had a function mean of -0.518, more than one year but less than four years of experience teaching web-based course had a function mean of -0.215, and four years and more experience of teaching web-based courses had a function mean of 0.418. Function two showed that faculty members who had less than one year of experience teaching web-based courses had a function mean of -0.513, more than one year but less than four years of experience teaching web-based courses had a function mean of 0.450, and four years and more experience of teaching web-based courses had a function mean of -0.116 (see Table 58 and Figure 8).

Table 58
Centroid Coefficients – Years of Experience Teaching Web-based Courses

	Centroid Coefficient	
	Function One	Function Two
Less Than One Year	-0.518	-0.513
More Than One Year But Less Than Four Years	-0.215	0.450
Four Years and More	0.418	-0.116

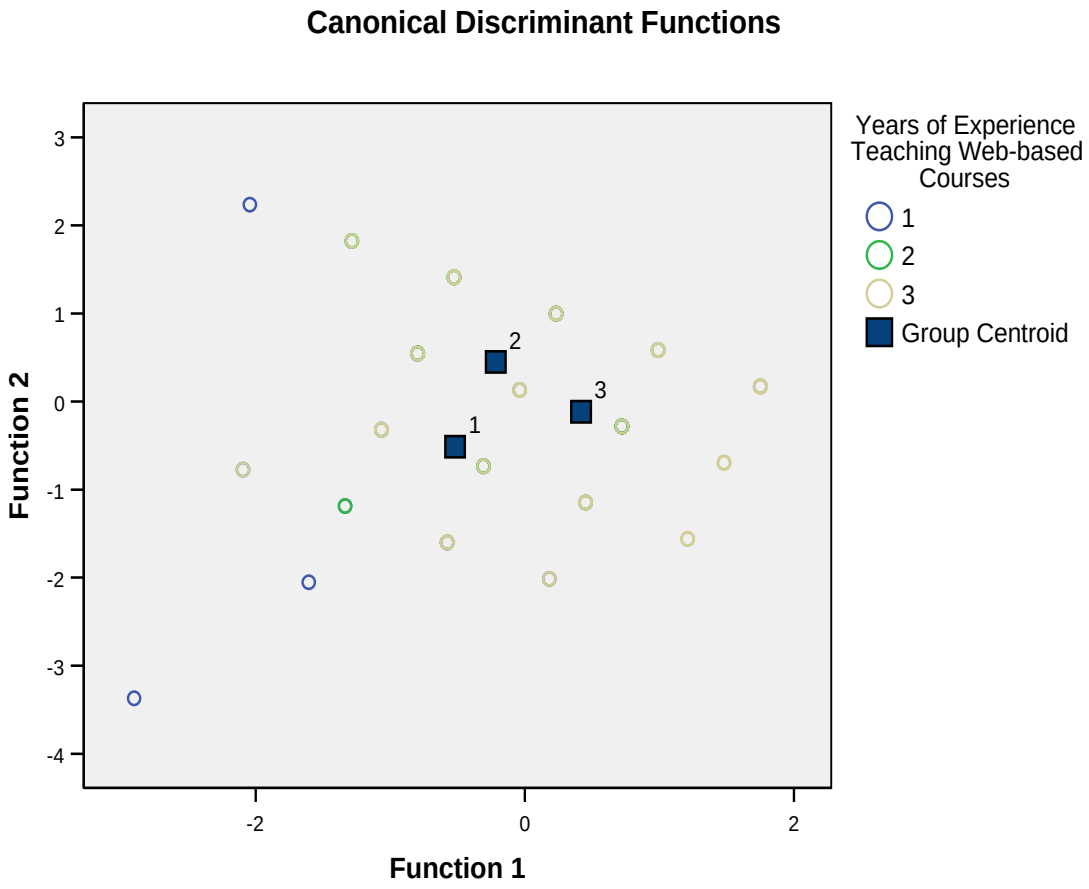

Figure 8. A representation of centroid coefficients for faculty members who had years of experience teaching web-based courses with 1 for less than one year, 2 for more than one and less than four years, and 3 for 4 years and more. Both function 1 and 2 were significant.

Table 59 presents the correlation coefficients and standardized function coefficients. These results indicated that those faculty members having less than one year of experience teaching web-based courses were less likely to provide students with the opportunities for further research on topics related to teaching objectives and to ensure understanding of status of their current knowledge. Faculty members having four years or

more of experience teaching web-based courses were more likely to provide students chances to research further on topics related to teaching objectives. Faculty members having more than one but less than four years of experience teaching web-based courses were more likely to provide students opportunities to understand the status of their current knowledge.

Table 59
Correlation Coefficients and Standardized Canonical Discriminant Function Coefficients – Years of Experience Teaching Web-Based Courses

	Correlation Coefficients with Discriminant Function		Standardized Canonical Discriminant Function Coefficients	
	1	2	1	2
Meta-understanding current knowledge	.955(*)	-.297	0.895	-0.448
CL-interesting topics(a)	.459(*)	.060	x	x
Meta-logical thinking(a)	.455(*)	-.027	x	x
TO-using methods to solve problems(a)	.451(*)	-.098	x	x
Meta-strengths and weaknesses(a)	.445(*)	.011	x	x
TO-sense of ownership with a rubric(a)	.441(*)	.076	x	x
Meta-identifying needs of assignment(a)	.435(*)	-.159	x	x
COLL-positive at disagreement(a)	.431(*)	.069	x	x
SA-framing conversation(a)	.428(*)	.008	x	x
TO-applying knowlege in contexts(a)	.425(*)	-.010	x	x
COLL-research further in groups(a)	.420(*)	.076	x	x
Meta-understanding how to look for help(a)	.403(*)	.011	x	x
COLL-background and beliefs(a)	.401(*)	.170	x	x
Meta-monitoring own learning(a)	.371(*)	.131	x	x
COLL-negotiating ideas(a)	.371(*)	.135	x	x
COLL-groups in agreement(a)	.357(*)	.136	x	x
CL-confidence in learning(a)	.347(*)	.106	x	x
Meta-detecting errors skills(a)	.340(*)	.015	x	x
TO-employing theory and practice(a)	.339(*)	.134	x	x
CL-prior experience(a)	.299(*)	.211	x	x
SA-sharing learning with me or others(a)	.281(*)	-.025	x	x
CL-reflecting with teachers(a)	.239(*)	.186	x	x
CL-conversing with other learners(a)	.211(*)	-.013	x	x
SA-criticizing project(a)	.202(*)	.148	x	x
CL-research further on topics	.478	.878(*)	0.303	0.973

CL-big picture(a)	.242	.314(*)	x	x
COLL-groups for establishing own knowlege(a)	.269	.313(*)	x	x
SA-organizational expressions of ideas(a)	.149	.174(*)		

Note 1: * Largest absolute correlation between each variable and any discriminant function.
Note 2: a This variable not used in the analysis.
Note 3: x Indicates this item not included.

Summary

The purpose of this study was to establish a valid and reliable instrument that can be used to assess self-reported performance of university faculty regarding their instructional practices and applications of internet technology. As a part of this purpose, this study sought to discover the differences between demographic information of Taiwanese university faculty members regarding their internet technology usage and their teaching strategies. Furthermore, this study was to determine what clusters of teaching strategies and internet technologies usage can best discriminate demographic information.

A one-shot, quantitative, non-experimental, case study design was used in order to investigate faculty members' characteristics related to their teaching strategies and internet technology usage in a Taiwanese university. The population included in this project consisted of 320 full-time faculty members employed at a Taiwanese university. This method of selecting participants produced a non-probability and convenience sample and was based on their willingness to participate in the study. A return rate of 104 respondents was found to represent the population with a certainty of 95% and confidence interval of 7.91 for the statistical tests performed. Chapter four represents the findings in four sections. These findings were supported by methodical data analyses.

Survey Reliability and Validity - Research Question One, Two, and Three

This section first detailed the face and content validity of each survey item regarding teaching strategies. Four expert panels examined the meaning of each question

to be asked to identify the meaning of the questions about their teaching strategies. After the questionnaire was translated into Chinese, one expert in a Taiwanese university examined the meaning of each item to make sure it could aligned with the Taiwanese culture, and the questions were reduced in number from forty-eight to thirty-four.

The Cronbach alpha method was followed to examine the internal reliability of survey items about teaching strategies. The results of the Cronbach alpha analysis represented good internal consistency reliability at $\alpha = 0.94$ in the teaching strategies items. Principle Components Analysis was then conducted to examine the reliability of the questionnaire by reducing large items into classified datasets. At the preliminary stage, eight uncorrelated components with Eigenvalues greater than 1.0 were identified. After examining the meaning of each new component, with several items temporarily removed, four components appeared likely to explain the whole picture of teaching strategies (Component 1, “Collaborative learning”; Component 2, “Conversation”; Component 4, “Learning by doing”; and Component 5, “Theory and research”). After repeating factor analysis with only four components, this four-component model appeared to reflect adequately the underlying twenty-eight items about teaching strategies. Six items were removed including Meta-mistakes shared, SA-mastering knowledge by conversation, TO-self evaluation by a scoring rubric, SA-sharing thinking by conversation, Meta-adapting effective Learning, and TO-topics are close to experience.

After twenty-eight items were identified and classified into four new components, Cronbach's alpha statistic method was applied to examine the internet consistency of questionnaire. The findings represented good internal consistency reliability at $\alpha = 0.928$.

Descriptive Statistics of Survey Items - Research Question Four

Descriptive data were calculated and analyzed with regard to demographics, internet technology usage, and teaching strategies. Demographic variables included gender, served college, degree source, years of experience teaching web-based courses, years in higher education, attendance at the web-based training courses, and college encouragement to attend web-based training courses. Internet technology usage was measured to support instruction with four variables including PowerPoint, video-based instruction, email communication and encouragement of students to participate in threaded discussion. After validity and reliability examination, twenty eight variables regarding faculty teaching strategies were studied: prior experience, big picture, research further on topics, interesting topics, reflecting with teachers, confidence in learning, conversing with other learners, using methods to solve problems, employing theory and practice, applying knowledge in contexts, sense of ownership with a rubric, sharing learning with me or others, framing conversation, criticizing project, organizational expressions of ideas, groups for establishing own knowledge, groups in agreement, negotiating ideas, positive at disagreement, research further in groups, background and beliefs, understanding current knowledge, identifying needs of assignment, monitoring own learning, understanding how to look for help, strengths and weaknesses, detecting errors skills, and logical thinking.

MANOVA Analysis – Research Questions Five

This section reported on the analysis of the effects of demographic independent variables on internet technology usage for research question 5.1 and the effects of demographic independent variables had on teaching strategies for research question 5.2.

Demographic variables were regarding the use of the following independent variables: gender, served college, degree source, years of experience teaching web-based courses, and attendance at the web-based training courses.

Research question 5.1. MANOVA results showed that the variables of years of experience teaching web-based courses and attendance at the web-based training courses significantly affected the internet technology usage. ANOVA tests followed to further describe how years of experience teaching web-based courses and attendance at the web-based training courses affected the internet technology usage considered. The results of ANOVA tests indicated that usage of PowerPoint, video-based instruction, email communication, and threaded discussion significantly differed based on years of experience teaching web-based courses by faculty members and the usage of video-based instruction, email communication, and threaded discussion significantly differed based on attendance at the web-based training courses by faculty members (see Table 60).

Table 60
A Summary of Internet Technology Usage with Significantly Different Mean Scores by Group

Internet Technology Usage	Gender	Served College	Degree Source	Years of Experience Teaching Web-based Courses	Attendance at the Web-based Training Courses
PowerPoint	x		x		X
Video-based Instruction	x	x	x		
Email Communication	x	x	x		
Threaded Discussion	x	x	x		

Note: x Indicates not significant between independent variables and dependent variables.

Research question 5.2. MANOVA results showed that gender, served college, degree source, years of experience teaching web-based courses, and attendance at the web-based training courses respectively did not significantly affect the teaching strategies. Because the independent variable was found to not significantly affect the

dependent variable, no further ANOVA tests were performed. Summary results and tables are presents as following (see Table 61).

Table 61
A Summary of Teaching Strategies with Significantly Different Mean Scores by Group

Internet Technology Usage	Gender	Served College	Degree Source	Years of Experience Teaching Web-based Courses	Attendance at the Web-based Training Courses
Prior experience	x	x	x	x	x
Big picture	x	x	x	x	x
Research further on topics	x	x	x		x
Interesting topics	x	x			x
Reflecting with teachers	x	x	x	x	x
Confidence in learning	x	x		x	x
Conversing with other learners	x	x	x	x	x
Using methods to solve problems	x	x	x	x	x
Employing theory and practice	x	x	x		x
Applying knowledge in contexts	x	x	x	x	x
Sense of ownership with a rubric	x	x	x		x
Sharing learning with me or others	x	x	x	x	x
Framing conversation	x	x	x	x	x
Criticizing project	x	x	x	x	x
Organizational expressions of ideas	x	x	x	x	x
Groups for establishing own knowledge	x	x	x	x	x
Groups in agreement	x	x	x	x	x
Negotiating ideas	x	x	x	x	x
Positive at disagreement	x	x	x		x
Research further in groups	x	x	x		x
Background and beliefs	x	x			x
Understanding current knowledge		x	x		x
Identifying needs of assignment	x	x	x	x	x
Monitoring own learning	x	x	x	x	x
Understanding how to look for help	x	x		x	x
Strengths and weaknesses	x	x	x		x
Detecting errors skills	x	x	x	x	x
Logical thinking.	x	x	x	x	x

Note: x Indicates no significance between independent variables and dependent variables.

Discriminant Analysis – Research Questions Six

This section reported on the analysis of the effects internet technology usage variables had on demographic variables for research question 6.1 and the effects teaching strategies variables had on demographic variables for research question 6.2. Demographic variables were regarding the use of the following independent variables: gender, served college, degree source, years of experience teaching web-based courses, and attendance at the web-based training courses.

Research question 6.1. Discriminant analysis results showed that internet technology usage variables significantly discriminated between each group membership of served college, years of experience teaching web-based courses, and attendance at the web-based training courses. Three group memberships were found.

First, discriminated group membership indicated that one predictor variable significantly differentiated between faculty members who served at the college of HSNS, engineering, management, or service industries. The variable was PowerPoint usage. These results indicated that those faculty members who used PowerPoint less frequently in teaching activities were likely faculty members who served in the college of HSNS.

Second, discriminated group membership indicated that one predictor variable significantly differentiated between faculty members who had less than one year, more than one year but less than four years, and four years and more of experience teaching web-based courses. The variable was PowerPoint usage. These results indicated that those faculty members who used PowerPoint less frequently in teaching activities were likely faculty members who had less than one year of experience teaching web-based courses.

The third discriminated group membership indicated that two predictor variables significantly differentiated between faculty members who had attended or who had not attended web-based training courses. The two predictor variables were video-based instruction and threaded discussion. These results indicated that those faculty members who used video-based instruction and threaded discussion in teaching activities most frequently in teaching activities had likely attended web-based training courses.

Research question 6.2. Discriminant analysis results showed that teaching strategies variables significantly discriminated between each group membership of gender, degree source, and years of experience teaching web-based courses. Three group memberships were found.

First, discriminated group membership indicated that one predictor variable significantly differentiated between women and men faculty members. The variable was "understanding how to look for help." These results indicated that women faculty members less frequently provided students self-regulation in understanding their own thinking and understanding how to look for help.

Second, discriminated group membership indicated that two predictor variables significantly differentiated between faculty members who had a degree from eastern or western education systems. Two predictor variables were "confidence in learning" and "conversing with other learners." These results indicated that faculty members with western degrees most frequently provided students learning objectives closer to their experience to promote the most confidence in learning and provided students the least conversation with other learners based on existing knowledge structures.

The third discriminated group membership indicated that two predictor variables significantly differentiated between faculty members who had less than one year, more than one year but less than four years, and four years and more, of experience teaching web-based courses under the teaching strategies dimension. The two predictor variables were “research further on topics” and “understanding current knowledge”. These results indicated that faculty members with less than one year of experience teaching web-based courses were less frequently to provide students with the opportunities to research further on topics and self-regulate their current knowledge. Faculty members who had four years or more of experience teaching web-based courses most frequently provided students the opportunities to research further about topics. Faculty members who had more than one but less than four years of experience teaching web-based courses most frequently provided students the measure their ability to regulate their learning processes.

The next chapter explored the implications these findings hold for faculty members and universities. An introduction to the chapter was presented and an overview of the study was given, along with a review of the research design. Then, findings were discussed, conclusions were drawn and recommendations were suggested. Finally a chapter summary was provided.

CHAPTER FIVE

OVERVIEW, FINDINGS AND RECOMMENDATIONS

The study established a valid and reliable instrument, inspired by Reeves' (1997) web-based learning strategies, for use to investigate self-reported performance of university faculty regarding their teaching strategies and applications of internet technology. Additionally, this study sought to discover the differences between demographic information of university faculty members regarding their internet technology usage and their teaching strategies. This chapter is divided into six sections. First, an overview of the study is given. This overview includes the summary of problem statement, purpose of the study, and the research questions and null hypotheses. Second, the study's research design is demonstrated. This section discusses the population, sample collection, and the statistical analysis methods applied. Third, a discussion of findings is provided. Findings are organized based on each research question and use of four separated sub-sections described by research question. Fourth, conclusions are drawn. Fifth, recommendations are provided, and sixth, a summary is offered.

Overview

In higher education, faculty members have used internet technologies to support their teaching strategies. Faculty members must respond to the benefits of integrating internet technologies for use in students' learning activities to help students obtain their own knowledge. Chapter two of this study provided a review of the related literature in six key areas. First, the literature indicated that effective education is based on supporting learners with opportunities to share understandings through dialogue, to experience

through participation, and to construct their own knowledge through reflection and not passive learning through lecturing.

Second, universities' and faculty members' use of internet technology in teaching was examined and how they apply learner-centered instructional strategies with internet technology to reshape their teaching strategies. Third, four internet technology tools including PowerPoint, video-based instruction, e-mail communication, and threaded discussion were examined. Emphasis was given to ways in which each internet technology tool supports teachers as they foster. Fourth, web-based learning as defined by Motteram (2006) was explored, as to how involvement in web-based course design provides an alternative of learning beyond the limitation of physical appearance in a face-to-face classroom. Five, current research in web-based learning was investigated. Few studies examine the ways that faculty practice their teaching strategies and their application of internet technology in web-based learning activities (Chen & Chen, 2006). In fact, there is a lack of knowledge about faculty's instructional practices and their application of internet technology in higher education in Taiwan.

Six, conceptual underpinnings for this study were provided. Reeves' (1997) model of teaching strategies in web-based learning was further explored; Reeves discussed the development of effective web-based teaching strategies to support students' opportunities to learn. No studies or research instruments have been identified that would help teachers determine their own needs regarding their strategies and performance of web-based teaching with internet technology. There is a lack of a reliable and valid instrument to investigate the frequency of use of teaching strategies and their practice regarding internet technology in web-based learning environments.

Problem Statement

Recent research suggested that in order to promote student learning, teachers must use a variety of internet technology that encourage students in active participation (Goldberg, et al., 2006; Illowsky, 2007; Kim & Axelrod, 2005; Klemm, 2007; Maurino, 2007; Zahn, et al., 2005). Additionally, web-based learning has been demonstrated as a method of diversifying learning activities (Motteram, 2006; Petrides, 2002; Roper, 2007; Rovai, 2002; Wang, 2007). Surprisingly, little research has been done that investigates how faculty members practice their teaching strategies and their application of internet technology in web-based learning activities (Chen & Chen, 2006). Until now, there was no empirical study determining the reliability and validity of a faculty survey about the identification of current web-based instructional practices and the application of internet technology in a Taiwanese university. No studies or research instruments have been identified that would help teachers determine their own needs regarding their strategies and performance of web-based teaching with internet technology. Understanding teachers' practice regarding teaching strategies for web-based learning and their methods for applying internet technology should help them self-monitor their performance and improve their teaching strategies when applying internet technology. There was a lack of a reliable and valid instrument to investigate the effectiveness of teaching strategies and their practice regarding internet technology in web-based learning environments.

Purpose of the Study

The purpose of this study is to determine the validity and reliability of web-based teaching strategies for use as an instrument to conduct a survey to determine the level of instructional practices by a Taiwanese university faculty and the degree to which

Taiwanese university faculty perceive their performance regarding internet technology usage as measured by the faculty's response. In order to accomplish this primary purpose, this study examined the data from university faculty responses regarding trends and differences among and between common factors and the demographic variables of gender, served college, degree source, years of experience teaching in web-based settings, and attendance at the web-based training courses.

Research Questions and Null Hypotheses

Research questions and null hypotheses were developed in order to guide the study. Each is represented in the following.

Research question 1

Do the items contained in the survey of teaching strategies have face and content validity?

Research question 2

Are the items contained in the survey of teaching strategies reliable?

Research question 3

Can common factors be identified in the response of Taiwanese university faculty to the survey of teaching strategies and can those factors be used to reduce the number of survey questions while maintaining reliability?

Research question 4

What are the summary statistics for internet technologies usage and performance to the teaching instructional strategies?

Research question 5

What items best decide category membership?

Sub Research question 5.1. Are there differences between internet technologies usage reported by Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses?

Sub Research question 5.2. Are there differences between teaching strategies reported by Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses?

Research question 6

What cluster functions as best discriminant by category membership?

Sub Research question 6.1. Are there clusters of internet technologies usage items that discriminate when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses?

Sub Research question 6.2. Are there clusters of teaching strategies items that discriminate when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses?

There were six developed hypotheses to determine answers to the stated research questions. These hypotheses were described in the following:

H_o1. The items contained in the survey of teaching strategies for Taiwanese university faculty were not reliable.

H_o2. There are no common factors in the survey of teaching strategies for Taiwanese university faculty.

H_o3. There are no significant differences between internet technologies usage for Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses.

H_o4. There are no significant differences between teaching strategies for Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses.

H_o5. There are no clusters of internet technologies usage items that discriminate when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses.

H_o6. There are no clusters of teaching strategies items that discriminate when grouped by gender, served college, degree source, years of experience teaching web-based courses, or attendance at the web-based training courses.

Design of the Study

Reeves' (1997) theoretical framework of effective web-based learning was further investigated to create a valid and reliable instrument. A one-shot, quantitative (Hawley, 2005; Ury, 2003), non-experimental (Charles, 1998), and case study survey research design was used to collect data and to analyze findings with statistical methods used.

Population and Sample

The population in this project consisted of 320 full-time faculty members employed at four colleges of a selected Taiwanese university. The entire population (N=320) was sent an email (see Appendix D) that described the study, along with an informed consent statement, and a clickable hyperlink that directed potential respondents

to the study instrument (see Appendix E). This method of selecting participants produced a non-probability and convenience sample based on faculty members' willingness to participate in the study (Fink, 2006).

Statistical Analyses

To determine a valid and reliable instrument, a face and content validity was examined (Patton, 1997), followed by the internal consistency test using Cronbach alpha (Cronbach, 1951) and principle components analysis (Field, 2005) in research questions one, two, and three. Because dependent variables are correlated, a one-way multivariate analysis of variance (MANOVA) was used to examine the effects of inter-correlated dependent variables on independent variables in research question five (Field). Furthermore, discriminant analyses (DA) using the stepwise method were applied to determine important predictors into analysis when many predictor variables are presented (Dillon & Goldstein, 1984) in research question six. The summary of analyses used by research question was given (see Table 62).

Table 62
Summary of Analyses Used by Research Questions

Research question	Number of Items	Analysis Applied
1	52	Summary
2	34	Cronbach's alpha
3	34	Factor Analysis
4	45	Summary
5.1	4	MANOVA
5.2	28	MANOVA
6.1	4	Discriminant Analysis
6.2	28	Discriminant Analysis

Discussion of Findings

This section reiterates the research questions with related null hypotheses and summarizes the findings of data analyses from Chapter Four. The findings were obtained from the data analyses delineated earlier.

Survey Reliability and Validity - Research Question One, Two, and Three

The following was divided into three sections based on research question one, two, and three. The findings were represented.

Research question 1. Do the items contained in the survey of teaching strategies have face and content validity? Due to the fact that this research question focuses on identifying the meaning of each survey item with expert panels, no null hypothesis was offered that corresponded to this research question.

Four expert panels have provided valuable input in the process of examining the face and content validity of the questionnaire. Three experts with years of experience in developing instruments examined the meaning of each question asked and offered helpful suggestions. One expert in a selected Taiwanese university scrutinized the meaning of the questions asked and suggested what items needed to be deleted or merged to align with Chinese culture. The items about teaching strategies were reduced from forty-eight to thirty-four at the stage of face and content validity examination.

After face and content validity were examined, the thirty-four items pertaining to teaching strategies included whether the instructors helped students to: establish understanding based on their experience, understand the big picture of the learning topic, research further on the topics related to teaching objectives, be motivated about learning topics that interest them, reflect on what they have discovered with me, have confidence

in learning activities, converse with other learners about the topic, practice and demonstrate a familiarity with methods used to solve problems in reality, employ theory and practice in learning activities, apply their knowledge in other contexts, self-evaluate their quality of learning achievement with the support of a scoring rubric, share their knowledge and receive meaningful feedback from other learners or me, communicate effectively with the support of a norm of discussion, present their project that is supported with critiques by me or other learners, express their thoughts in an organized way, work together in groups to establish their knowledge, work together in groups to share knowledge and reach an agreement on learning, negotiate meaning from different perspectives with groups, research further about teaching topics within groups, demonstrate positive thinking about disagreement within groups providing chances for further research and the results, understand the idea that different perspectives of group members can be derived from their culture and background, understand the status of their current knowledge, identify the needs of the assigned task, monitor their own learning progress, understand their own thinking and know how to look for help, understand individual strengths and weaknesses to implement different learning plans, detect their error and correction skills, and evaluate their performance with the support of logical thinking.

Research question 2. Internal consistency was followed to examine survey items that address question two. Research question two was given as "Are the items contained in the survey of teaching strategy reliable?" Null hypothesis one was given as "The items contained in the survey of teaching strategies for Taiwanese university faculty were not

reliable." The result indicated the survey items of teaching strategies were a reliable instrument and the null hypothesis one was rejected.

Teaching strategies items were a reliable instrument before and after examining the result of factor analysis. Before factor analysis was examined, the findings of the reliability test demonstrated that thirty-four questions about teaching strategies were a reliable instrument. Additionally, after factor analysis was investigated, the reliability test was introduced to re-examine twenty-eight teaching strategies items.

Research question 3. Can common factors be identified in the response of Taiwanese university faculty to the survey about teaching strategies and can those factors be used to reduce the number of survey questions while maintaining reliability? Null hypothesis two was given as "There are no common factors in the survey of teaching strategies for Taiwanese university faculty." The result indicated the survey items about teaching strategies can be reduced and grouped into four components and the null hypothesis two was rejected.

New component names were learning by doing, collaborative learning, conversation, and theory and practice. This four-component model appeared to reflect adequately the underlying twenty-eight items about teaching strategies.

Descriptive Statistics of Survey Items - Research Question Four

Research question four was given as "What are the summary statistics for internet technology usage and performance to the teaching instructional strategies?" Due to the fact that this research question simply surveys the summary statistics of faculty members' internet technology usage and their perspectives on teaching strategies, no null hypothesis was offered that corresponded to this research question.

Four internet technologies used included PowerPoint, video-based instruction, email communication, and threaded discussion. Twenty-eight teaching strategies items surveyed included whether faculty members reported that they help students to: establish understanding based on their experience, understand the big picture of the learning topic, research further on the topics related to teaching objectives, be motivated about learning topics that interest them, reflect on what they have discovered with me, have confidence in learning activities, converse with other learners about the topic, practice and demonstrate a familiarity with methods used to solve problems in reality, employ theory and practice in learning activities, apply their knowledge in other contexts, self-evaluate their quality of learning achievement with the support of a scoring rubric, share their knowledge and receive meaningful feedback from other learners or me, communicate effectively with the support of a norm of discussion, present their project that is supported with critiques by me or other learners, express their thoughts in an organized way, work together in groups to establish their knowledge, work together in groups to share knowledge and reach an agreement on learning, negotiate meaning from different perspectives with groups, research further about teaching topics within groups, demonstrate positive thinking about disagreement within groups providing chances for further research and the results, understand the idea that different perspectives of group members are derived from their culture and background, understand the status of their current knowledge, identify the needs of the assigned task, monitor their own learning progress, understand their own thinking and know how to look for help, understand individual strengths and weaknesses to implement different learning plans, detect their

error and correction skills, and evaluate their performance with the support of logical thinking.

Demographic variables included gender, served college, degree source, years of experience teaching web-based courses, years in higher education, attendance at the web-based training courses, and college encouragement to attend web-based training courses.

The following are the reported summary findings regarding demographic variables. Men accounted for nearly 14% more of the respondents than women. Of the served colleges surveyed, the college least represented was the College of Service Industries, while the college most represented was the College of Management.

Faculty members who graduated from eastern and western education systems were represented nearly equally. 78.9% of faculty members had one year or more years of experience teaching web-based courses and 46.2 % of faculty members had four years or more. 97.1% of faculty members had more than one year of teaching experience in higher education. 50% of faculty members had attended web-based courses training. 89.5% of faculty members reported that their served college "always," "usually," "often," or "sometimes" encouraged them to attend web-based training courses.

Summary findings of internet technology usage were given. PowerPoint was reportedly used more frequently than any other method with over 80% of respondents using PowerPoint "always," "usually," or "often." E-mail was the second most frequently used internet technology with 75% of respondents using E-mail "always," "usually," or "often." Threaded discussion was used less frequently than any other reported internet technology usage with under 30% of respondents using threaded discussion "always," "usually," or "often."

Summary findings of teaching strategies were offered. Big picture was reportedly used more frequently than any other method with 86.5% of respondents providing the big picture "always," "usually," or "often." Confidence in learning was the second most-frequently used teaching strategy with 85.5% of respondents providing confidence in learning "always," "usually," or "often." Criticizing project was used less frequently than any other reported teaching strategy with 50% of respondents providing critical analysis of projects "always," "usually," or "often."

MANOVA Analysis – Research Questions Five

Research question five contained two sub-questions, including research question 5.1 as "Are there differences between internet technologies usage reported by Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching in web-based settings, or attendance at the web-based training courses?" Null hypothesis three was given as "There are no significant differences between internet technologies usage for Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching in web-based courses, or attendance at the web-based training courses." And research question 5.2 as "Are there differences between teaching strategies reported by Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching in web-based courses, or attendance at the web-based training courses?" Null hypothesis four was given as "There are no significant differences between teaching strategies for Taiwanese university faculty when grouped by gender, served college, degree source, years of experience teaching in web-based courses, or attendance at the web-based

training courses." Based on the findings summarized below, null hypothesis three was rejected.

Research question 5.1. A MANOVA showed that years of experience teaching web-based courses and attendance at the web-based training courses significantly affected the internet technology usage. Gender, served college, and degree source had no significant effect on internet technology usage. Four items about internet technology usage — PowerPoint, video-based instruction, email communication, and threaded discussion — were significantly different for faculty members who had less than one year, more than one year but less than four years, and four years and more of experience teaching web-based courses. Three items about internet technology usage — video-based instruction, email communication, and threaded discussion — were significantly different for faculty members who had attended web-based training courses and faculty members who had not attended web-based training courses.

Discriminant Analysis – Research Question Six

Research question six contained two sub-questions, including research question 6.1 as "Are there clusters of internet technologies usage items that discriminate when grouped by gender, served college, degree source, years of experience teaching in web-based courses, or attendance at the web-based training courses?" Null hypothesis five was given as "There are no clusters of internet technologies usage items that be discriminated when grouped by gender, served college, degree source, years of experience teaching in web-based courses, or attendance at the web-based training courses," and research question 6.2 as "Are there clusters of teaching strategies items that discriminate when grouped by gender, served college, degree source, years of

experience teaching in web-based courses, or attendance at the web-based training courses?" Null hypothesis six was given as "There are no clusters of teaching strategies items that discriminate when grouped by gender, served college, degree source, years of experience teaching in web-based courses, or attendance at the web-based training courses." Based on the findings summarized below, both null hypothesis five and six were rejected.

Research question 6.1. A discriminant analysis using the stepwise method showed that served college, years of experience teaching web-based courses and attendance at the web-based training courses can be discriminated by predictor variables of internet technology usage: PowerPoint, video-based instruction, email, and threaded discussion. Gender and degree source can not be discriminated.

First, the use of PowerPoint significantly differentiated between faculty members who served in the colleges of HSNS, engineering, management, and industrial services. Results indicated that faculty members who served in the college of HSNS were less likely to use PowerPoint to systematically present their knowledge. Faculty members from the other three colleges were likely to use e-mail communication, video-based instruction, and threaded discussion to support their teaching activities at the similar rates.

Second, the use of PowerPoint significantly differentiated between faculty members who had less than one year, more than one year but less than four years, and four years or more of experience teaching web-based courses on the internet technology usage dimension. Results indicated that faculty members having less than one year of

experience teaching web-based courses were less likely to use PowerPoint to organize their knowledge and provide clear presentations in their teaching activities.

Third, video-based instruction and threaded discussion significantly differentiated between faculty members who had attended the web-based training courses and had not attended the web-based training courses on the internet technology usage dimension. These results indicated that faculty members having attended web-based training courses were more likely to use video-based instruction and provide more free time to converse with students through threaded discussion.

Research question 6.2. A discriminant analysis using the stepwise method showed that gender, degree source, and years of experience teaching web-based courses can be discriminated by predictor variables of teaching strategies: prior experience, big picture, research further on topics, interesting topics, reflecting with teachers, confidence in learning, conversing with other learners, using methods to solve problems, employing theory and practice, applying knowledge in contexts, sense of ownership with a rubric, sharing learning with me or others, framing conversation, criticizing project, organizational expressions of ideas, groups for establishing own knowledge, groups in agreement, negotiating ideas, positive at disagreement, research further in groups, background and beliefs, understanding current knowledge, identifying needs of assignment, monitoring own learning, understanding how to look for help, strengths and weaknesses, detecting errors skills, and logical thinking. Served college and attendance at the web-based training courses can not be discriminated.

First, the variable titled "Meta-understand how to look for help" significantly differentiated between women and men faculty members. Results indicated that those

women faculty members in their teaching strategies were less likely to provide students with ways to make sure they understand their own thinking and know how to look for help.

Second, the variables titled "CL-confidence in learning" and "CL-converse with other learners" significantly differentiated between faculty members with eastern degree and with western degree. Results indicated faculty members with western degrees were more likely to provide students confidence in their learning activities and less likely to provide students conversation with other learners about learning topics.

Third, the variables titled "Meta-understand current knowledge" and "CL-research further on topics" significantly differentiated between faculty members who had less than one year, more than one year but less than four years, and four years and more, of experience teaching web-based courses on the teaching strategies dimension. These results indicated that those faculty members having less than one year of experience teaching web-based courses were less likely to provide students the chance to research further on topics related to teaching objectives and to help students understand the status of their current knowledge. Faculty members having four or more years of experience teaching web-based courses were more likely to provide students the chance to research further on topics related to teaching objectives. Faculty members having more than one but less than four years of experience teaching web-based courses were more likely to provide students the chance to understand the status of their current knowledge.

Conclusions

New knowledge was learned through interpreting the findings in this study and the following rejections of null hypotheses one, two, three, five, and six. This new knowledge provided valuable information which to suggest the subsequent conclusions.

1. The teaching strategies questionnaire was a reliable and valid instrument. This instrument could be applied in similar Taiwanese technology universities. Further investigation regarding the learning activities within the knowledge creation cycle between faculty members and students should be addressed (see Figure 9).

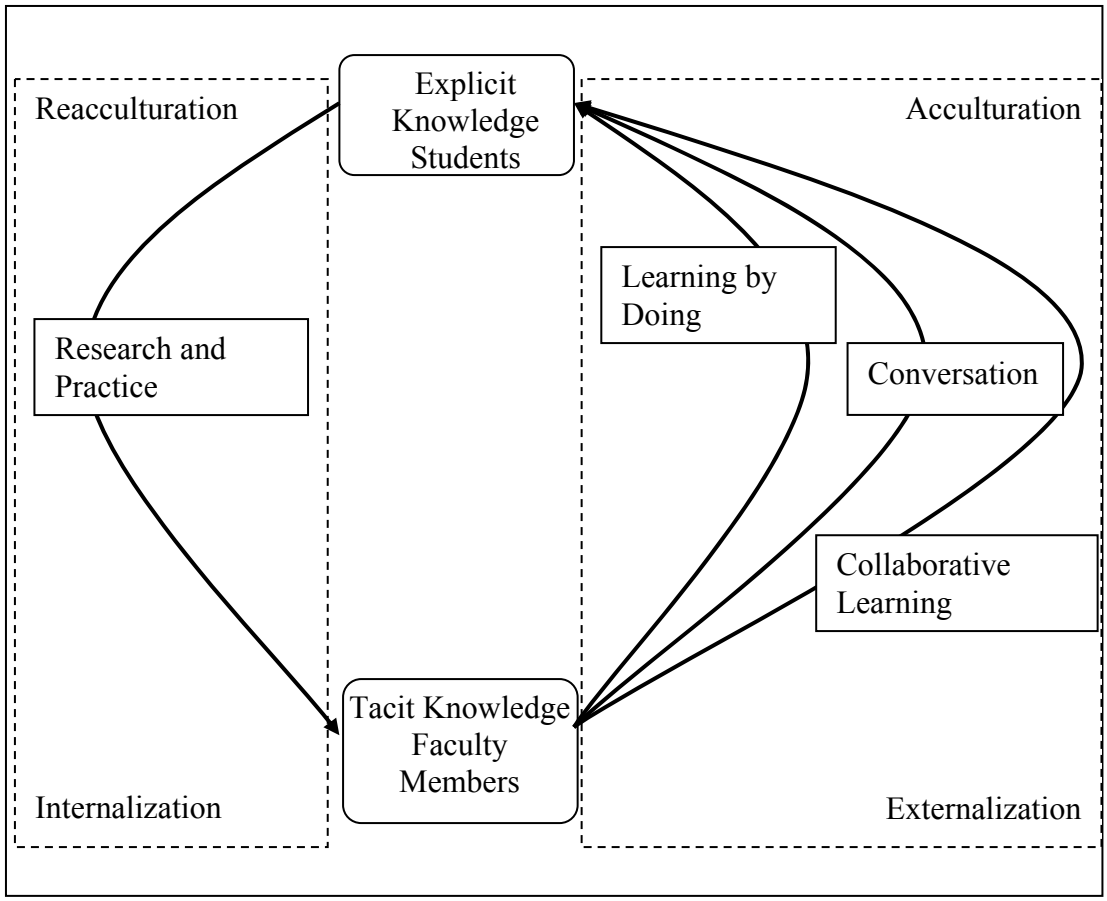

Figure 9. A model of the "explicit knowledge and tacit knowledge" dynamic of the knowledge creation cycle from faculty members' perspectives (inspired by Nonaka & Takeuchi, 1995).

2. The location where faculty members received their own training—i.e., whether they were educated at eastern or western universities—influenced their teaching strategies and methods. Faculty members with eastern or western degrees provided different conversation strategies to help students to promote their knowledge creation (see Table 63 and Figure 10). When faculty members with western degrees provided learning objectives that were based on students' experience, this led to students having confidence in learning.

This implied that students' confidence in learning results when faculty members with western degrees converse with students to understand the students' needs. The conclusion was consistent with the theory proposed by Nonaka and Takeuchi (1995) and suggested that faculty members with western degrees were more likely to converse with students concerning the idea of "requisite variety" and individual differences than were faculty members with eastern degrees (p. 198).

Table 63

Description of New Component Name, Items about Teaching Strategies and Variable Name

New Component Name	Items about Teaching Strategies	Variable Name
Learning by Doing	• Understand individual strengths and weaknesses to implement different learning plans.	• Meta-strengths and weaknesses
	• Detect their error and correction skills.	• Meta-detecting errors skills
	• Practice and demonstrate a familiarity with methods used to solve problems in reality.	• TO-using methods to solve problems
	• Apply their knowledge in other contexts.	• TO-applying knowlege in contexts
	• Understand their own thinking and know how to look for help.	• Meta-understanding how to look for help
	• Evaluate their performance with the support of logical thinking	• Meta-logical thinking
	• Monitor their own learning progress.	• Meta-monitoring own learning
	• Understand the status of their current knowledge.	• Meta-understanding current knowledge
	• Self-evaluate their quality of learning achievement with the support of a scoring rubric.	• TO-sense of ownership with a rubric
	• Identify the needs of the assigned task.	• Meta-identifying needs of assignment
Collaborative Learning	• Work together in groups to establish their knowledge.	• COLL-groups in agreement
	• Work together in groups to share knowledge and reach an agreement on learning subjects.	• COLL-groups for establishing own knowledge
	• Research further about teaching topics within groups.	• COLL-research further in groups
	• Demonstrate positive thinking about disagreement within groups providing chances for further research and results.	• COLL-positive at disagreement
	• Negotiate meaning from different perspectives with groups.	• COLL-negotiating ideas
	• Present their project that is supported with critiques by me or other learners.	• SA-criticizing project
	• Understand the idea that different perspectives of group members are derived from their culture and background.	• COLL-background and beliefs

Conversation	• Reflect on what they have discovered with me.	• CL-reflecting with teacher
	• Have confidence in learning activities.	• CL-confidence in learning
	• Share their knowledge and receive meaningful feedback from other learners or me.	• SA-sharing learning with me or others
	• Express their thoughts in an organized way.	• SA-organizational expressions of ideas
	• Converse with other learners about the topic.	• CL-conversing with other learners
	• Communicate effectively with the support of a norm of discussion.	• SA-framing conversation
	• Be motivated about learning topics that interest them.	• CL-interesting topic
Theory and Practice	• Understand the big picture of the learning topic.	• CL-big picture
	• Research further on the topics related to teaching objectives.	• CL-research further on topics
	• Establish understanding based on their experience.	• CL-prior experience
	• Employ theory and practice in learning activities.	• TO-employing theory & practice

Note 1: CL indicates construct learning.
Note 2: TO indicates task ownership.
Note 3: SA indicates sense of audience.
Note 4: COLL indicates collaborative support.
Note 5: Meta indicates metacognitive support.

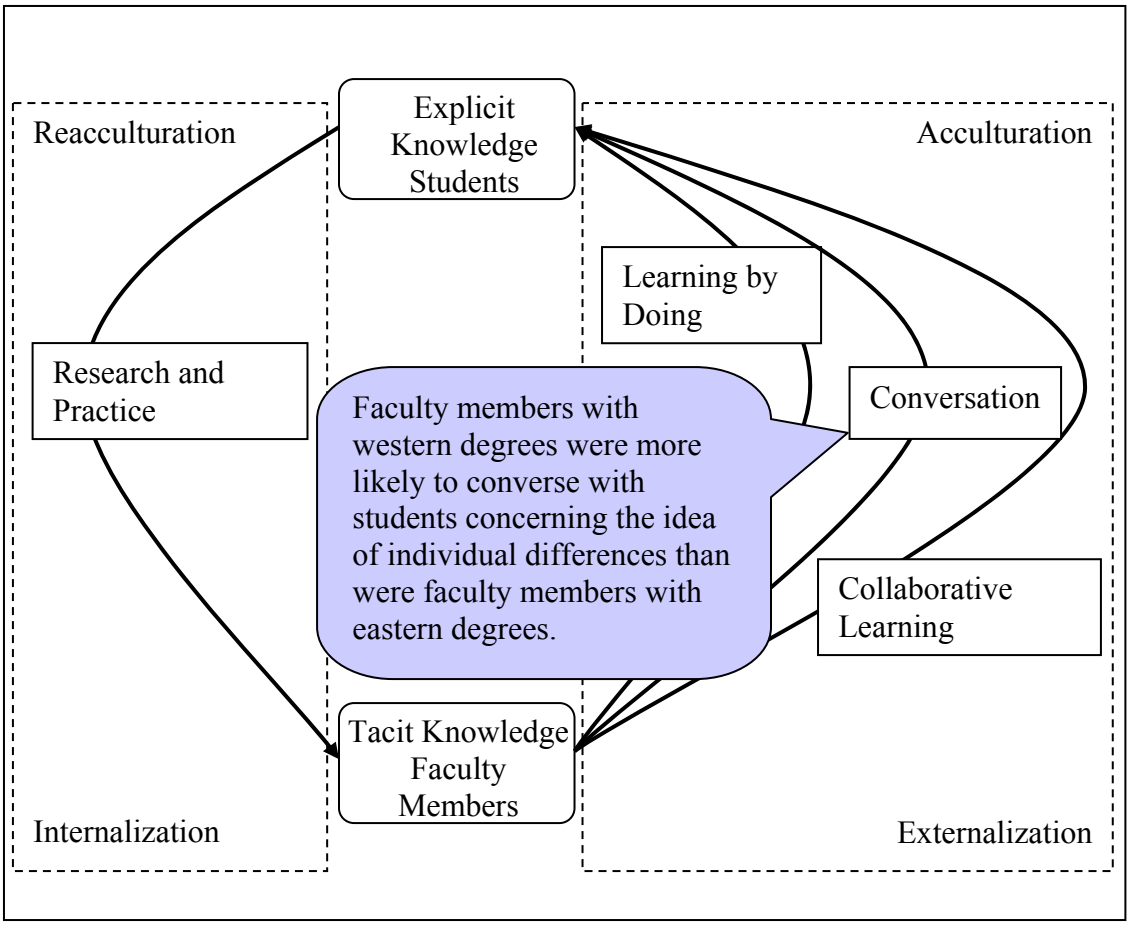

Figure 10. A presentation of difference in conversation for faculty members with western degrees and faculty members with eastern degrees. A model of the "explicit knowledge and tacit knowledge" dynamic of the knowledge creation cycle from faculty members' perspectives (inspired by Nonaka & Takeuchi, 1995).

3. The use of diversified teaching strategies was gender dependent. Women and men faculty members were different in their "learning-by-doing" teaching strategies to support students as they create knowledge (see Table 63 and Figure 11). Women faculty members were more likely to facilitate students "doing while learning" than were men faculty members. Men faculty

members were more likely to request students to self-regulate their learning strategies than were women faculty members. "Self-regulating" learners have the abilities to plan and monitor their own learning strategies (Paris & Winograd, 1999; Zion, et al., 2005).

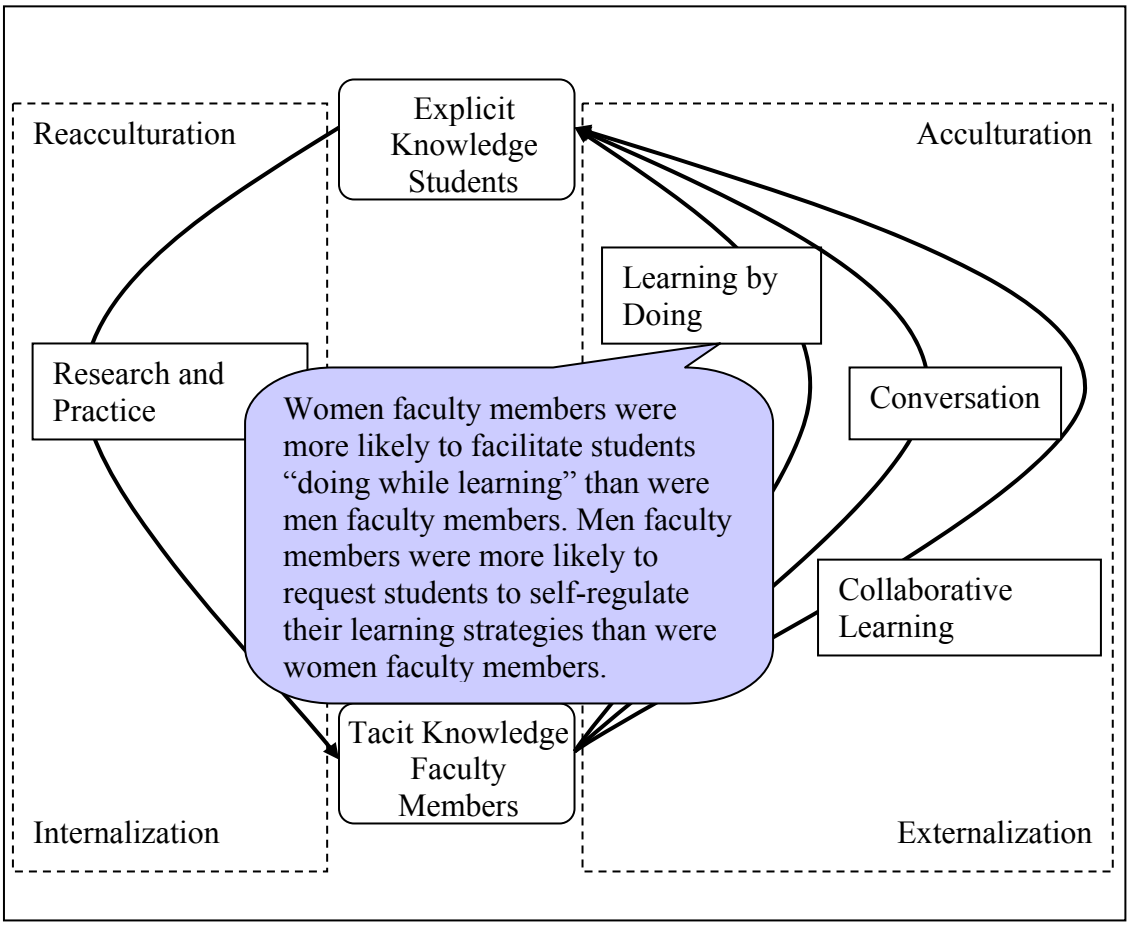

Figure 11. A presentation of difference in "doing by learning" for women faculty members and men faculty members A model of the "explicit knowledge and tacit knowledge" dynamic of the knowledge creation cycle from faculty members' perspectives (inspired by Nonaka & Takeuchi, 1995).

4. The use of teaching strategies was dependent on the faculty members' years of experience teaching web-based courses. Faculty members' years of web-based

teaching experience influenced their teaching strategies of theory and practice and learning by doing (see Table 63 and Figure 12). Faculty members with more years of web-based teaching experience were more likely to provide students the chance to apply theory and practice in their learning goals than were faculty members with fewer years of web-based teaching experience. In general, faculty members with fewer years of web-based teaching experience were less likely to apply theory and practice as well as learning by doing in their teaching strategies than faculty members who had more years of web-based teaching experience.

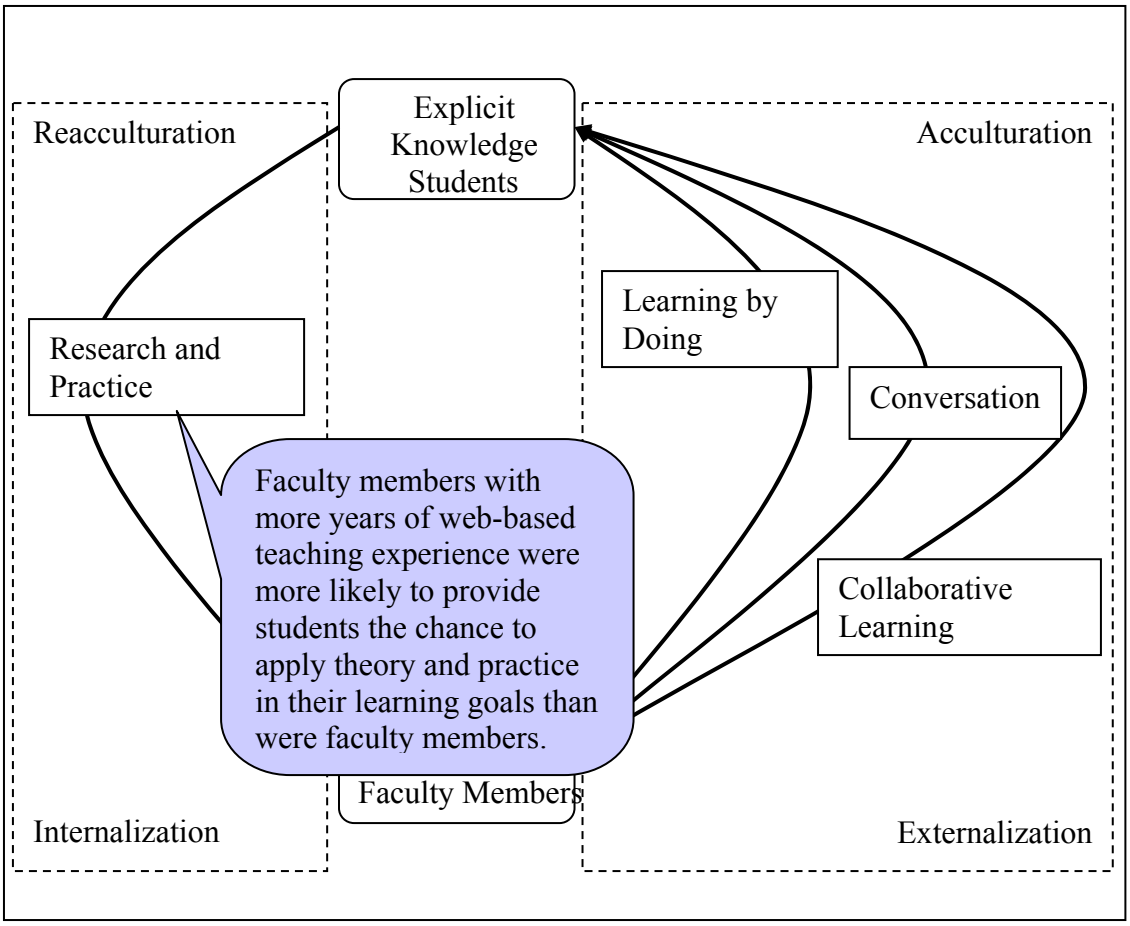

Figure 12. A presentation of difference in theory and practice of faculty members with more years of web-based teaching experience and faculty members with fewer years of web-based teaching experience. A model of the "explicit knowledge and tacit knowledge" dynamic of the knowledge creation cycle from faculty members' perspectives (inspired by Nonaka & Takeuchi, 1995).

5. The use of internet technology was dependent on the amount of faculty members' web-based teaching experience. Faculty members having less years of web-based teaching experience were less likely to use PowerPoint to organize their knowledge and provide clear presentations in their teaching

activities. The conclusion suggested that universities need to provide faculty members with less years of web-based teaching experience more training on how to use PowerPoint to support their teaching activities.

6. The use of internet technology was dependent on the college in which the faculty taught. Faculty members in the college of HSNS were less likely to use Powerpoint to systematically present their knowledge. The conclusion suggested that universities need to provide faculty members in the college of HSNS more training on how to use PowerPoint to support teaching activities.
7. The use of internet technology was dependent on attendance at web-based training courses. Faculty members who had attended web-based training courses were more likely to use video-based instruction and provide more free time to converse with students through threaded discussion. The conclusion was supported by Goldberg et al. (2006) that video-based instruction provided more freedom for faculty "to improve the quality of student-faculty contact time" (p. 125). Universities need to encourage faculty members to participate in web-based training courses to use video-based instruction and promote constructive conversation.
8. This instrument looked only at the processes of internalization and externalization, and acculturation and reacculturation (Bruffee, 1999), from faculty members' perspectives, and the dynamic of tacit knowledge to explicit knowledge, but showed a breakdown in the knowledge creation from students' perspectives, regarding explicit knowledge to tacit knowledge (Nonaka and Takeuchi, 1995) (see Figure 9). This instrument illustrated an

"explicit knowledge and tacit knowledge" dynamic, whereby externalization of teaching strategies was illustrated, while a faculty member applied four general teaching strategies. Three of the strategies were directed at externalization of knowledge and one was directed at internalization of knowledge (i.e., transfer of knowledge from the teacher to the student). The faculty member externalized "tacit knowledge" so that the student can gain "explicit knowledge" during acculturation. Additionally, faculty members externalized explicit knowledge through the use of diversified teaching strategies of learning by doing, conversation, and collaborative learning to support students as they obtained their own knowledge. The student internalized their new explicit knowledge and gained tacit knowledge through doing research and practice. The cycle has come full circle. Students become teachers.

Recommendations

In this study, although some questions were answered, still more questions needed to be investigated. Based on the findings and conclusions made in this study, the following recommendations were offered for further study.

1. Further studying of the teaching strategies questionnaire should take place so that this instrument can be used in various education systems.
2. This study should be replicated among different populations in order to discover how faculty members in various disciplines adopt their teaching strategies.
3. Universities should consider diversity of teaching strategies among faculty members and encourage faculty members to diversify their teaching strategies.
4. Further study should address a model of the "explicit knowledge and tacit knowledge" dynamic (see Figure 9) for use as a lens to view how knowledge was created between teachers and students in universities. Specifically, the "explicit knowledge and tacit knowledge" dynamic from students' perspective should be investigated.
5. Further training of faculty members in their application of internet technology to support their teaching strategies should be addressed.

Summary

In higher education, web-based learning has become widely used to as a supplement to a traditional face-to-face classroom. Faculty members when teaching in web-based environments need to adopt diversified teaching strategies and utilize internet technologies to support their teaching activities. This study utilized Reeves' (1997) web-based teaching strategies as the theoretical framework to examine how teachers externalize their knowledge to support students' learning experience. The study's purpose was to establish a valid and reliable instrument that can be used to assess self-reported performance of university faculty regarding their instructional practice and applications of internet technology.

This chapter was divided into six sections. First, an overview of the study was provided. This overview included a summary of the problem statement, the purpose of the study and the research questions and null hypotheses. Second, a review of the research design was provided. This section summarized the study as a quantitative, non-experimental case study survey research design. The MANOVA and discriminant analysis were used in order to analyze the data acquired. Third, a discussion of findings was provided. Findings were organized such that each research question and null hypothesis was addressed through the use of distinct sub-sections.

Five overall null hypotheses were rejected and one null hypothesis was not rejected. Findings indicated that the items about teaching strategies were a reliable and valid instrument. Additionally, the independent variables a) served college, b) years of experience teaching web-based courses, and c) attendance at the web-based training courses significantly influenced a faculty member's use of internet technologies.

Moreover, findings demonstrated that the independent variables a) gender, b) degree source, and c) years of experience teaching web-based courses significantly influenced a faculty member's teaching strategies.

Fourth, conclusions were given and finally recommendations were provided. These conclusions and recommendations suggested that the teaching strategies instrument was reliable and valid and could be applied in similar populations. Researchers should more fully investigate how the interaction within the model of the "explicit knowledge and tacit knowledge" dynamic of the knowledge creation cycle at universities related to experiences gained from faculty members and students through students' lenses. Universities should consider recruiting faculty members with diverse teaching strategies in each college to provide different teaching strategies to give students opportunities to construct their own knowledge. For example, department chairs might hire faculty members with consideration toward balance in gender and balance among education systems—eastern or western—in which faculty members were educated. Universities should continue training faculty members in their use of internet technologies to support their teaching activities to maximize students' success.

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Appendix A

Survey of Current Teaching Instructional Practice and Application of Internet Technology for University Faculty: Faculty (Preliminary)

Directions: Please respond to the questions by checking the answers to questions 1-6 and circling the answers to questions 7 that most accurately describes your experience:

1. Gender: __M __F

2. Served college: __HSNS __Engineering __Management __ Service Industries

3. Degree source: __Eastern __Western

4. Years of experience teaching web-based courses:

   __0 year __0-1 year __1-2 years __2-3 years __above 4 years

5. Years in higher education:

   __0-1 year __1-5 years __5-10 years __10-15 years __15-20 years __above 20 years

6. Have you attended the Web-based teaching training courses?

   _Yes _No

7. My college encourages me to attend web-based teaching training courses:

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

Please select the response below that best reflects your usage of internet technology as faculty member.

Directions: Using the provided 9-point scale, respond to the questions by circling the response that most accurately expresses your usage of internet technology by completing the following prompt: *According to only one course you teach in current semester:*

8. I use PowerPoint to support my teaching activities.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

9. I use video-based instruction to support teaching activities.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

10. I use e-mail to communicate with students.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

11. I encourage students to participate in threaded discussion.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

Please select the response below that best reflects your opinion of the associated statement.

Directions: Using the provided 9-point scale, respond to the questions by circling the response that most accurately expresses your belief about your students' performance by completing the following prompt: *According to my teaching strategy, I provide opportunity for my students to:*

12. Establish understanding based on their experience.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

13. Understand the big picture of the learning topic.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

14. Research further on the topics related to the teaching objectives.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

15. Be motivated about learning topics that interest them.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

16. Reflect on what they have discovered with me.

Always				Sometimes				Never

9 8 7 6 5 4 3 2 1

17. Converse with me about the topic of learning.

Always Sometimes Never
9 8 7 6 5 4 3 2 1

18. Have confidence in the learning activity.

Always Sometimes Never
9 8 7 6 5 4 3 2 1

19. Converse with other learners about topic.

Always Sometimes Never
9 8 7 6 5 4 3 2 1

20. Connect current practice that is close to students' experience.

Always Sometimes Never
9 8 7 6 5 4 3 2 1

21. Define learning topics that are close to their experience.

Always Sometimes Never
9 8 7 6 5 4 3 2 1

22. Practice and demonstrate a familiarity with methods used to solve problems in reality.

Always Sometimes Never
9 8 7 6 5 4 3 2 1

23. Employ theory and practice in learning activities.

Always Sometimes Never
9 8 7 6 5 4 3 2 1

24. Solve a problem regarding the topic with ill-defined problem statements.

Always Sometimes Never
9 8 7 6 5 4 3 2 1

25. Apply their knowledge in other contexts.

Always Sometimes Never
9 8 7 6 5 4 3 2 1

26. Focus on major learning topics with the support of a scoring rubric.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

27. Demonstrate a sense of ownership in learning activities with the support of a scoring rubric.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

28. Self-evaluate their participation in learning activities with the support of a scoring rubric.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

29. Self-evaluate their quality of learning achievement with the support of a scoring rubric.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

30. Express what they have learned to other learners.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

31. Share their knowledge and receive meaningful feedback from other learners or me.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

32. Change their thinking through conversation.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

33. Master their knowledge and discover learning goals through conversation.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

34. Communicate and frame issues effectively.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

35. Communicate effectively with the support of a norm of discussion.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

36. Present their project that is supported with critiques by me or other learners.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

37. Evaluate evidence and construct meaningful explanations about their findings with other learners.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

38. Analyze information and debate about their findings with other learners.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

39. Express their thoughts in an organized way.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

40. Work together in groups to establish their knowledge.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

41. Work together in groups to share knowledge and reach an agreement on learning subjects.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

42. Build consensus within groups.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

43. Negotiate meaning from different perspectives with groups.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

44. Clarify individual responsibility within groups.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

45. Understand the criterion of group success.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

46. Research further about the teaching topic within groups.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

47. Redefine their prior assumptions while conflict occurred within groups.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

48. Demonstrate positive thinking about disagreement within groups providing chances for further research and results.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

49. Understand the idea that different perspectives of group members are derived from their culture and background.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

50. Understand the status of their current knowledge.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

51. Identify the needs of the assigned task.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

52. Adapt effective learning action.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

53. Monitor their own learning progress.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

54. Understand their own thinking and know how to look for help.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

55. Understand individual strengths and weaknesses to implement different learning plans.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

56. Explain their learning progress.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

57. Detect their error and correction skills.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

58. Evaluate their performance with the support of logical thinking.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

59. Ensure lessons learned from mistakes are shared.

Always				Sometimes				Never
9	8	7	6	5	4	3	2	1

Reeves, T. C. (1997). A model of the effective dimensions of interactive learning on the World Wide Web. University of Georgia. Retrieved November 3, 2008, from http://it.coe.uga.edu/~treeves/WebPaper.pdf

Appendix B

Faculty Explanatory Letter

Dear School Faculty:

As a requirement for completion of my doctoral degree at the University of Missouri-Columbia, I am working on a dissertation titled "Determining Reliability and Validity of a Faculty Survey and Identification of Current Teaching Strategy and Application of Internet Technology in a Taiwanese University." My data will require input from school faculty through the enclosed survey instrument. I would be very thankful if you could take a few minutes to respond to the enclosed survey questionnaire.

It is not expected that you will personally experience either risks or benefits from this research. Through your participation in this study, faculty in this Taiwanese university will better understand their needs for teaching strategy and internet technology application to foster students' learning.

It will take you twenty to thirty minutes to answer the fifty-nine items in the questionnaire. All answers will be kept confidential and only be used for this study. No department or person will be named in this study.

Your participation in this research study is voluntary. You are free to withdraw your consent and discontinue your participation at any time. The findings of this research may be subject to publication in the future.

Thank you very much for your cooperation in this study. Your shared knowledge will have helped a graduate student complete his dissertation and you will have contributed to further research in the field of teaching strategy and internet technology application in this Taiwanese university.

Please feel free to ask questions at any time during the study. You may contact me at the telephone numbers included below or by e-mail. You are also free to contact my major advisor, Dr. Phillip Messner at (660) 562-1478. If you have any question about your rights, please contact the University of Missouri Institutional Review Board at (572) 882-9585.

Your participation in returning the enclosed questionnaire and signed consent form to the secretary of the Information Science department will be greatly appreciated.

Sincerely yours,

Jeng-Yiiang Li
0021-573-823-6048
e-mail: jlfd7@mizzou.edu

Appendix C

Consent Form

Teaching Strategy and Internet Technology Applications for Faculty in a Taiwanese University

Dear faculty,

This study will use a questionnaire designed to assess the degree to which faculty from this Taiwanese university are practicing teaching strategies and internet technology and establishing a reliable and valid instrument. Three hundred twenty faculty from four colleges will receive questionnaires. Faculty responses will be grouped by demographic categories such as gender, college service, degree source, years of experience in web-based teaching and attendance at web-based training courses. Finally, the study will use the findings to attempt to establish a reliable and valid instrument of teaching strategy and internet technology application for faculty in this Taiwanese university and predict the degree to which faculty of the university with common demographic characteristics may meet this instrument. Your participation—completing and returning the enclosed questionnaire along with this form properly signed—will require less than twenty minutes.

- **Participation in this study is completely voluntary.** You may withdraw from participation at any time you wish, including in the middle of the survey or after it is completed. You may choose not to answer any single question or group of questions if you prefer. If you decide at a later time that you do not want me to use your survey in my study, I will respect your decision.

- **Your identity will be protected in the reporting of my findings.** I will use a code or pseudonym rather than your real name or the name of your department in my report. While your name or the name of your department appears in public records of events in my study, I will change it to a code or pseudonym throughout my reporting.

This study will provide further implications and indications of how well university faculty members are being prepared to lead their teaching activities and internet technology application to promote students' learning. Higher education systems will be able to use the results of this study to develop more realistic teaching strategies that will focus on making faculty members more effective teachers in the new internet technology era.

If at this point you are willing to participate in the study, please complete and sign the consent form on the following page. Keep the top page for your records.

----I, _____, agree to participate in the study of teaching strategy and internet technology application for university faculty. I understand that this

questionnaire will be grouped with similar data for use in a doctoral dissertation that will include printed reports and published materials, my participation is completely voluntary, I may withdraw my participation at any point in the study, and my identity and the identity of my department will be protected in reporting of the findings.

Printed Name: _____ Signed: _____ Date: _____

Appendix D

Correspondence with Subjects

Sent June 20, 2008 to all 320 subjects

I am conducting research for a dissertation as partial fulfillment of my doctoral degree through the University of Missouri-Columbia. My dissertation is titled "Determining Reliability and Validity of a Faculty Survey to Identify Current Teaching Strategies and Application of Internet Technologies in a Taiwanese University" and requires that I collect data from full-time faculty members.

I would appreciate it if you could take a few minutes to complete the survey. Please link to the website following this message to participate in this study. The survey contains 45 questions and will take you 20-25 minutes to complete. All responses will be kept confidential and no school or individual will be named in this study.

You will not be personally rewarded in any way for participating in this research. However, with your contribution to the research regarding teaching strategies and application of internet technologies, it will assist me in completion of this dissertation.

Please let me know if you have any questions. You may also contact my advisor, Dr. Phillip Messner at (660) 562-1478. For questions about your rights in this study, contact the University of Missouri Institutional Review Board at (572) 882-9585.

Please follow the link below to complete the informed consent document and subsequent questionnaire.

By clicking the website below, I agree to participate in the study of instrument development for the University of Missouri; I understand that data collected by the researcher will be used in a doctoral dissertation. My participation is completely voluntary and I may withdraw my participation in the survey at any time, and my identity will be protected in reporting of the findings.

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http://freeonlinesurveys.com/rendersurvey.asp?sid=x6y2kyydy2ws73s450370

Thank you for your time.

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Appendix E

Survey of Current Teaching Instructional Practice and Application of Internet Technology for University Faculty: Faculty

Directions: Please respond to the questions by checking the answers to questions 1-6 and circling the answers to questions 7 that most accurately describes your experience:

1. Gender: __M __F

2. Served college: __HSNS __Engineering __Management __ Service Industries

3. Degree source: __Eastern __Western

4. Years of experience teaching web-based courses:

   __0 year __0-1 year __1-2 years __2-3 years __above 4 years

5. Years in higher education:

   __0-1 year __1-5 years __5-10 years __10-15 years __15-20 years __above 20 years

6. Have you attended the Web-based teaching training courses?

   _Yes _No

7. My college encourages me to attend web-based teaching training courses:

Always			Sometimes			Never
7	6	5	4	3	2	1

Please select the response below that best reflects your usage of internet technology as faculty member.

Directions: Using the provided 7-point scale, respond to the questions by circling the response that most accurately expresses your usage of internet technology by completing the following prompt: *According to only one course you teach in current semester:*

8. I use PowerPoint to support my teaching activities.

Always			Sometimes			Never
7	6	5	4	3	2	1

9. I use video-based instruction to support teaching activities.

Always			Sometimes			Never
7	6	5	4	3	2	1

10. I use e-mail to communicate with students.

Always			Sometimes			Never
7	6	5	4	3	2	1

11. I encourage students to participate in threaded discussion.

Always			Sometimes			Never
7	6	5	4	3	2	1

Please select the response below that best reflects your opinion of the associated statement.

Directions: Using the provided 7-point scale, respond to the questions by circling the response that most accurately expresses your belief about your students' performance by completing the following prompt: *According to my teaching strategy, I provide opportunity for my students to:*

12. Establish understanding based on their experience.

Always			Sometimes			Never
7	6	5	4	3	2	1

13. Understand the big picture of the learning topic.

Always			Sometimes			Never
7	6	5	4	3	2	1

14. Research further about the topics related to the teaching objectives.

Always			Sometimes			Never
7	6	5	4	3	2	1

15. Be motivated about learning topics that interest them.

Always			Sometimes			Never
7	6	5	4	3	2	1

16. Reflect on what they have discovered with me.

Always			Sometimes			Never
7	6	5	4	3	2	1

17. Have confidence in the learning activity.

Always			Sometimes			Never
7	6	5	4	3	2	1

18. Converse with other learners about topic.

Always			Sometimes			Never
7	6	5	4	3	2	1

19. Connect current practice that is close to students' experience.

Always			Sometimes			Never
7	6	5	4	3	2	1

20. Practice and demonstrate a familiarity with methods used to solve problems in reality.

Always			Sometimes			Never
7	6	5	4	3	2	1

21. Employ theory and practice in learning activities.

Always			Sometimes			Never
7	6	5	4	3	2	1

22. Apply their knowledge in other contexts.

Always			Sometimes			Never
7	6	5	4	3	2	1

23. Self-evaluate their participation in learning activities with the support of a scoring rubric.

Always			Sometimes			Never
7	6	5	4	3	2	1

24. Self-evaluate their quality of learning achievement with the support of a scoring rubric.

Always			Sometimes			Never
7	6	5	4	3	2	1

25. Share their knowledge and receive meaningful feedback from other learners or me.

Always			Sometimes			Never
7	6	5	4	3	2	1

26. Change their thinking through conversation.

Always			Sometimes			Never
7	6	5	4	3	2	1

27. Master their knowledge and discover learning goals through conversation.

Always			Sometimes			Never
7	6	5	4	3	2	1

28. Communicate effectively with the support of a norm of discussion.

Always			Sometimes			Never
7	6	5	4	3	2	1

29. Present their project that is supported with critiques by me or other learners.

Always			Sometimes			Never
7	6	5	4	3	2	1

30. Express their thoughts in an organized way.

Always			Sometimes			Never
7	6	5	4	3	2	1

31. Work together in groups to establish their knowledge.

Always			Sometimes			Never
7	6	5	4	3	2	1

32. Work together in groups to share knowledge and reach an agreement on the learning subjects.

Always			Sometimes			Never
7	6	5	4	3	2	1

33. Negotiate meaning from different perspectives with groups.

Always			Sometimes			Never

7 6 5 4 3 2 1

34. Research further about the teaching topic within groups.

Always Sometimes Never
7 6 5 4 3 2 1

35. Demonstrate positive thinking about disagreement within groups providing chances for further research and results.

Always Sometimes Never
7 6 5 4 3 2 1

36. Understand the idea that different perspectives of group members are derived from their culture and background.

Always Sometimes Never
7 6 5 4 3 2 1

37. Understand the status of their current knowledge.

Always Sometimes Never
7 6 5 4 3 2 1

38. Identify the needs of the assigned task.

Always Sometimes Never
7 6 5 4 3 2 1

39. Adapt effective learning action.

Always Sometimes Never
7 6 5 4 3 2 1

40. Monitor their own learning progress.

Always Sometimes Never
7 6 5 4 3 2 1

41. Understand their own thinking and know how to look for help.

Always Sometimes Never
7 6 5 4 3 2 1

42. Understand individual strengths and weaknesses to implement different learning plans.

Always			Sometimes			Never
7	6	5	4	3	2	1

43. Detect their error and correction skills.

Always			Sometimes			Never
7	6	5	4	3	2	1

44. Evaluate their performance with the support of logical thinking.

Always			Sometimes			Never
7	6	5	4	3	2	1

45. Ensure lessons learned from mistakes are shared.

Always			Sometimes			Never
7	6	5	4	3	2	1

Reeves, T. C. (1997). A model of the effective dimensions of interactive learning on the World Wide Web. University of Georgia. Retrieved November 3, 2008, from http://it.coe.uga.edu/~treeves/WebPaper.pdf

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Appendix F

Follow-up Messages

Sent June 23, 2008 to 250 remaining subjects

Dear faculty members,

Friday I sent you a message asking you to participate in a research study. If you have had trouble opening the link to the website to complete the questionnaire, you may use the link provided below:

http://freeonlinesurveys.com/rendersurvey.asp?sid=x6y2kyydy2ws73s450370

Please let me know if there are any problems.

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Sent June 27, 2008 to 230 remaining subjects

Dear faculty members,

I know that you are busy at the end of this semester. At this point, I still have not received enough responses for data analysis to complete the dissertation.

If you could spend 15 minutes to complete the survey (please hyperlink to the following website), it would be a great help.

http://freeonlinesurveys.com/rendersurvey.asp?sid=x6y2kyydy2ws73s450370

Please let me know if there are any problems and have a great summer.

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