EFL and ESL Teacher Values and Integrated Use of Technology in Universities in the Asia-Pacific Region

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Educational Technology, Multimedia, Computer-Assisted Language Learning, CALL, Computer-Mediated Communication, CMC, ESL, EFL
Abstract

Educators who teach international students English as a second language (ESL) or English speakers teaching English as a foreign language (EFL) in universities in non-English speaking countries in the Asia-Pacific region are often challenged to develop culturally appropriate curriculum for a diverse group of learners. Prompted by educational policy over the past two decades, the technological infrastructure in most universities throughout the world has advanced. Innovative tools for language learning have been developed for computer-assisted instruction. The purpose of the present study was to assess to what extent teachers use multimedia in EFL/ESL university classrooms in relation to the theoretical underpinnings of constructivism as well as Rogers’ (1995) theory of diffusion of innovations and adopter categories. Further, the study aimed to ascertain what factors contribute to or discourage teachers’ use of multimedia in tertiary level English language teaching classrooms. A mixed-method research design was used and both quantitative and qualitative data were collected. One hundred and seventy-nine English-language teachers from five universities in the Asia-Pacific region were interviewed and data were collected on their use of multimedia. Complex relationships were found among teacher-held educational and cultural values, teaching experience, formal computer professional learning, nationality, institution, region, age, gender, and collaboration with colleagues. Results showed that even with adequate access to hardware, software, technical support and computer professional learning, most teachers in the study made limited use of multimedia in the EFL/ESL classroom. As well, the results indicated that teachers in all three universities in Taiwan used multimedia in the EFL/ESL classroom less than teachers in Australia and in Thailand. Teachers who endorsed constructivist teaching methodologies tended to use multimedia more.
Also, teachers with fewer than ten years teaching experience tended to use technology in teaching more. Data showed the use of integrated technology by teachers usually diminished as teachers got older. However, results showed that teachers who engaged in professional learning tended to use multimedia more regardless of age. Future directions in technology integration and recommendations for creating and sustaining a culture of technology at educational institutions are offered. Suggestions for professional development to encourage the integrated use of technology in English language teaching programs are outlined.

KEYWORDS: EFL, ESL, culture of technology, technology-enhanced language learning, computer-assisted language learning (CALL), multimedia in language teaching, learning styles, multiple intelligences, second language acquisition, computer-assisted instruction, CAI, social constructivism, cultural constructivism.
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Statement of original authorship

The work contained in this thesis has not been previously submitted for a degree or diploma at any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signed: [Signature]

Date: 2/10/2007
Dedication

To my Dad, who is the wind beneath my wings and my comfort in life, who has supported my every endeavor, and who has been an ultimate inspiration to those who know him.
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I would like to acknowledge Dr. Sun-Pern Kowang, Vice President of Chienkuo Technology University in Taiwan, whose vision and brilliance inspired me to undertake this research and whose extensive and ongoing support allowed me to flourish in the field of multimedia in the EFL classroom and in online program development.

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Definition of Terms & Acronyms

Academic capitalism – Describes the trend within universities to link research funding to marketability (Slaughter & Leslie, 1997; Tai, 2002).

ALIS – Alberta Learning Information Service. Online source for career, learning, and employment information and services provided by the Government of Alberta, Canada.

ARPA – Advanced Research Projects Agency. This agency was founded in 1958 in response to the surprise launch of the first Russian artificial satellite (1957) which led to the origin of the Internet. ARPA conducts advanced research applicable to the military for the United States Department of Defense.

ASEAN – Association of Southeast Asian Nations. Established in Bangkok in 1965, the ASEAN region consists of 10 countries with an overall population currently of about 500 million.

ASTP – Army Special Training Program. The audiolingual approach to language teaching started with the ASTP.

Audiolingual approach – Developed by anthropologists to train American intelligence operatives for foreign assignments and was popular from the 1940s through the 1960s. It included teaching aspects of the target culture and presupposed that grammar would be learned inductively. This approach is based in structural linguistics (structuralism) and behavioristic psychology (Skinner's behaviorism) with a heavy emphasis on spoken rather than written language. Audiolingual approaches depend on rote memorization rather than the instructor's creative ability (Belcher & Hirvela, 2001).

Blended learning – A course delivered partially face-to-face and partially online via the Internet.
Blogs – Short for “web logs” where individuals can post photographs and log notes and publish them via computer to the World Wide Web.

CAI – Computer-assisted instruction. An aide to teaching in which computers are used to enhance the learning environment by assisting students in gaining mastery of specific skills. This form of instruction can be used in conjunction with computer-mediated communication.

CALL – Computer-assisted language learning. Computer-assisted instruction (CAI) used for the specific purpose of learning a language.

CBI – Content-based instruction. In CBI, instead of learning a language per se, students learn about something in the ‘target’ language.

CD-ROM – Compact Disc-Read-Only Memory. A type of optical disk capable of storing large amounts of data. The most common size is 700 megabytes which means single CD-ROM has the storage capacity of approximately 600 floppy disks which is enough memory to store about 300,000 text pages or one hour of video footage.

CELL – Computer-enhanced language learning. CELL is used here in preference to CALL (Computer-assisted language learning) to recognize the enhancing role that computers play in the language learning process. “Humanistic elements of the use of computers in language learning emerge in discussions of types and techniques of learning, where CELL brings the real world into the classroom, makes learning more relevant, develops the learners' sense of responsibility, promotes non-linear and co-operative learning, helps reduce the need for a meta-language, and changes the role of the teacher” (Hoven, 1999, p. 88).
CLT – Communicative language teaching. In CLT, the teacher serves as a facilitator, allowing students to be in charge of their own learning. The teacher sets up exercises and gives direction to the class, but the students do more speaking than in a traditional classroom. This responsibility to participate can often lead to an increased sense of confidence in using the language. Fluency is valued over accuracy. Focus on facilitating effective communication instead of teaching language structures.

CMC – Computer-mediated communication. Communication with people via the computer in online environments such as discussion boards; Internet messaging services; e-mail; video conferencing; Internet telephone which is known as Voice over Internet Protocol (VoIP); for example, “Skype.”

Collaborative learning – A learner-centered environment where students are in control of their own learning. Learning may be cooperative, collaborative or independent where students are the key decision makers and the teacher acts as facilitator and guide (Fahraeus, 2004; Hyslop-Margison, 2004; Jacobsen, 2005).

Community of inquiry – A model of interactive communication for online learning using computer-mediated communication showing cognitive presence, teaching presence, and social presence.

Constructivism – Constructivism is a theory of learning based on the idea that knowledge is constructed by the learner based building on what is already known. Learners are considered to be active agents seeking meaning. Learning is intended to be authentic and interdisciplinary and extends to life experiences beyond the classroom (Brooks & Brooks, 1992; Perkins, 1992b).
Cultural constructivism – The process through which various cultural paradigms in the course of knowledge construction, may potentially create multiple realities for students and teachers from differing cultural backgrounds (Hutchinson, 2006).

Cultural paradigm – Culture is conceptualized as a dialectical process whereby people internalize meanings and also give a reorientation to some meanings. Culture is thus a process whereby meanings circulate in society.

Curriculum – The content (information and processes) that students are required to engage with and the medium (or process) used to engage with the content.

Distance delivery – Instructional delivery systems which connect learners with educational resources either by surface mail or via the Internet.

Educational technology – The use of any form of technological resources to support the process of teaching and learning.

E-learning – E-learning involves the use of a computer or electronic device to deliver training or education. Network-enabled transfer of skills and knowledge where educational content is delivered via the Internet, audio or video tape, satellite TV or CD-ROM. E-learning refers to the use of electronic applications and processes to learn in virtual classrooms, through digital collaboration or standalone computers. In terms of language teaching, e-learning can be student-computer interaction or person-to-person interaction via the computer.

E-mail – Electronic mail. Invented in 1971 by Ray Tomlinson to send messages across a distributed network (Gaudin, 2002).

EFL – English as a foreign language. Refers to English learned in a country where it is not the primary language.
ESL – English as a second language, as in an English-speaking country with students whose initial language is not English.

Face-to-face instruction – Classroom instruction where the teacher and the student are present.

FTP – File transfer protocol. The process whereby files are uploaded to a server so a website can be viewed when the user downloads into their personal computer.

Grammar-translation method – The proper use of verbs, nouns, adjectives, adverbs, prepositions, conjunctions, articles, and pronouns are systematically learned. Grammar is taught deductively. Still used in various settings around the world when the focus is accessing technical texts in a foreign language.

GUA – Global University Alliance. A consortium of universities working with NextEd, a Hong Kong-based online education specialist with offices in Australia, London, Washington, and Beijing.

High speed Internet – A move from dial-up 56kps (kilobytes per second) speed Internet access over telephone lines to much faster ADSL (asymmetric digital subscriber line), a new technology that allows more data to be sent over existing copper telephone lines. ADSL supports data rates of from 1.5 to 9 Mbps (megabytes per second) when receiving data (also known as downloading) and from 16 to 640k when sending data (also known as uploading).

HTML – HyperText Markup Language is the authoring language used to create documents on the World Wide Web.

IDE – Internet-based distance education.

ICT – Information and communication technology.

IT – Information technology.
III – Institute for Information Industry. Implemented in Taiwan in 2004 through the National Information Infrastructure to plan and promote computer competence on a national level as well as to increase economic development.

Integrated Technology – Technology used to enhance curriculum to improve learning, productivity and performance.

Interactive multimedia – Allows two-way interaction between a user and multimedia course material or another user with direct response to the input, as opposed to one-way communication from TV, video, and other non-responsive media. Interactive attributes can give immediate feedback such as quiz scores and can include data or text entry, mouse input, touch screens, voice commands, video capture and real-time interaction between people and computers.

Interactivity – Involves people working together and having an influence on each other. In terms of computer-assisted language learning, interactivity involves information passing continuously in both directions between a computer and the person who uses it.

Internet – The interconnection of networks using the TCP/IP common protocol which is a set of rules for communication between computers. The Internet had its origins in 1969 when the Advanced Research Projects Agency in the United States began ARPANET, an electronic network for military purposes.

ISTE – International Society for Technology in Education. An organization in the United States that sets standards to assist teachers in harnessing the power of technology in their teaching corresponding to Howard Gardner’s multiple intelligences.

L2 – Second (or other) language learned.
Learning Communities – Online discussion groups using computer-mediated communication.

Learning styles – Internally based characteristics of individuals for the understanding and absorption of new information (Gardner, 1983; Kang, 1999).

Limitations (of the study) – “An aspect of a study that the researcher knows may negatively affect the results or generalizability of the results but over which the researcher has no control” (Gay, Mills, & Airasian, 2006, p. 598).

Lingua franca – A language that gains international currency as a language of trade or business.

Message boards – Online forums for exchanging information. Messages are recorded and can be accessed in real time or asynchronously. Also called discussion boards.

MI – Multiple intelligences. Howard Gardner’s (1983) theory is that people have 8 intelligences: linguistic, logical-mathematical, spatial, kinesthetic, musical, interpersonal, intrapersonal, and environmental intelligences. For Gardner, an intelligence is “the ability to solve problems, or create products, that are valued in one or more cultural settings.”

MoE – Ministry of Education.

MM – “Teacher use of multimedia” scores as used in the context of the data only within this study.

Multimedia – The use of computers to present text, graphics, video, animation and sound in an integrated way.

MUVEs – Educational Multi-User Virtual Environments.

NAFTA – North American Free Trade Agreement.

Pedagogy – The process of teaching and the materials used for lessons.
Polysemy – The ambiguity of an individual word or phrase that can be used in
different contexts to express two or more different meanings.

POS – Parts of speech.

Semantic network – A set of verbal associations. The name for a family of
representational schemes rather than a single form.

SLA – Second language acquisition.

Social constructivism – The theory that knowledge is the result of social interaction
and language usage which is a shared, rather than an individual experience.
Implicit in this view is the need to focus on the learner and not on the subject
material being taught (Adams, 2006).

TAM – Technology acceptance model. Developed by Davis, Bagozzi, and Warchaw
(1989) who found a relationship between perceived usefulness and intention
to use technology.

Telephony – Internet ‘telephone’ allowing users to speak in real time from computer
to telephone or computer to computer using voice over internet protocol
(VoIP).

Traditional teaching – A teacher-centered environment where the teacher is largely
in control and is the main instructor and key decision maker. The learning
environment is usually competitive and grades driven.

USDE – United States of America Department of Education.

World Wide Web – A hypermedia-based system for browsing Internet sites. It is
named the Web because it is made of many sites linked together; users can
travel from one site to another by clicking on hyperlinks. A system of Internet
servers that support specially formatted documents.
CHAPTER ONE

INTRODUCTION

1.1 Background

Educational technology can be defined as a "goal oriented problem-solving systems approach utilizing tools, techniques, theories, and methods from multiple knowledge domains, to: (1) design, develop, and evaluate, human and mechanical resources efficiently and effectively in order to facilitate and leverage all aspects of learning, and (2) guide change and transformation of educational systems and practices in order to contribute to influencing change in society" (Lippincini, 2005, p. 107).

Ministries of education throughout much of the world are encouraging the use of integrated educational technology and this is filtering into the English language classroom (Culp, Honey, & Mandianach, 2003). The use of multimodal technology in language studies is a cost-effective and highly stimulating way to achieve the goal of acquiring a second language, however, research shows that teachers have widely varying responses to the adoption of integrated technology (for example, see Rogers, 1995; Tong & Trinidad, 2005). The factors that contribute to or detract from teacher adoption of technology are complex (Hodas, 1993; Newhouse, Trinidad & Clarkson, 2002a). Jacobsen and Lock (2005) conclude that technological change is necessarily disruptive to familiar teaching practice.

This disruption to familiar teaching could be why many EFL/ESL teachers may not regard educational technology as a viable tool for teaching English language skills (McGrail, 2005). With first year English being mandated for undergraduate student non-English majors in Taiwan (Huang, 1998), and English language proficiency test scores in Taiwan being “shamefully low” (Krashen, 2005, para. 2)
pedagogical concerns over English language teaching are increasing amongst universities (McGrail, 2005).

Technology facilitates the storage, transmission, and retrieval of information in multimedia on an individualized, interactive basis (Romano, 2003): In an information age, technology could be regarded as a vital way to keep up-to-date in terms of accessing and communicating information. In a similar vein, computer-assisted language learning can be a means of improving English language teaching (Daud, 1992; Liontas, 2002; Pope & Golub, 2002; Rilling, Dahlman, Dodson, Boyles, & Pazvant, 2005). While academic planners are increasingly encouraging the use of technology and the technological infrastructure of universities, particularly in the Western world, has improved dramatically over the last two decades, there are nonetheless barriers to teachers’ use of multimedia in EFL and ESL classrooms.

The benefits of computer-assisted instruction (CAI) come from the presentation of instructional material that allows for interactivity and immediacy and can dynamically adapt to the specifics of a given user's pattern of responses. With the focus on developmental processes and learning outcomes, students can benefit from the features of computer-based learning systems (Kerr, 1996).

Romano’s (2003) view is that quantifiable improvements in teaching and learning result from empowering teachers to use technology as an educational tool. In his words, “there can be no revolution in education, only skillfully managed evolution” (p. 17). An evolution in education policy is precipitating a paradigm shift from teacher-centered teaching to learner-centered learning, a theoretical progression toward ‘social constructivism’ (Brooks, 1993; Ely, 1991; Perkins, 1992b). By definition, constructivism encompasses the notion that the learner, rather than the teacher, constructs knowledge (Duffy & Jacobsen, 1992; Ely, 1991). The use of
multimedia in the classroom and e-learning in general are innovations in education forging new ground within the theoretical framework of constructivism (Bullock, 2004; Davis, 1995; Davis et al., 1989; Ruschoff, 1993).

This dissertation focuses on the current status of technology in university education and highlights key prevailing factors that encourage or discourage the use of technology by teachers in EFL and ESL university classrooms in the Asia Pacific region.

1.2 Purpose of the Study

The purpose of this study was to ascertain the extent to which EFL/ESL university teachers integrate technology into English language teaching. The study specifically aimed to:

1. Identify the factors that contributed to teacher uptake of technology in English language teaching.
2. Identify the factors that were linked with university teachers’ inability or unwillingness to adopt technology in English language teaching.
3. Describe noteworthy aspects of university teachers’ explanations about their teaching, professional learning, and aspects of their work life that influence the extent of their uptake of technology in their EFL/ESL classrooms.
4. Provide an explanation of teacher values which are influential in their willingness to actively engage in university-based, computer-assisted English language learning.
1.3 Significance of the Study

Ministries of education and universities throughout much of the world are developing and implementing educational technology policies in academic institutions. Educational technology policy which supports ‘bottom up’ professional development for both teachers and administrators could provide them with practical and theoretical grounding for use of technology in education. For widespread teacher use of multimedia in the classroom to succeed, supportive organizational policy must exist and, for example, require that the technological infrastructure within academic institutions reflect the most recent developments in hardware, software, and high speed Internet access providing ‘more than adequate’ access and reliable technical support (Jacobsen & Lock, 2005).

With academic institutional investments in technological infrastructure in place, benefits from these innovative resources can, in theory, be maximized. However, decisions about which investments in infrastructure are or should be made need to be informed by a sound evidence base. This study is intended to serve as one of those pieces of evidence.

Globalization and technology are changing the face of education in most parts of the world. There are several reasons why teachers’ use of multimedia in the university level English language classroom is a viable professional asset. With online programs facilitating access anytime and anywhere, teachers who have experience using multimedia in their teaching potentially have an added professional edge in classroom settings, online interactions or in blended learning environments.
In the developed world, the current generation of youth has grown up digitally and students are increasingly competent with technology (Tapscott, 1998). This level of student learning stimulation often comes from sources outside the classroom. If teachers are unable to provide a learning environment which is sufficiently stimulating to young people, then the prospect of student learning in the classroom being considerable is likely to be diminished. If individual teachers develop the professional expertise in technology to bridge the ‘generational digital divide,’ this could contribute to a paradigm shift in education where learning is an exciting life-long endeavor for both teachers and students (Culp et al. 2003).

This study investigated the extent to which university teachers were adopting computer assisted instruction in English language teaching and the interacting variables that contributed to teachers’ use of multimedia in the classroom. In so doing, the educational values which were influential in teachers who adopted technology were identified. The study also noted whether the implementation of integrated technology was not necessarily linked to teachers having undertaken relevant professional development programs. Given technology in education seems to be here to stay and the need for EFL/ESL is growing, demand for teachers who successfully adopt technology in English language classrooms will almost certainly increase. Hence, academic administrators and individual teachers need to understand which key factors contribute to this evolving approach to teaching and learning.

1.3 Research Questions

This study will respond to the following research questions:
1. To what extent do EFL/ESL teachers use integrated technology in the classroom in (the participating) universities in Australia, Thailand, and Taiwan?

2. How do variables (of age, gender, teaching experience, formal computer professional learning and/or professional learning, technical support, collaboration with colleagues, and nationality/region) amongst teachers promote or inhibit the use of multimedia in the EFL/ESL classroom within the Asia-Pacific region?

3. If teachers hold educational values which endorse constructivist teaching in relation to their professional practice, will they be more inclined to use technology than teachers who usually teach didactically?

1.4 Theoretical Model

Rogers’ (1995) research explores patterns of employee uptake with technological innovations. In the context of his ‘diffusion of innovations’ theory, Rogers’ conceptual model suggests there are five stages which individuals go through in relation to the acceptance of innovations: (a) knowledge, (b) persuasion, (c) decision, (d) implementation, and (e) confirmation. For Rogers, adoption of an innovation is often a sensitive matter within the workplace at the organizational and/or individual level. Further, Rogers argues that even in the confirmation stage, if an individual receives conflicting messages about the innovation, they could reverse a previous decision to adopt the initiative.

Rogers (1995) outlines five adopter categories that loosely follow a distribution model: innovators (2.5%), early adopters (13.5%), early majority (34%), late majority (35%), and laggards (16%). Innovators were venturesome and typically
had control of financial resources and technical expertise; *early adopters* were integrated into the social organization; *early majority* were deliberate but not leaders, *late majority* were skeptical; and *laggards*’ focus was on the past ways of proceeding plus being suspicious of change agents. The distribution pattern within Rogers’ model shows that, in any given organizational system, few will readily accept new technologies. This conceptual model provides a means to examine patterns of teacher ‘uptake’ and ‘refusal’ (where there is passive or active resistance to implementation) of technology in English language classrooms in tertiary educational institutions.

‘Traditional’ teaching is often didactic in form and characteristically teacher-centered. As well, it is often formal, controlled, and autocratic enabling the teacher to direct how, what, and when the students learn (Byrom, 1997; Jonassen, Howland, Moore, & Marra, 2003). Frequently, didactic teaching involves a teacher at the front of a classroom telling students what to do and how to learn. By and large, Asian educational contexts seem to exemplify the traditional instructional style (Benson, Chik, & Lim, 2003; Kirkpatrick, 2002; Singh & Doherty, 2004). Alternatively, learner-centered learning is defined as responsive, collaborative, problem-centered, and democratic, with the student being an active agent in deciding how, what, and when learning occurs. Such learner-centered teaching and learning is commonly known as constructivist (teaching and learning). However, it is more formally recognized as social constructivism which is a theory that knowledge is the result of social interaction and language usage (Adams, 2006; Smith, 1999; Wildner-Bassett, 2005). Hence, social constructivism, as introduced by Vygotsky (1934), plus Rogers’ (1995) conceptual model for adoption of technological innovations will provide the theoretical constructs for the study of teacher values and their integrated use of technology in the university EFL/ESL classroom.
1.5 Assumptions

Assumptions are a way of establishing a study’s boundaries (Bailey, 1997). Further, any notable fact which is likely to be true but has yet to be verified in the particular study should be acknowledged (Gay, Mills, & Airasian, 2006). This study was based on the following assumptions:

1. Concepts of computer-based teaching and learning would vary between and within each of the field sites (institutions).
2. Technological infrastructure would have been well-established and maintained for several years in each of the institutions.
3. Technical support would be available to teachers at each institution.
4. Computer-based teaching would be an established and growing organizational system of providing learning for students in each of the field sites.
5. There would be occasions when teachers would claim to be taking up technology in the classroom yet the claim would not be able to be discerned at the classroom level. This would not necessarily diminish the credibility of their claim.
6. Information technology departments, or their equivalent, at each field site (institutions) would provide professional development to teachers for the purpose of increasingly integrating technology into teaching.
1.6 Limitations of the Study

Whilst ideally this investigation may have benefited from the researcher observing the participating university teachers teaching EFL/ESL in classroom settings, it was not possible due to time and financial constraints attached to the researcher’s visits (to each of the field sites/universities) across the three countries. This means that the data relied on teachers’ self-reports of their own teaching practices as opposed to direct observations or another form of data collection. Nonetheless, given that an evidence base consists of theory, research, and practice, it is important to identify practitioner/teacher ‘voice.’

1.7 Definition of Key Terms

In addition to the Definition of Terms and Acronyms provided earlier, noteworthy terms used throughout this document are defined in more detail below in an endeavor to increase understandings. In the context of this dissertation, the terms listed below will use the following specific definitions.

Constructivism is a theory of learning based on the idea that knowledge is constructed by the knower based on mental activity building on what is already known. Learners are considered to be active organisms seeking meaning (Hughes & Daykin, 2002; Vygotsky, 1934, 1966). Learning is authentic and interdisciplinary and extends beyond the classroom (Brooks, 1993; Duffy, 1992; Fox, 2001; Perkins, 1992a).

Constructivist learning in classrooms is collaborative in nature and takes place in a learner-centered environment where students are, to a considerable degree,
in control of their own learning (Davis & Sumara, 2003). Learning is cooperative or independent where students are the decision makers and the teacher acts as facilitator and guide. Knowledge, which is the result of social interaction and language usage, is called \textit{social constructivism} and is a shared, rather than an individual, experience (Adams, 2006; Smith, 1999; Wildner-Bassett, 2005).

The term \textit{technology} is notoriously values-laden (Hodas, 1993; Luppicini, 2005) thus creating confusion when it is used in the domain of education. For Luppicini (2005), \textit{technology} refers to both "material construction as well as the intellectual and social contexts… it refers to the organization of knowledge for the achievement of practical purposes as well as any tool or technique of doing or making, by which capability is extended" (p. 104).

Liontas (2004) defines \textit{multimedia} as digital learning that “enables the orchestration of various cognitive learning strategies, supports teacher modeling, making language instruction innovative and exciting” (p. 318). Romano (2003) claims that \textit{interactive multimedia} “vastly heightens sensory perceptions compared with those provided by books, chalkboard, and teacher-talk” (p. 48).

Wang (2004) defines \textit{computer-mediated communication} (CMC) as "communications between human beings via a computer network" (p. 375). Wang adds that as prevalent technology in language learning has matured, CMC has come to mean “Internet-based videoconferencing in fourth-generation distance language learning” (p. 392).

Jung defines \textit{experiential learning} as “student-centered and student-driven learning mode which displays the characteristic of authentic communication" (Jung, 1993, p.1). Similarly, \textit{education} is a vast and vital construct. However, the goals of
education vary across countries, school districts, and in individual classrooms. According to Perkins (1992):

The basic goals of education are deceptively simple. To mention three, education strives for the *retention, understanding, and active use* of knowledge and skills. (p. 45)

Furthermore, language learning hinges on *motivation*. For MacIntyre (2002) *integrative motivation* to learn a second language refers to “a combination of motivational intensity, desire to learn a language, and attitudes toward learning the language” (p. 48).

*Globalization* and *culture* are other terms that are confounded in the literature. In the context of this work, and for operationalizing purposes, *globalization* means “compression of space and time” and thus “the intensification of social and political relationships and heightened economic competition” (Singh, 2004, p. 14). For Singh (2004), *culture* “refers to the symbolic resources (language, images, fashion codes, knowledge, political ideologies, and so forth) that are increasingly available in rapid flow across territorial borders, as well as to the ways people individually and collectively experience and make sense or meaning of these cultural resources” (p. 15). Accordingly, *global culture* is used to denote “the growing uniformity and homogenization of the world's culture” (p. 16).

There are two major forms of *online learning* also known as *e-learning*: (a) stand-alone courses that operate as a virtual classroom in which technology acts as “both a tutor and a tool” and (b) add-on multimedia activities that enhance classroom teaching or distance education courses where technology is used as a “tool and a communication device” (Felix, 2003, p. 122). While research on online learning and
1.8 Scope of the Study

This study outlines a backdrop to the contemporary sociocultural and socio-technical context of English language teaching in the Asia-Pacific countries of Taiwan, Thailand, and Australia. With English becoming the global *lingua franca* and language proficiency being closely tied to understanding the culture where the language is spoken, culturally-sensitive contexts for teaching English are increasingly transmitted through electronic media and technological networks.

The research was conducted with English language teachers in five universities in Taiwan, Thailand, and Australia. All teachers surveyed were teaching in English to university students whose first language was not English. Some were ESL teachers of various nationalities teaching English in Australia to international students whose first language is not English: Some were Taiwanese EFL teachers in Taiwan teaching English to homogeneous groups of Chinese-speaking Taiwanese students. Some were teachers from other countries teaching English as a foreign language in Thailand to both Thai and international students from all over the world. The primary concern of this study was the nature and extent of English language teachers’ use of multimedia in the sampled university classrooms (regardless of where they were located or whether were native or non-native English speakers).

The challenge for all teachers in the study was to develop curriculum to meet the needs of diverse groups of learners including catering for individual differences and culturally preferred ways of learning. This study set out to examine the complex
interactions between variables that were linked (see Gay, Mills, & Airasian, 2006) to the use of multimedia in the English language classroom.

The reasons for choosing to investigate in the Asia-Pacific region are as follows. First, this region, particularly Taiwan, is known to have a high profile in, and engagement with, technology. Second, educational policy in most Asian countries is mandating English language instruction. Third, Australian universities have a high percentage of Asian students seeking to learn English in a native English environment. The profiles of the five universities in the study show a variety of English language teaching contexts with international cohorts of teachers and students. By analyzing the values of teachers across institutions and regions, it was hoped that a profile for teacher acceptance of technology could be established.

Similar studies have been conducted with North American school teachers: In terms of teachers in the United States see, for example, Becker (2000) who examined the characteristics of teachers who had exemplary use of multimedia and Honey and Moeller (1990) who correlated teacher values and technology integration. In relation to Canadian teachers, see, for example, the study conducted by Jacobsen (1998) who looked at adoption patterns and characteristics of faculty of integrate technology. Furthermore, with technology seemingly gaining momentum as a viable tool for teaching English, updated information on EFL and ESL teacher uptake was of relevance to this inquiry.

1.9 Overview of the Thesis

Chapter One establishes the context of the dissertation. It defines the research problem, provides definitions of key terms, specifies the research questions, and
provides an overview of the theoretical approach, theoretical significance, policy significance, and professional significance of the study.

Chapter Two reviews the literature on theoretical aspects of constructivism: specifically social and cultural constructivism. It also examines research on teacher change, issues of technology adoption and ‘refusal,’ and shifts in teacher-student dynamics with computer-assisted instruction and computer-mediated communication. A broad discussion on educational technology policies in the Asia-Pacific region, as well as issues in technology integration in academia follows. The literature on globalization and educational technology is reviewed as well as educational technology policies in world regions. Research follows on cultural differences in language learning includes collectivist and individualist cultural paradigms and the effects of multimedia on motivation and learning styles. As well, the chapter examines theories of language acquisition and methods of language teaching. Embedded teaching and learning practices influence the nature and the rate at which educational changes can be successfully implemented. A discussion follows on learning modalities including cognitive styles, field dependence and independence, multiple intelligences, and spatial constructs. Moreover, research on computer-assisted language learning and student motivation is reviewed. The literature review concludes with a section on testing and measurement which notes the limitations of standardized assessment in relation to identifying language proficiency.

Chapter Three outlines the scope of the research, the feasibility and the limitations of the study. A description of the pilot study, subjects, instruments, and the model for statistical analysis is included.
Chapter Four describes the results and details of the data analysis. This includes descriptive statistics, summary statistics, main effects, and interactions among variables. As well, key qualitative data are included.

Chapter Five is the discussion, a theory-driven analysis of the significant statistical findings of the study in the context of constructivism and Roger’s (1995) model of adoption of technology as it applies to English language education in Taiwan, Thailand, and Australia.

Chapter Six outlines future directions in technology integration offering comprehensive models for professional development for teachers in the use of integrated technology in language learning. New paradigms for professional development in multimedia and future directions in educational technology are also discussed.
2.1 Introduction

In the past four decades, the applied field of educational technology has been struggling to define itself (Luppicini, 2005). The use of computers as a delivery modality for instruction is a contentious issue that exposes a myriad of new factors for educators’ consideration and assessment (Bull, 1999; Sheingold & Hadley, 1990). Luppicini (2005) considers that educational technology "revolves around concerns with mental processes and products to serve human purposes embedded in socio-environmental contexts” (p. 107) that can leverage change contributing to organizational transformations within society and education systems.

The development of new knowledge and new technologies can contribute to shifts in thinking, but these shifts occur in conjunction with specific applications and modeling by colleagues (King, 2003; Phelps, Graham, & Kerr, 2004). Moreover, organizational context plays a significant role in the adoption of technology in education (Alvine, 2000; Dooley, 1999; King, 2003). King (2003) affirms that:

Educational technology application and innovation hold the potential to greatly impact educational practice; as we consider such application, we face an opportunity to truly transform our perspectives of the profession, our paradigms of what learning experiences are like, and our dreams of what can happen. (p. 5)

A key duty for educators is to prepare each generation of students for the future and, according to Tapscott (1998), it is a digital future. Bindé (1998) asserts that new technologies will necessitate a new educational culture, one that will require children to develop different skills:
With a changing medium for knowledge, our conception of knowledge as such must also change. Knowledge is no longer an acquired, stable capital, a constantly open book in our minds, but a territory where the mind roams freely, a cloud of fragmented and disseminated locations, of which we cannot claim to have a synthetic vision. It is no long the same task of learning nor the same effort at memorization which will be required of our children. (Bindé, 1998, p. 846)

Technology is a driving force in education in the new millennium (Adamy & Heinecke, 2005; Byrom, 1997; Pope & Golub, 2000). Romano (2003) asserts that teachers resist using technology because they have not been provided with a “convincing explanation of how technology will empower them” (p. 2). Whether teachers accept technology or not, academic institutions are mandating integration of technology into academic programs (Tai, 2002; US Department of Education, 1999; White, 2004).

Felix (2003) asserts that the use of technology in language education is surrounded by myths. Indeed, Felix questions whether teachers can teach well online because of such constraining impressions. Felix offers the following list of “generalized, unqualified statements” (p. 119) that dominate stereotypical opinions of online learning: “(a) administrators are interested only in saving costs and have little interest in the quality of any learning that is taking place; (b) online learning will replace classroom teaching; (c) teaching online will save time; (d) offering courses online will save staff; (e) students resent being taught online; (f) it is not possible to teach as well online as in the classroom” (p. 119). Felix refutes these claims on the grounds that computer-assisted instruction within the classroom setting can add value to face-to-face teaching, and she further emphasizes that the challenge
lies in building and sustaining high quality online language programs. Felix concludes that new technologies offer a creative context in which teachers can develop authentic learning tasks that are stimulating and engaging and which take individual student differences into account.

According to Becker (2000), using technology can change educators’ teaching style thereby influencing student learning outcomes. For Burnston (2003) and King (2003), using technology in educational contexts is contributing to an underlying paradigm shift in educational philosophy. Adopting technology can add to the existing heavy work load of teachers. The notion that technology can make teachers’ work easier is controversial. Learning to teach with computers may, in fact, add to the pressure teachers feel with overwhelming workloads. While using technology in education has the potential eventually to reduce teacher work loads, steep learning curves with unfamiliar instructional tools can initially be daunting. Finkel (1991) illuminates an important point which contradicts Felix:

Computers cannot teach. Impressive as they are, computers can do almost nothing directly either to inspire or facilitate learning. This is what teachers do, and with support, they do it very, very well.... Indeed, computers will not automate or streamline the teaching job. If anything, they will make it harder. (p. 10)

The question of whether or not teachers will adopt technology in teaching is not simply about steep learning curves and additions to teachers’ workloads. It could be that far more is at stake when considering the value of adopting technology in teaching. Murray (2000) challenges the assumption that the introduction of new technologies triggers changes in social consciousness that, in turn, affect literacy and how it functions in individuals and society. For Murray (2000), literacy is a
sociocultural phenomenon and while technology facilitates social transformation, researchers should examine the “sociocultural milieu into which information technology is introduced to see how the technology amplifies certain characteristics (or not)” (p. 44). From a critical historical perspective, technology is not the generator of social or cognitive changes, but rather an amplifier of cultural values and beliefs. According to Murray (2000), “technological determinism masks the need for educators and other consumers of technology to engage in discussions of the ethics and social responsibilities involved in its use” (p. 54).

Teaching is a demanding profession; learning about integrated technology use places high demands on teachers’ personal and professional time. There are many interacting factors that influence whether teachers adopt or resist new innovations in technology. In the next section, issues of teacher change, technology acceptance and refusal, and electronic versus face-to-face teaching are explored further.

Section 2.2 reviews the theoretical underpinnings of social constructivism within the context of education and technology providing the theoretical frame for the study.

### 2.2 Constructivism as a Theoretical Frame for the Study

Constructivism is learner-centered and inquiry-based and it often asks students to negotiate through complex cognitive constructs (Joyce & Showers, 1995; Perkins, 1992b). Rather than being a theory about teaching, constructivism relates to knowledge construction and learning. According to Brooks and Brooks (1993), learning from a constructivist perspective is a “self-regulated process of resolving inner cognitive conflicts that often become apparent through concrete experience, collaborative discourse, and reflection” (p. vii). Further, constructivist theory defines
knowledge as “temporary, developmental, socially and culturally mediated, and thus, non-objective” (p. vii).

Traditional teacher-centered classroom practices primarily teach static factual information and yet, in today’s world, learners need to know how to integrate and update knowledge to remain competitive in the market economy (Aust, Newberry, O’Brien, & Thomas, 2005; Slaughter & Leslie, 1997). In learner-centered environments, learners take an increasingly active role in their learning while teachers “play a progressively diminishing role” thus achieving “controlled learner autonomy” (Hoven, 1997, p. 277). The theoretical construct of learner-centeredness is not new as described by Sears and Hilgard (1964) more than four decades ago:

The "teacher-centered" behavior of directing, demanding, and using private criteria in deprecating a student leads to hostility to the self or the teacher, aggressiveness, or occasionally withdrawal, apathy, and even emotional disintegration. The "learner-centered" behavior of accepting the student, being evaluative or critical only by public criteria, and being usually supportive, elicited problem orientation, decreased interpersonal anxiety, and led to emotionally readjusting and integrative behavior. (p. 197)

If Sears and Hilgard’s (1964) claim still has application, it means that regardless of the form of teaching provided, learning needs to be done in an environment where problem-solving and experimentation are encouraged and mistakes are seen as part of the process of learning. Constructivism calls for active participation in problem solving developing critical thinking skills that students find meaningful and engaging (Berns & Erikson, 2001).

Davis and Sumara (2003), who conducted research in elementary and middle schools in Alberta, Canada caution that the complex processes that are described by
constructivist theorists do not fit with the mechanical structures of school systems. Further, Davis and Sumara argue that constructivism is not “prescriptive but descriptive” (p. 130).

Lebow (1993) outlined five suggestions for engaging learners based on constructivist pedagogical principles: (1) maintain a buffer between the learner and the “potentially damaging” (p. 4) effects of traditional instruction; (2) provide a context that supports both learner autonomy and relatedness; (3) embed the reason for the lesson into the activity; (4) enable the learner to increase personal responsibility for construction and deconstruction of a task; and (5) encourage learning to engage in intentional learning by inviting strategic explanation of errors. Diversity of expertise, differences in learning styles and interests, and the creation of a community of inquiry are all facilitated using constructivist theory (Terwel, 1999).

In conducting case-study research on the teaching style of a Chinese university teacher in Shanghai, Mok (2006) makes an important point: what seemed to be a teacher-dominated lesson may, in fact, be a representation of learner-centeredness which is acceptable in the local teacher’s culture. Mok investigated the mismatch between “unfavorable classroom image” (p. 132) and the outstanding achievement of Chinese learners. In a review of research, Mok concluded that teacher-dominated lessons may not be necessarily ‘bad’ for learners while learner-centered lessons are not inherently ‘good.’ Mok argues:

While student-centeredness is often seen as a process of learning where exploration is valued and students initiate the pursuit of knowledge, the teacher developed a framed experience to explore the intended object of learning based on his understanding of how his students think. (p. 140)
Constructivism emphasizes the view that new experiences are interpreted and made sense of in terms of previous experiences and has evolved since its inception by Vygotsky (1934, 1966) into several related branches two of which are relevant to the current study and are discussed in turn. The theoretical underpinnings of social constructivism are described in Section 2.2.1 and those of cultural constructivism follow in Section 2.2.2.

### 2.2.1 Social Constructivism

Social constructivism speaks to the empowerment of the learner (see, for example, Appleton, 1996; Meehan, Holmes, & Tangney, 2001; Smith, 1999). Rather than focusing on the subject matter to be taught, the focus shifts to the learner. From research conducted in higher education establishments in the UK, Allen (2005) argues that behaviorism makes the assumption that human beings are passive and reactive. From the perspective of social constructivism, human beings are seen as interactive which tends to more learning beyond the “context of pedagogical structuring into a process of social transformation” (p. 249).

In exposing a number of myths regarding constructivism, Davis and Sumara (2003) point out that, even if knowledge is socially constructed, this does not necessarily mean that learners need to socially interact with one another while learning. Interaction with the subject matter may suffice. Further, Davis and Sumara caution that personal learning, collective knowledge, and cultural evolution are not “directional” (p. 135) constructs. Rather, learning and knowledge construction are organic processes.

By using social constructivism as a theoretical frame for comprehending transferability of knowledge and skills, collaboration among teachers and students,
and social interaction, the essence of the traditional “transmission teaching” is challenged (Brophy, 2006, p. 537).

2.2.2 Cultural Constructivism

Hutchinson (2006) wrote that knowledge is created in the “crucible of culture” (p. 301). Research has shown that cultural paradigms color the way both teachers and students from diverse cultures construct knowledge creating multiple realities for individuals in distinct learning environments (see, for example, Dougiamas, 1998; Gopinathan, 2006; Hutchinson, 2006; Scott, Cole, & Engel, 1992).

Gopinathan (2006) studied tertiary level students in Singapore and proposed the need for “knowledge indigenization” (p. 261) stating that teacher education needs to be more culturally authentic since teaching and learning are “best viewed as culturally scripted activities” (p. 261). Gopinathan calls for a paradigm shift in teaching and learning emphasizing that globalization and communication technologies have created new opportunities and avenues for valuing of culturally appropriate knowledge. Gopinathan argues that changes in educational policy in the Asia-Pacific region often provoke cultural dissonance. According to Gopinathan:

A fundamental problem that has not been faced up to by Asian educators and which may be contributing to ineffectiveness with regard to school change and education reform generally is the strong role of teachers’ prior beliefs and how culture may be relevant here. Settled cultures, even when faced with modernization influences, do not change quickly with respect to values like child-adult relationships, authority, obedience, respect, etc. (p. 266)
With large class sizes and a wide-range of ability levels represented in English language classrooms in the Asia-Pacific region, finding ways to individualize instruction is a constant challenge (Appleton, 1996; Cheng, 2002). Further, finding cultural relevance with groups of learners from a wide range of countries of origin (see, for example, Appendices E and F) is a key component to effective curriculum development. However, as Chen (2001) argues regarding the unique situation in her research at Taiwanese universities, relevant applications of cultural constructivist constructs are dependent on unique cultural contexts that exist in the Asia-Pacific region.

Palan (2004) argues that the link between constructivism and globalization is strong and emphasizes that cultural constructivist theories stress the impact of modern media and communication technology. For Palan, “social theory is not a neutral tool of observation and generalization, but an instrument of collective thinking, shaping to some extent its objects of observation” (p. 12). Knowledge acquisition is active and strategic and is an interaction between individuals mediated within cultures within the context of a changing educational paradigm.

Section 2.2.3 makes links between constructivist values and technology integration further setting the stage for the study.

2.2.3 Constructivist Values and Technology Integration

A theoretical link has been made between constructivism and information processing technologies (Allen, 2005; Hughes, Ventura, & Dando, 2004; Salmon, 2000). Thompson (1999) argues that when students use computer tools in ways which focus on the attributes of concepts and their interrelationships, learning is enhanced. From a constructivist standpoint, the computer can an instrument of
student empowerment (Hyslop-Margison, 2004). It has been suggested by researchers that the computer itself is a metaphor for the mind as an information processor (Perkins, 1992a; Terhart, 2003).

Allen (2005) cites an emerging pedagogical consensus around constructivism which includes collaborative learning, authentic tasks, reflection, and the promotion of individual identities and learning communities. Further, Allen argues that hybrid and “web-centric courses” (p. 254) inherently encourage interactivity and collaboration, an approach that Allen describes as “cognitive interactionist” (p. 254).

According to Dougiamas (1998), “computers carry an entire philosophy of knowledge construction, symbol manipulations, design and exploration, which, if used in schools, can subversively promote changes in curricula, assessment, and other changes in teaching and learning” (Cultural Constructivism Section, para. 2). Riel and Becker (2000) conducted research in secondary schools in the United States and found that when teachers promoted knowledge construction rather than engaging in direct instruction, they were more likely to use technology in the classroom.

Further, research shows that learner-centeredness can be facilitated by CAI and the use of multimedia in learning (see, for example, Dupin-Bryant, 2004; Machnaik, 2002; Perkins, 1992; Tapscott, 1998). According to Dupin-Bryant (2004), keys to the effectiveness of using technology in teaching are: (a) training in the use and application of technology, (b) training in curriculum development and constructivist teaching methodology, (c) consulting with technical support staff, and (d) discussion with other instructors using CAI. According to Perkins (1992b), the teachers’ role also evolves, “it is the job of the constructivist teacher (or interactive technology) to hold learners in their ‘zone of proximal development’ by providing just enough help and guidance, but not too much” (p. 163).
Pullen (2001) supports the conjecture that the application of constructivist principles and philosophy may be the viable path for effective education in computer technology. It is clear that the literature supports the view that enhanced use of ICT in teaching can provide a more flexible learning environment extending the range of influence of education, particularly in multicultural settings (Allen, 2005; Appleton, 1996; Hughes & Daykin (2002); Hughes et al., 2004). Phelps et al. (2004) stipulate that:

For future generations to maximize their capability to operate within competitive and technologically driven economies, it is critical to foster computer abilities at every level of the schooling process, and teachers are central to this endeavor. (p. 49)

The pursuit of learning for its own sake must be developed if life-long learning, an overarching goal of constructivist educational values, is to be established in both students and teachers. Cross-generational and cross-cultural interactions create social and cultural contexts within the constructivist frame which in turn facilitate learner empowerment.

Section 2.2 explored the theoretical constructs of social constructivism, cultural constructivism, and educational technology. Section 2.3 examines the impact that globalization and educational technology policies have had on higher education in world regions. It also reports on current developments in Internet usage in the countries of origin of the teachers in the study. In order to assess access to technology, a discussion on availability of access to the World Wide Web in the world regions represented by the teachers in the current study is included.
2.3 Globalization and Educational Technology

Academic institutions in most parts of the world are infusing instructional technologies into higher education (Brennan, 1999; Rogers, 2005; Thiessen, 2001). Increasing educational funding is being directed towards integrated technology and e-learning (Forster, Dawson, & Reid, 2004). Gunasekaran, McNeil, and Shaul (2002) estimated that expenditures on all forms of education in 2002 exceeded $2 trillion worldwide, with revenue growth for e-learning outstripping that of all other sectors of the education industry. New instructional paradigms are emerging and independent learners are facing an almost bewildering range of options in learning portals (Roffe, 2002).

As the global economy becomes more consumer-oriented, a key trend in education is to introduce innovative, online, individualized programs suited to a wide-range of learner needs (Allen & Seaman, 2003; Culp et al., 2003; Serdiukov, 2001). The drive for diversification within academia is both ‘top down’ from the administrative level and ‘bottom up’ from students who are the consumers of education (Kerr, 1996). Culp et al. (2003) analyzed twenty years of key reports on educational technology policy and concluded that:

Although these reports also reference the importance of adequately trained and motivated teachers, they foreground the potential of the digital tools themselves to change the learning environments and the teaching process, making it more flexible, more engaging, and more challenging for the students. (pp. 5-6)

To get an ‘edge’ in the global market, there is ever-increasing pressure for university graduates to not only learn English but also to develop the technological skills that allow them to be successful on the world stage (Jonassen et al., 2003).
Culp et al. (2003) present a compelling argument in relation to labor market capacities stating that increasing the technological literacy of graduates would “improve decision making, increase citizen participation, support a modern workforce, enhance social well-being, and narrow the digital divide” (p. 6).

Higher education holds a pivotal role in preparing graduates to compete in a global economy (Bull, 1999). Where higher education was previously accessible only to an elite population, in today’s world it has become fundamental and accessible to most individuals who wish to compete on the global stage. According to Tai (2002), the trend in educational institutions in the Asia-Pacific, North America, Australia, and United Kingdom is toward academic capitalism. The term academic capitalism describes the trend within universities to link research funding to marketability (Slaughter & Leslie, 1997; Tai, 2002).

According to Slaughter and Leslie (1997), universities have become economically viable surrogates of corporate research and development for marketable goods. Slaughter and Leslie further emphasize the view that technology is a key factor for competitiveness in the global market economy. As well, English is often vital to doing international business (Warschauer, 2000). In a similar vein, Young (2001) argues that organizations within the private and public sectors are adopting web-based technologies at an unprecedented rate. Information technology companies are prominent in international markets and, according to Warschauer (2000), by 1990, 47.4% of the employed population in the United States, 45.8% in the United Kingdom, 45.1% in France, and 40% in West Germany were either directly or indirectly involved in IT industries.

In a critical review of the scientific literature on globalization and information technology, Wilson (1998) made three distinct conclusions. First, Wilson found that
IT has “less impact on less-developed-country societies than is often claimed by IT
enthusiasts and partisans” (p. 6). Second, Wilson noticed that IT had both positive
and negative impacts on society and that the impact was situation-specific and
therefore could not be generalized. Further, Wilson concluded that the acceptance or
rejection of IT will be shaped “by local cultural values through which winners or
losers filter their realities and their evaluation of IT's impacts” (p. 6). Finally,
Wilson’s research established that “IT is not a disembodied force, autonomous and
above society, but a tool wielded on behalf of a particular group, whose availability
and disposition are dictated by the distribution of power and wealth of a given
society” (p. 6).

Some research shows (see, for example, Cuban, 2001; Kerr, 1996) that while
the overarching approaches for introducing technology through systems theory
appealed to business, the military, and industry, teachers seem to have resisted the
adoption of technology in education. Kerr (1996) suggests that the difficulty of failed
technological applications in schools is not the technology or those who use it, but
lies within the school system.

If global business is highly oriented to technology, it seems likely that
educational institutions would make technological literacy a high priority in
academia. While the literature shows that this may be true at the policy level, the rate
at which teachers adopt technology in their teaching may not follow trends set in the
world of business.

The fundamental inquiry of this dissertation is to ascertain to what extent
worldwide trends in globalization and technology affect individual EFL/ESL
teachers, leading them to adopt the use of multimedia in the language classroom.
Many, if not all, students learning English as a foreign language or as a second
language are doing so to prepare themselves to compete in the global economy on the world stage. If English language teachers adopt the use of technology, they can simultaneously assist students to make progress in English language acquisition as well as in technological literacy thus preparing students for success in global markets. Hence it is critically important that technology be considered in multiple ways and not simply as a tool that teachers can use in the classroom.

Technological literacy hinges on access to technology, in particular to the Internet, and varies across countries. Section 2.3.1 reviews the statistics for Internet access for the countries of teachers who participated in the study.

2.3.1 Internet Access for Teachers in the Study

Teachers and learners in most regions in the world are making steady gains in access to high-speed broadband Internet thus facilitating computer-enhanced teaching methodologies. Increased access to information networks and to technology-enhanced instruction is changing the face of education for both students and teachers at all levels of education in most regions of the world.

While Internet had its origins for military purposes in the United States in 1969 and e-mail was invented in 1971, the first international electronic networking began in 1973 at the University College in London (Zakon, 2005). Over the past three decades, Internet access has been spreading around the world though the spread has been somewhat uneven. For example, Table 2.1 shows the total subscribers for Internet usage and population penetration statistics for the countries represented by the teachers in the study. Note that within the sample of teachers at the five universities in the study, the following eleven nationalities were represented.
Table 2.1

*Internet Usage and Population Statistics for Countries of Teachers in the Study*

This table is not available online. Please consult the hardcopy thesis available from the QUT Library.


Internet access is central to the use of technology in teaching. As shown in Table 2.1, there is a striking difference in Internet access between developed and developing countries. This difference is decreasing as time progresses with previously low penetration of Internet usage in countries such as Thailand and China steadily giving way to higher levels of use. This differential in usage of the Internet is relevant to the current study since EFL/ESL teachers’ use of multimedia in the classroom in the Asia-Pacific region was compared with the variables of nationality and world region.

The percentage of population penetration by Internet is within half a percentage point for the United States (68.7%), Singapore (68.3%), and Australia (68.2%). Canada (63.8%) and the United Kingdom (63.1%) also show relatively high population penetrations approximately 5% behind the US, Singapore, and Australia and within .7 of a percentage point of each other. Similarly, Japan (60.9%) and
Taiwan (60.5%) show high population penetration and are .4 percentage points from each other. Meanwhile, Argentina (20.0%), Thailand (12.8%), China (7.9%) and Myanmar (0.1%) show low population penetration as compared with the aforementioned countries with substantially higher Internet access rates per capita.

Information on the World Wide Web is multiplying exponentially and remote regions in third world countries are gaining access to the Internet. Honey (2001) reports that the information available on the Internet is estimated to double every three months. While the 1980s and 1990s were affected by the lack of technological infrastructure in academic institutions, most universities worldwide have established the necessary protocols to facilitate the use of technology in teaching (Clarke & Hermen, 2001). Section 2.3.2 reviews research specific to educational technology in general in the Asia-Pacific region and Section 2.3.2.1 through Section 2.3.2.6 reviews the research in mainland China, Taiwan, Thailand, Australia, the United States, and Canada respectively. Given the demographics of the sample of teachers in the study, particular focus is given to reporting on the regions where the teachers come from.

2.3.2 Educational Technology Policies in World Regions

In an era of globalization, knowledge-based economies are putting pressure on governments and institutions of higher education around the world to be proactive in advocating changes that will facilitate life-long learning. These changes will almost certainly involve the increased use of technology in higher education around the world in both distance education programs conducted online and in the use of multimedia in classroom settings.
From the research on educational technology policies in the countries of the teachers in the study, it seems that the technological infrastructure of academic institutions has been strengthened in response to government policies. Even if the technological infrastructure is in place in academic institutions, there are still many educators who hesitate to use technology in the classroom (Bowman, 2000; Finley, 2004; Hyslop-Margison, 2004; Hodas, 1993; McGrail, 2005).

Dieterle (2005) interviewed educational technology policy makers in various organizational and systemic contexts about “equity issues inherent in the digital divide” and concluded that observation “in situ” was essential to the development of such effective policy (p. 2). Dieterle interviewed twenty leaders of various educational and international governmental organizations, and came to the following conclusions regarding the development of educational technology policy:

(1) Without an appropriate level of economic, human, and social capital, policies cannot overcome existing educational practices and culture; (2) the development of policy is an iterative and human process, as complex as the social problem the policy itself seeks to address; (3) “technology” in the world of education has a different meaning than “technology” outside the world of education; (4) groups that have traditionally influenced education policy are now competing with groups that before were generally silent in the education policy conversation, and (5) policy is a system. (p. 2)

Nunan (2003) conducted a major study on educational technology policies for English language education in the Asia-Pacific region by reviewing published governmental and quasi-governmental documentation as well as interviewing representatives within educational systems at the elementary, secondary, and tertiary levels. Nunan concluded that the ‘digital divide’ (between those who have access to
computers and those who do not) is real and that there was a vast difference in accessibility of computers in rural and urban areas in mainland China, Taiwan, Vietnam, Malaysia, and Japan (China, Taiwan, and Japan are relevant to this study). Nunan also reported that the central pillar of government rhetoric subscribed to communicative language teaching and task-based language teaching. Elsewhere, Nunan (2002) reported that poor English skills in teachers at all levels of instruction in all countries surveyed made it difficult if not impossible for teachers to implement these methodologies. Further, Nunan suggests that technology-rich input-based programs could go a long way to support teachers whose English language skills were poor provided they had access to appropriate hardware and software and adequate professional learning on how to use them.

Sections 2.3.2.1 through 2.3.2.6 explore the research on educational technology in the regions pertaining to the current study.

2.3.2.1 Research on educational technology in mainland China.

Friesner and Hart (2004) explored educational technology programs in mainland China. According to Friesner and Hart, the Chinese government has demonstrated its commitment to e-learning in its High Tech Research and Development Program established in the late 1980s. The investigation by Friesner and Hart revealed three main reasons why China will probably rely on online learning: (1) there are 19 million companies in China; (2) four hundred new cities have created an explosion in jobs; and (3) e-learning is a way to resolve the “inequity in the bimodal distribution of wealth” (p. 82).

Friesner and Hart (2004) report that China had 68 million Internet users in 2003, a statistic which is increasing every day. While issues of language, religion,
marketing styles, values and attitudes, social organization, and restricted access to information need consideration, the overall incentive with the new government policy regarding Internet is to allow “a more individualistic culture” (p. 83) to emerge for Chinese people. Freisner and Hart conclude that a solution for growing demands for education when there is a shortage of teachers in China is e-learning. While this will require much greater penetration of Internet access in the remote, less populated areas of eastern China, government policies are supporting the expansion of Internet access (Fang & Warschauer, 2004; Song et al., 2005).

Fang and Warchauer (2004) reported on a five-year technology-enhanced educational reform initiative at a university in eastern China. In the interest of using new technologies for international communication, collaboration, and research, pedagogical and curricular reform was undertaken. The stated focus was to increase “authentic interaction,” allowing learners greater autonomy, and providing content “more relevant to students' lives and careers” (p. 301). However, Fang and Warchauer found that few faculty members were willing to incorporate the constructivist strategies because “such instruction demands a great deal of time and effort and because student-centered learning clashes with more traditional norms and incentives in Chinese higher education” (p. 301).

In a study assessing technical proficiency and self-confidence in basic computer skills with 489 pre-service and in-service secondary and tertiary educators in China, Song et al. (2005) found that, similar to North American teacher preparation programs, China was not preparing future teachers to use technology effectively in their classrooms. Song et al. suggested that budget limitations for teacher preparation in China could be a reason but also reported on the “lack of
sound national strategies to guide educational leaders in recognizing and addressing the essential conditions for effective use of technological support” (p. 197).

According to Song et al. (2005), computers were introduced into a few experimental schools in China between 1982 and 1990 and, from 1991–1997, achieving computer literacy was the main focus. After 1997, CAI was introduced and incorporated into subject-specific curriculum and multimedia and computer networks were introduced as "powerful technologies to help create constructive, supportive, and rich learning environments in schools” (p. 198). However, there is a decidedly unbalanced picture between the rapidly developing areas on the east coast of China and the rural areas in the north and west. In December of 1999, the Ministry of Education in China set up the Educational Technology in Higher Education Committee approving 122 technical training centers for instructors in higher education (Song et al., 2005). Song et al. report that in 2000, the Connecting Every School Project was launched by the Ministry of Education in China which aimed to get 90% of elementary and secondary schools online using satellite technologies by the year 2010. Despite these initiatives, in 2000, Song et al. reported that the ratio of students per computer was 1:99 in China compared with 1:5 in the United States.

In 2004, new college English curriculum requirements were released in China attaching great emphasis on the application of multimedia in English teaching as well as introducing new teaching models (College English Curriculum Requirements, 2004). The mandate is for colleges and universities to move away from the existing unitary teacher-centered instruction by introducing new teaching models using multimedia and network technology. It is proposed that the credits acquired via computer-assisted instruction account for 30%-50% of the total credits (Ministry of Education, People’s Republic of China, 2004).
2.3.2.2 Research on educational technology in Taiwan.

Tai (2002) reviewed the strategies undertaken by both government and universities in Taiwan in response to the market pressures of globalization. Tai identified the internationalization of higher education, in other words, the need to have highly educated citizens and employees, as a key response to globalization. This has been made possible by the revolution in communication and information technologies which bring mobility to millions of people, services, products, media, and currency.

Taiwan’s government has responded to the impact of globalization with various incentives such as the Life-long Learning Law which allows employees to take paid educational leave from their jobs and receive tax breaks on tuition. Tai (2002) reports that increases in educational funding have largely gone to primary and secondary schools leaving meager budgets for the reformation of higher education. Taiwan’s ‘White Paper’ is a report on new policies in higher education, first released in 1998, which encourages universities to increase private funding and relax the standards for raising tuition fees (Tai, 2002). By increasing cooperation with business, universities are receiving increased donations from industry.

At the policy level, the Ministry of Education in Taiwan makes teacher support and education a government priority. Chow and Ge (2001) reported that an impressive 220,000 teachers had participated in various information technology workshops in Taiwan by 2001. Yet, in Taiwan, this professional development has led to surprisingly little technology integration in classroom instruction (Chow & Ge, 2001).

Over the last decades, a trend was established for Taiwanese students go abroad for higher education. However, this trend has reversed slightly with an
annual decline of 3–5% reported by Tai (2000). This decline is partly due to increases in the number of Taiwanese students entering graduate studies in Taiwan and partly due to decreases in birth rate in the past two decades (Tai, 2000).

Government responses leading to fewer students enrolling in universities abroad included changes to the reward system for professors in Taiwan. These, implemented since 1995, have promoted educational research in an attempt to strengthen the quality of higher education. Prior to the 1990s, Taiwan’s professors were rewarded on the basis of seniority only. In 1995, the Ministry of Education “envisaged a new reward structure based on productivity” (Tai, 2002, p. 179). While this merit-based system typically been a principal for promotion in academia in Western countries, it is only in the early stages of implementation in Taiwan.

The National Information Infrastructure, through the Institute for Information Industry (III) in Taiwan, was implemented to plan and promote computer competence at a national level thereby increasing economic development (III, 2004). The goal was to implement systems to develop the population’s ability to use information technologies (III, 2004). Also, the Ministry of Education in Taiwan promoted distance education to extend the resources of the country’s educational institutes to support people and businesses in rural areas. These were incentives to sustain life-long learning in Taiwanese citizens (Wu, 2004).

Since 2004, the Government of Taiwan has initiated large scale ‘e-learning nets’ to provide creative educational services. In addition, a national project called the ‘E-learning Park’ provides various services and functions to the domestic e-learning industry outsourcing to e-learning vendors (Wu, 2004). This investment in e-learning infrastructure aims to enable both industrial and educational sectors to develop an effective e-learning model and to share online resources. As the
government expands support for e-learning, it is anticipated that the demand for e-
learning will increase (Wu, 2004).

The Ministry of Education in Taiwan has placed a priority on funding
international academic cooperation projects related to e-learning (Boulter, 2004). As
well, individual teachers in Taiwan have recently been authorized to teach university
classes online for academic credit. According to Wu (2000), a ‘White Paper’ was
presented that initiated policy changes for e-learning which later became a
controversial issue in educational circles. The initiative was designed to “enforce the
usage of computers and the Internet to implement convenient and effective distance
education” (Wu, 2000, p. 88).

Despite the worldwide trends towards e-learning, at present, Taiwan’s
Ministry of Education regulations prevent students from enrolling in more than one
third of their degree in online programs: That ruling encompasses online programs
from accredited universities in other countries. Nevertheless, while progress toward
granting academic credits for classes taken online may be slow, it seems clear that
the Ministry of Education is both committed to the development of e-learning and
actively investing in the infrastructure to extend its capabilities (Khadria, 2002). This
is also the case in Thailand (Section 2.3.2.3) where the Ministry of Education does
not allow students to take online courses for credit in Thai universities. Online
courses for credit have gained wide acceptance in Australia (Section 2.3.2.4), the
United States (Section 2.3.2.5), and in Canada (Section 2.3.2.6).

The Ministry of Education in Taiwan launched the Information Education
Infrastructure Program in 1997. This ambitious blueprint for technology in education
endeavored to set up a computer classroom in every elementary and middle school
with one personal computer per student. The Ministry of Education began the
process by having every school online, although it aims to have every classroom with
direct access to the Internet. By 2001 in Taiwan, 70 universities and colleges had
already set up distance-learning environments using the Internet and 71% percent of
university students in Taiwan reported using the Internet for homework assignments
(Chow & Ge, 2001).

In summary, the Ministry of Education and the private sector in Taiwan have
done much to address the influence of globalization augmenting the technological
infrastructure of educational institutions, offering incentives for professional
learning, and facilitating exposure to interactive and dynamic learning models
available online for teachers and students alike.

Section 2.3.2.3 examines the research on educational technology in Thailand.

2.3.2.3 Research on educational technology in Thailand.

In 1998, the National and Social Development Board in Thailand announced
the Mass Communication and Information Technology Development Plan for
Human Resources and Social Development that was to span 1998 through 2008
(Chorpothong & Charmonman, 2004). Despite the ambitious plan, broadband
Internet was established in Thailand only in 2002. In 2004, e-learning was being used
only in 10% of classroom learning in Thailand (Charmonman, 2004).

Low Internet use in educational contexts is undoubtedly due to lack of access
on a national level which would affect both teachers and students. Statistics are not
available for specific use of Internet at universities in Thailand in the past two
decades because the infrastructure was not yet in place and access was limited at best
even on the most progressive campuses. Table 2.2 shows the progression of Internet
In 2003, the Commission on Higher Education within the Ministry of Education in Thailand appointed a regulating committee to create guidelines for Internet-based Distance Education (IDE) programs in colleges and universities in Thailand (Brahmawong, 2004). It is the jurisdiction of the IDE provider in Thailand to define which domestic and international distance education programs from abroad are eligible for credit in compliance with the Commission on Higher Education’s Regulations on Criteria for Credit Transfer to Degree Programs (Brahmawong, 2004).

The National Higher Education Development Plan from the Ministry of Education in the Kingdom of Thailand is instituting academic and professional standards to “produce high quality graduates well versed in both theories and practices and capable of transferring the knowledge and experience in their professional services and equipped with sound judgment, systematic and critical thinking and morality” (Brahmawong, 2004, p. 8). While students can enroll in

From Chorpothong & Charmonman, 2004, p. 112.
online university programs abroad (with minimum residency requirements), they cannot obtain a university degree from a Thai university online. Information technology teams from prominent universities such as Institution 2 have been actively lobbying the Ministry of Education in Thailand for years to allow online-delivery university courses for credit. In preparation for this eventuality, state-of-the-art IT facilities on the campus of Institution 2 near Bangkok were established starting in 1995. Twenty-five thousand of the then 50,000 Internet users nationwide in 1995 were located on this campus (Chorpothong & Charmonman, 2004). Chorpothong and Charmonman have been promoting educational technology since creating a prototype university-level program for the delivery of e-learning programs at the tertiary level of formal education in Thailand.

Each IDE provider must establish a Regional Internet Distance Education Center to provide “on-demand educational services on the application, registration, information and knowledge access, tutorial sessions, seminars and conferences, distance learning media services, libraries, book stores, closely supervised on-line examinations, guidance and counseling, and intensive professional experiences” (Brahmawong, 2004, p. 13). The new trend in Thailand is to make technology an integral part of teacher preparation programs (Vrasidas, Zembylas, & Legaspi, 2004). If the overall educational goal in universities in Thailand is for teachers to use multimedia for instructional purposes, pre-service teachers must have access to professional learning in technology in teachers college. The move toward student-centered pedagogical practices has been initiated in Thailand in that “technology has the potential to support constructivist learning and be used for active, authentic, reflective, and collaborative activities” (Vrasidas et al., 2004, p. 83). The new
teaching approach is being introduced using technology to support the ultimate expansion of technology in education.

Section 2.3.2.4 reviews the literature on educational technology in Australia.

2.3.2.4 Research on educational technology in Australia.

The federal government of Australia has been a global leader in promoting its nation’s e-learning initiatives over the past three decades: This achievement involved considerable fiscal and human resource investments in education and training in e-learning and developing the infrastructure to support and sustain it (White, 2004). White reports that from 2000 to 2005, the government committed $246 million to research, training and technological infrastructure in universities and $34 million to the development of “high quality online curriculum content” (p. 4). According to White, the major advantages of the government initiative were empowerment of the learner, sharing customized content, and the provision of educational opportunities across boundaries and domains.

Educational policy in Australia has been focused on flexible delivery modes of education. According to an extensive Australian study by Cunningham, Tapsall, Ryan, Stedman, Bagdon, and Flew (1998):

Flexible delivery, in one form or another, has been part of Australian higher education from its earliest days, initially in the form of external and predominantly part-time study. However, distance education has long been seen as the poorer cousin of full-time study on-campus, and in any case has represented only a change in delivery mode of the same course structures that have been part of university education for many years. Changes are now being driven by a convergence of factors which include the growing
capabilities and importance of information technology, together with the emerging recognition of the student as a client in a competitive environment, and a growing sophistication in understanding the different ways in which students learn. (p. 42)

The Networked Nation Policy was instituted in the 1990s by “education.au limited” which was established as a company owned by all Australian (state-based) Ministers of Education and Training plus the federal Minister to “develop and manage online services and products agreed by the education and training stakeholders” (White, 2004, p. 2). The mandate was to supply the skills to drive the information economy, the infrastructure of sustainable information technology, new approaches to educational and training content including intellectual property management, organizational structures and the regulatory framework (see Figure 2.1). Further, White outlined the structure of the Networked Nation Policy in Australia as a relationship between government policies and infrastructure setting up collaborative processes with e-learning, e-products and services.

The incentive for collaboration is strong in Australia because it is considered a “federated system” (White, 2004, p. 4). The “new dimension to the education enterprise” (p. 4) is potentially a costly one. According to White, Australia is second to Switzerland in leading the world with the largest proportion of international tertiary students, of whom there were 233,000 across all sectors in 2001. Figure 2.1 shows the relationship between government and e-learning.
The New South Wales Teachers Federation (n.d.) published a policy on information and communications technology in education acknowledging that ICT will be a natural part of students’ life and will contribute to life-long learning. As well, the Federation states that teachers will need to develop competency in using computers in order to integrate technology into existing curriculum and that adequate access in schools and at home is imperative to achieving this overarching goal. The Technology in Learning and Teaching professional learning and development program was designed not as a replacement but as an enhancement to the existing curriculum across all levels of education. ICT is to be “genuinely embedded” across the curriculum and the subsequent competences “should be generated as a natural part of the syllabus development process” (p. 4). Even in the case of online learning for students in remote locations, the New South Wales Teachers Federation policy explicitly states that technology should not replace the teacher as human interaction is vital to successful learning.
According to White (2004), for the Australian government to be successful in distance delivery around the globe, it must protect and maximize return on investment while being “interoperable, usable, manageable, and durable” (p. 6). Australia was an early leader in the development of information management standards for education: The Technical Educational Development Institute at Institution 1, which has been operational since 1974, exemplifies this initiative. It is an institute which enables school sector strategies to be represented via the *Learning in an Online World: Learning Architecture* and the higher education *Collaborative Online Learning and Information Systems* project (White, 2004, p. 6). Well-established, cross-sectoral collaboration has matured creating functional online knowledge networks and database driven educational enterprise web services which use cutting edge technologies. As well, over 18,000 resources are quality assured by educators and catalogued, responding to both the information and communicative capabilities of the Internet, and networking online communities of school principals, early childhood educators, and faculty from higher education. These strategic alliances are business models incorporating wholesale, brokerage, and retail (where online services and educational resources are bought and sold). Establishing critical educational and industry standards, new multimedia content development and curriculum priorities potentially bridges pedagogical gaps for both high-risk groups and students whose primary language is other than English (White, 2004). Career planning initiatives are also networked to support career planning and life-long learning in an information economy and knowledge society.

Once the ‘architecture’ was established and the students and teachers adapted to the changes in educational paradigm, a number of interrelated factors were identified as contributing to the overall yield. These included higher staff skill levels
and professionalism, higher expectations of students, and a growing culture of trust that encouraged experimentation and risk-taking. White (2004) reported that student motivation increased, their communication and work were of higher quality, and their educational inquiries were more relevant. Both students and teachers had access to seemingly infinite quantities of current and relevant information.

As a consequence of the well-supported educational initiatives, Australia’s universities now have more than two hundred courses offered fully online, particularly in higher education. Even face-to-face instructors use online learning management systems and more than half the student body across Australia will take an online course as part of their degree. In many instances, if students miss a face-to-face class, they can access the lecture online. They can communicate asynchronously outside the regular teaching hours and generally have a more flexible learning environment (Cunningham et al., 1998).

The Australian Graduate Survey (2006) has been conducted annually by Graduate Careers Australia and higher education institutions since 1972. The surveys, including a Course Experience Questionnaire, are conducted in accordance with a Standard Recommended Methodology and have a twofold purpose: To gather information on the experiences of graduates shortly after they qualify, and to provide educational institutions with a range of information about their graduates. Statistical information is being collected to assess the effectiveness of online and face-to-face programs according to graduates entering the workforce measuring teaching standards, relevance of the course and perceptions of information technology resources.

While educational technology in Australia is no longer seen as a “trendy sideshow,” it is still the subject of much debate (White, 2004, p. 11). Being of a
younger generation, most students may be more technologically minded than teachers and embrace technology in education more readily (Cunningham et al., 1998). Students in remote rural areas may be naturally inclined to consider the benefits inherent in e-learning (Fahraeus, 2004). But even though e-learning in Australia is well-developed and well-supported, it is still not considered mature (Forster et al., 2004). According to Challis, Holt, and Rice (2005):

The power of ICT supported experiential learning can be enhanced through its grounding in holistic approaches to designing teaching and learning environments for whole programs and fields of professional study. In these broader teaching and learning contexts, ICT can provide and support new learning experiences in multi-faceted ways in diverse learning settings. (p. 37)

In a review of teacher education in Australia, Phelps et al. (2004) found that there was an aging population of teachers and that few currently practicing teachers had received pre-service training in computer use and that most had “high computer anxiety and low computer self-efficacy” (p. 50). Researchers found that there was an “ineffectiveness of teacher training programs” as well as a gap between teachers’ technological ability and their “perceived computer competence” (p. 50).

While students have grown up with technology, teachers are, in a sense, on the other side of the digital divide and need to adjust to students taking the lead. To remedy this, White (2004) suggests that 25% of the technology dollar should go into teacher training. In a similar vein, Kirkpatrick (2002) suggests that now that the technological infrastructure is in place, investment needs to go into people who will model the successful use of online programming from the perspectives of both teachers and learners.
Section 2.3.2.5 reviews the literature on educational technology in the United States.

2.3.2.5 Research on educational technology in the United States.

In 1999, a full-scale study into barriers to teacher use of technology was conducted by the United States Department of Education (USDE) (National Center for Educational Statistics, 1999). The 1999 study produced some noteworthy findings: for example, generally, teachers who perceived a lack of computers in the school and a lack of time for students to use computers, were less likely to give assignments that involved the use of computers or the Internet. The data indicated that about half of all public school teachers used computers or the Internet for classroom instruction, to prepare curriculum, and to communicate with others regarding administrative tasks.

While there is now some statistical information available on distance education at higher academic institutions in the United States, few research studies have focused on the effectiveness of online education (see, for example, Allen & Seaman, 2003; Global University Alliance, 2006; Liu et al., 2004). Distance delivery in education is not new having “made its debut in the late 19th century” (Flowers et al., 2004, p. 55). Nowadays, computers and the Internet have in notable ways transformed distance education with many institutions doing away with postal services in favor of electronic communication.

In a review of twenty years of educational technology policies, Culp et al. (2003) noticed a change in the tone of the policy reports starting in 1995. After that time, reports presented educational interests in the United States in a different light,
one of “transforming education through technology” (p. 20). In Culp and his colleagues’ (2003) words, the reports began to:

[…] present education technology as a driver of school reform, rather than as a class of tools and resources that, to varying extents, could be matched to educational challenges already recognized by educators. In these reports technology becomes a tool of transformation, which promised, simply by its presence and capabilities, to cause changes in how teachers teach, how schools are organized, and how students work together and learn. (p. 20)

Ideologically, distinguishing technology as a driver of educational transformation, as opposed to a set of tools, has important implications (Davis et al., 1997; Finkel, 1991; McKenzie, 2005). As has been stated throughout this thesis, technology in teaching has the potential to substantially assist in transforming learning to a constructivist, learner-centered paradigm. Viewed from the perspective of teacher-centered teaching, technology has all-to-often been approached as merely a tool kit which many traditional teachers have seen as having limited use. This may be in part because early CAI was based on behaviorism and were not learner-centered and constructivist (Kerr, 1996).

A study undertaken by Wild, Griggs, and Downing (2002) led to a framework for employing e-learning as a tool for knowledge management. Further, Wild and colleagues’ investigation revealed that, by 2002, 97% of college students surveyed in the United States reported using the Internet for research and 70% claimed to use the Internet daily.

Allen and Seaman (2003) found a strong relationship between institutional size and online learning outcomes at tertiary institutions in the United States. More specifically, the larger the institution, the more likely it was that there was a
favorable response to online learning from students. Results from Allen and Seaman’s inquiry revealed the following findings for the United States: (a) eighty-one percent of all institutions of higher education offer at least one fully online or blended course; (b) online degree programs are offered by 34 percent of private American colleges and universities (both for profit and nonprofit); (c) among public institutions (for profit), the numbers are even more compelling, with 97 percent offering at least one online or ‘blended’ (part face-to-face and part online) course and 49 percent offering at least one online degree program; and (d) when asked about “the role of online education for the future of their institution,” sixty-seven percent answered that it is “a critical long-term strategy” (p. 5). Further, in 2002, over 1.6 million students took at least one online course, 578,000 of these students took all of their courses online, and among all tertiary level students in the United States, eleven percent took at least one online course.

Hoffman, Novak, and Schlosser (2002) examined the demographics of computer usage in a large sample (N = 7,157) in the United States comparing the variables of age, education, income, gender and race. While initial findings indicated that computer usage was greater in white males with higher income and more education, Hoffman et al. concluded that the gaps in usage and access were steadily decreasing over time with increased ownership of personal computers and increased access of computers in the workplace.

In an effort to match technologies to public priorities for educational improvement, Culp et al. (2003) suggest that “technology needs to work in concert with other factors like effective leadership, instructional priorities, and the day-to-day demands of classroom practice” (p. 22). A balance must be struck between the demand of improving educational practice over time and pressing public concerns for
accountability and equity. Similarly, a balance is needed between the impetus for change in the educational paradigm and for technology adoption.

2.3.2.6 Research on educational technology in Canada.

Canadian academic institutions, much like their Australian counterparts, have long had to face the problem of educating remote populations imposed by vast geographical distances with low population density. For example, Queens University launched its first distance delivery program in Canada in 1889 (Wagner, 2005). Select academic institutions began offering distance delivery in the 1970s with Tele-Université created in Quebec in 1972, followed by Athabasca University in Alberta in 1973 and the Open Learning Agency in British Columbia founded in 1978 (Cunningham et al., 1998).

In 2004, Tele-Université announced e-learning partnerships and the initiation of online programs targeting students in remote areas of the Northwest Territories in northern Canada (Quebec E-learning Partnerships, 2004). According to Alberta Learning Information Services (ALIS) in 2006, there are 56 colleges and universities in Western Canada alone that offer distance education programs (ALIS, 2006).

Distance education programs in Canada which use the postal system to deliver materials are well-established. Yet, introducing online courses into existing academic programs in many tertiary institutions remains a slow process. In 2006, Athabasca University only offers e-learning as a delivery modality in four subject areas (WorldWideLearn, 2006). However, Athabasca University is involved in an international collaborative project developing online learning opportunities for students. One example is that Athabasca University is a founding partner in the Global University Alliance (GUA), a consortium of universities working with
NextEd, a Hong Kong-based online education specialist with offices in Australia, London, Washington, and Beijing. GUA works with ten partner universities which, in 2001, offered 99 courses with student enrollment in Australia, Bangladesh, China, Indonesia, Hong Kong, Malaysia, the Philippines, Singapore, Thailand, and the United States (GUA, 2006).

Section 2.3 has explored key issues linked to globalization and educational technology. Section 2.4 reviews the literature on teacher change and the use of technology in teaching.

### 2.4 Teacher Change and the Use of Technology

#### 2.4.1 Technology Refusal

Technology has opened many doors and has changed communication, the way most people do business, and the way most people are educated. While it may seem on the surface that the adoption of technological innovations is virtually sweeping all levels of both Western and developing societies, resistance to such change is common among teachers (Gilbert & Kelly, 2005; Hodas, 1993). Cuban (2001) asserts that information technology (IT) in schools is not worth the money, even when the advantages are obvious. In academia, educational policy is providing the means for institutions to fortify themselves with technological hardware and attempt to exert influence on individual teachers to use technology and to integrate it into their teaching (Rogers, 1995; Romano, 2003). However, change is rarely welcomed by individual teachers in academia or schools (Hodas, 1993). Change implies the disruption of routine, lowering the net value and overall desirability of a new innovation. According to Cuban (2001):
Since the early 1990s … wiring schools, buying vast amounts of hardware and software, and campaigning to convince teachers to use new technologies in their classrooms have produced a modest shift from nonusers to occasional users and from occasional users to serious ones. (pp. 71-72)

Human experience is “mediated by interpretation” (McGrail, 2005, p. 8) and teachers vary in their attitudes toward technology. Hodas (1993) challenged the assumption technology would be readily accepted in education stating that “organizations are not rational actors: their goal is not to solve a defined problem but to relieve the stress on the organization caused by pressure operating outside of or overwhelming the capacity of normal channels” (p. 2).

While academic programs are becoming increasingly oriented to technology, and the technological infrastructure of universities worldwide has increased dramatically over the last two decades, barriers to teachers’ use of multimedia in the classroom continue (Aust et al., 2005; Finley & Hartman, 2004; Honey & Moeller, 1990). Even if using technological innovations in teaching can provide a more flexible learning environment, extending the range of influence of education and thus empowering the learner, teachers still resist using technology in their teaching. This perplexing situation has invoked the inquiry of educational researchers. Scheidlinger (1999) posits that:

One cannot avoid the question why, the most important invention of all times – the computer – that brought revolutionary changes into almost all avenues of human activity, has failed completely in the field of education, where its potential is clearly the greatest? (p.120)

Hodas (1993) investigated technology ‘refusal’ among teachers, and emphasized that technology is never value-free. Further, Hodas argues that, for
teachers, innovations do nothing more than engender disruption. For Hodas, schools are “profoundly normative institutions” and teachers “lack the rights of self-definition and discretionary control of resources” (Hodas, 1993, p. 4). Scheidlinger (1999) asserts that the structure of the school system and the nature of teaching have remained essentially unchanged for seven hundred years. Yet, Scheidlinger stipulates that the advances in technology and science in the past seventy-five years have outpaced those of the last two thousand years. Hodas (1993) argues that:

After proclaiming the potential of the new tools to rescue the classroom from the dark ages and usher in an age of efficiency and enlightenment, technologists find to their dismay that teachers can often be persuaded to use the new tools only slightly, if at all. (p. 1)

A survey of teachers in the United States found that 82% of teachers fitted a profile as “parental, practical, sensible, traditional, responsible, conservative, organized, procedural, orderly, and conventional” (Bollett & Fallon, 2002, p. 7). Bollet and Fallon went on to state that people with these characteristics are “reluctant to change and may even resist change” and that “they usually find it difficult to adapt to new methods” (p. 7).

Fang and Warschauer (2004) found that significant numbers of teachers prefer traditional teaching practices and are uninterested in computer training. Cuban (2001) found that over half of elementary and middle school teachers surveyed were non-users of technology for classroom instruction while 1 in 3 were occasional users and 1 in 10 used technology daily. In high schools, the vast majority never used technology in the classroom with 4 in 10 teachers reporting using computers once a month and only 2 in 10 being serious users.
There is a common yet unsubstantiated belief that the promotion of computer-assisted instruction (CAI), e-learning, and multimedia in the classroom will render the teacher obsolete (Bindé, 1998; Hodas, 1993; Pope, 2000; Romano, 2003). Whereas the role of teachers will necessarily shift with technology integration, Pope (2000) asserts that teachers will remain essential to the educational process.

Technology integration, if rooted in sound principles of pedagogical design, can lend itself to learner-centered, constructivist learning (Becker, 2000; King, 2003; Perkins, 1992b). Pope (2000) emphasizes the view that the shift to a learning-centered learning environment demands that the teacher's role change from that of an "information-giver" to one of "designer and director" of instruction and respondent to students' budding insights (p. 95). However, Apple (1982; 1998) argues that teachers are often mandated to use pre-set curriculum which leads to ‘deskilling’ teachers by separating formation from execution, leading to a reduction in teachers’ competence in building materials adapted to local contexts and the diverse needs of learners (Apple, 1982). Further, Apple contends that work intensification and increased demands on teacher time may contribute to teachers’ reluctance to adopt technology (Apple, 1982). Not only do teachers need additional time and expertise to design and/or use multimedia curricula, they also need technical support plus the focus to monitor the interactive aspects of the program (Jacobsen & Lock, 2005; King, 2003).

Research (for example, see Aust, et al., 2005; Bowman, 2000; Bullock, 2004; Machnaik, 2002; McGrail, 2005; Murray, 2000) has shown that teachers are reluctant to use technology because of fear. For example, teachers’ fears include: being replaced by technology; not having sufficient skills; insufficient time for training; and loss of authority. Teachers’ fear of being replaced by a machine is a complex anxiety which, according to Hodas (1993), threatens to cut into their professional
identity and self respect. In traditional classrooms and educational settings, the teacher is the administrator of knowledge and students have the duty to honor and obey teachers without questioning their authority (Bollett & Fallon, 2002). Fang and Warschauer (2004) found that ‘traditional’ teachers fear loss of authority and are concerned about the pressure of any such negative public opinion. Bindé (1998) asserts that despite teacher fears, it “does not mean, naturally, that education as a direct relationship between teacher and pupil is fated to disappear, no more than the book ever killed the teacher” (p. 850).

For teachers who are steeped in tradition, inconvenienced by change, and who are accustomed to being the ultimate authorities in classrooms, technological innovation can generate insurmountable resistance (Finley & Hartman, 2000; Gilbert & Kelly, 2005). Adaptation to new teaching methodologies and new technology can be an overwhelming challenge for teachers (Alvine, 2000; Hughes, 2005; Joyce & Showers, 1995; Strudler, 1993). A variety of studies (for example, see Gilbert & Kelly, 2005; Hawkridge, Jaworski, & McMahon, 1990; Hodas, 1993) has shown that many teachers are not confident about using technology in the classroom and feel inadequate about the limits of their expertise. Furthermore, once technology is embraced, keeping pace with upgrades of software and hardware is an ongoing process that can generate additional stress (King, 2003).

Dillon and Morris (1996) suggest that reliable predictions of user acceptance are related to the psychology of the users, the design process of information technology, and the quality of the technology in user terms. Indeed Dillon and Morris proposed clusters of determining variables based on original psychodynamic models of human behavior. The study by Dillon and Morris led to a “socio-technical systems theory of acceptance” (p. 6) which suggests that technology has little meaning and is
only comprehensible in terms of the context in which it is embedded and the organizational goals or transformations that it serves or enables. Closely tied to Roger’s (1995) diffusion of innovation theory, the socio-technical systems theory provides a general framework within which the social impact of technology can be modeled (Dillon & Morris, 1996).

Determinants of user acceptance were studied by Davis, Bagozzi and Warshaw (1989) in their technology acceptance model (TAM). Recognizing that computer systems cannot improve organizational performance if they are not used, the researchers set out to explain why people accept or reject computers. In a longitudinal study, Davis et al. showed that perceived usefulness strongly influenced peoples' intentions to use computer technology. Davis et al. (1989) found that perceived ease of use had a small but significant effect on the intention to use technology, although this effect subsided over time. Furthermore, ease of use was not as important a predictor of use of technology as the anticipated impact on job performance.

While many of the above studies pertain to school education, findings from Gilbert and Kelly (2005), who studied the "assimilation gap” (p. 110) between the acquisition of technological resources and their deployment in higher educational contexts, show close parallels between application issues in both sectors. Further, Gilbert and Kelly claimed: “The five characteristics of an innovation comprise (a) relative advantage; (b) congruence with existing values; (c) ease of use; (d) ability to trial; and finally (e) observability of results” (p. 111). The current study seeks to determine the factors that contribute to the implementation of technological resources in higher educational settings as well as ascertaining the degree to which adoption is values driven. As Gilbert and Kelly observed, if congruence with existing
values is lacking, teachers may resist the uptake of technology in their teaching practice.

In summary, the literature supports the premise that transformation within academic culture is complex and technology acceptance can be met with denial or resistance. Section 2.4.2 reviews further the literature on barriers to teachers’ use of technology. Section 2.4.3 reviews the literature on factors contributing to teacher use of technology.

2.4.2 Barriers to Teachers’ Use of Technology

A growing body of research is contributing to the understanding of barriers to teachers’ use of technology in elementary, secondary, and tertiary classroom instruction (Aust et al., 2005; Coppola, 2005; Davis, 1993; Finley & Hartman, 2004; Gilbert & Kelly, 2005; Hodas, 1993; Honey & Moeller, 1990; Jung, 1993; Rogers, 1995; Romano, 2003; Sheingold & Hadley, 1990). This section analyzes teacher characteristics, institutional characteristics, and teacher education as well as themes in teachers’ beliefs and/or values about the use of technology in their classrooms.

Honey and Moeller (1990) examined how teachers conceptualized the relationship between technology and education, distinguishing between “high tech” and “low tech” teachers (p. 3). Results from the study showed that high tech teachers were a homogeneous group with respect to pedagogical beliefs and practices. However, low-tech teachers had one of three distinct orientations: (a) they were student-centered but were reluctant to use technology because of personal fears and beliefs; (b) they were traditional and feared technology might alter their relationship of control and authority feeling overwhelmed by administrative duties and
complaining of lack of time; and (c) they were student-centered but found hardware was not readily available.

Honey and Moeller (1990) found that high tech teachers were self-taught, highly motivated individuals who began using IT in response to their students’ growing interest in computers and who wanted to be informed to provide their students with knowledgeable answers to their questions. Key problems that the low tech teachers had were learning on their own, overcoming issues of fear and inadequacy, dealing with problems with hardware breaking down, lacking time, and enduring a prohibitively low computer-to-student ratio. Honey and Moeller (1990) described teachers who refused to adopt IT as suffering from “technological phobia” (p. 14). The research by Honey and Moeller revealed a link between traditional teacher values and the use of technology. They concluded that traditional educational beliefs and practices, that is, teacher-centered delivery of knowledge, created barriers for technology integration.

Romano (2003) claims that teachers have not been offered a convincing explanation of how technology would empower them and that lessons learned by those in other professions have not been considered. Furthermore, pre-existing software does not easily integrate into teachers’ lesson plans, thus reducing their effectiveness and appeal. The problem identified by Romano is that educators do not fully grasp the capacity of technology to transform teaching and learning; thus, after fifty years of trial and error, its potential impact is still not realized. In Romano’s (2003) words:

Computer technology has been adapted to amplify the capacity of professionals in virtually every aspect of society - with the exception of the
teacher. Rationalizing this reality becomes increasingly difficult, since teaching and learning is an information-intensive process. (p. 89)

Sheingold and Hadley (1990) investigated the use of technology in education and found that it was a contentious issue exerting increasing pressure on teachers. Sheingold and Hadley’s research was conducted in 1990 and investigated both ‘past’ and ‘current’ barriers to teachers’ use of multimedia in their teaching. Research on IT is time-sensitive. With technological infrastructures in academia improving vastly over the past two decades, it will be important to compare findings from this 1990 study and the present study conducted in 2005.

In the context of Sheingold and Hadley’s 1990 study, highest rated ‘past’ barriers were (a) too few computers, (b) teachers’ lack of time, (c) too few printers, (d) problems scheduling computers, (e) not enough labs, (f) teachers’ lack of interest in computers, and (g) weakness of teachers’ own knowledge. Highest rated ‘current’ barriers were (a) teachers’ lack of time, (b) problems scheduling teacher computer time, (c) low computer-student ratio, (d) not enough computer labs, (e) inadequate financial support for computers from school and district, (f) too few printers and peripherals, and (g) not enough help to supervise student computer use. Sheingold and Hadley hypothesized that teachers in some of the schools studied had reached a “critical juncture” (p. 30) in that they wanted to accomplish more with technology, but could not do so unless changes within the organizational system took place. The impasse was in the larger context of the school system and the teachers themselves shared accountability for lack of use of technology in their teaching. Another critical finding resulting from Sheingold and Hadley’s study is that it takes a full five to six years of teaching with technology for teachers to master computer-based practices in the classroom. This timeframe may be pivotal in system-based planning for cultures
of integrated technology in primary, secondary, or tertiary education. If the administration of academic institutions does not consider the long-term requirements for technology integration, it may well prove to be a barrier to teacher uptake of multimedia.

One approach to resolving this dilemma is to focus on the professional learning of teachers. Bowman (2000) surveyed teachers who claimed they "did not see a single example for the infusion of technology in context" (p. 98) in their teacher education programs. The research by Bowman showed that lack of technology integration in teacher education manifested in the following concerns: “(a) inappropriate fit of technology with course content (25%), (b) inability to discern how to use technology in assignments (30%), (c) resistance of the supervising teacher (15%), (d) unavailability of computer labs (10%), (d) students unprepared for computer technology (5%), and (e) fears about classroom management (15%)” (p. 98). The absence of technology in teacher education could well be a major barrier to teachers’ future use of multimedia in the classroom.

Creating a culture of technology requires a system-wide consciousness that goes beyond the provision of adequate and functional hardware and software. For teachers to adopt the use of technology in teaching, endorsement from the school administration, modeling and support from colleagues, and an atmosphere of encouragement for students is required (Alvine, 2000). Without specific initiatives by school administrations to create a culture of technology, teachers may be less likely to have technology integration as a priority. Alvine found that when groups of graduate students were asked to brainstorm current issues and problems in teaching, none of the groups listed technology as one of their top five concerns.
Adamy and Heinecke (2005) note that people tend to teach the way they were taught. Furthermore, teachers are heavily influenced by what is rewarded in the academic environment in which they teach. An institutional barrier to technology integration may be created when there is no reward for the use of technology in university teaching. Critically, Adamy and Heinecke (2005) claim:

Each participant has been affected, either positively or negatively, by the organizational culture in which they work. In higher education this culture tends to be influenced by the tenure process; individuals are focused on performing in a way that will best lead to promotion. Currently, innovative practice such as the integration of technology into instruction is not normally linked to traditional tenure promotion activity. (p. 242)

Another barrier to teacher use of multimedia in the classroom could be lack of professional learning specific to computers, integration of technology, and modeling of applied technology. There are many teachers, even those who have had specific and extensive professional learning, for whom the use of technology in classroom instruction is a daunting prospect. Jacobsen and Lock (2005) make the case that “one-size-fits-all workshops” (p. 77) and stand-alone courses are limiting and tend to fragment professional development and carry little if any ongoing support. Further, Jacobsen and Lock make a strong case for the fact that training teachers in basic technology skills does not sufficiently prepare them to integrate technology into classroom pedagogy in a constructive manner. Hughes’ (2005) research yielded similar findings in that, for personal and systemic reasons, only one third of teachers feel “well prepared” or “very prepared” (p. 228) to use multimedia in their teaching.
To have a positive impact on the behavior of teachers, Gilbert and Kelly (2005) proposed that, instead of trying to transform an organizational culture to integrate technology, focus should be placed on the specific goals of the institution, the change agents within it, and building on the strengths of the existing academic culture. Yet, changes within school systems are not so easy to achieve, as Fried and Sarason (2003) argue: “The most significant feature of the educational system is its propensity to perpetuate itself, to just roll along in the face of considerable research illuminating its inefficiencies and failures” (p. 4).

Felix (2003) cautions that resistance to change may be rooted in the fact that in order to effectively use technology, particularly in language teaching, even more resources and effort, both human and financial, are required. Further, Felix suggests that language educators have “been grappling for longer than any other discipline with the need for interactivity and communication” seeking ways to engage students in real life activities and authentic settings (p. 119). The key issue for Felix is that online technologies are valuable extensions of classroom instruction especially when incorporating constructivist approaches.

In summary, barriers to teacher use of technology occur at the personal level for individual teachers, at the institutional level depending on whether or not a culture of technology is fostered at the administrative level, and at the level of teacher preparation whereby modeling and professional learning specific to the use of technology is developed. Further to enhancing teacher knowledge and institutional support, sufficient access to hardware, software, and technical support seem crucial to the successful implementation of educational technology.
Section 2.4.3 will explore identified factors that both contribute to teacher use of technology and that provide leverage for the unique benefits and new possibilities provided by digital technologies.

2.4.3 Factors Contributing to Teachers’ Use of Technology

Several factors that contribute to teachers’ use of technology in teaching will be discussed in detail below. These factors include modeling by colleagues, expectations by school administration, access, positive experiences with computers in teaching, and teacher beliefs and attitudes about technology in teaching.

A number of studies have shown that a key factor in encouraging teachers to introduce and sustain the use of multimedia in classroom instruction is modeling (Alvine, 2000; Aust et al., 2005; Becker, 2000; Bowman, 2000; Gilbert, 2005; Honey & Moeller, 1990; Pope, 2000). In research with high school teachers engaged in professional development for technology integration in the United States, Bullock (2000) found that lack of modeling by the mentor teacher was a “disabler” while modeling concrete uses of technology in specific subject areas and grade levels was found to be an “enabler” (p. 220). In addition to effective mentoring, encouragement, and modeling, Bullock found that clear expectations, easy access to technology and technical support, and positive experiences with computers in classroom settings facilitated the necessary skill development for teachers to use technology on a regular basis.

Similarly, Adamy and Heinecke’s research found that three dynamic factors that need to be operational: (a) access to hardware, software, and technical support; (b) teacher educators’ relationships with key technical players; and (c) positive organizational attitudes toward technology use emphasizing the organizational
context in which faculty technology innovation takes place. Adamy and Heinecke (2005) suggest that technology integration is a “social process that must have administrative institutional support to succeed” (p. 233).

Another factor contributing to teachers’ use of multimedia is attitude toward educational technology. Howland and Wedman (2004) surveyed pre-service secondary level teachers in the United States learning to use technology in their classrooms. Instead of viewing technology as a compilation of skills to be acquired, the ideology of life-long learning emerged with pre-service teachers "developing self-concepts of themselves as technology users" (p. 241).

Bowman (2000) declares that most teachers who use multimedia understand that “technology does not replace good teaching; instead it opens new horizons for discovery and exploration” (p. 99). Furthermore, teachers should not attempt to use technology for technology’s sake; for example, implementing computers in classroom settings for repetitive drills which are devoid of contextual grounding. This point is echoed by Becker (2000) when he says, “all efforts to use computers with students are not equally defensible” (p. 1).

Schools need to move away from a ‘technocentric’ assessment of IT to one which focuses on how IT contributes to realizing life-long pedagogical goals and objectives (Burnston, 2003; Howland & Wedman, 2004). Thurmond and Wambach (2004) outline three crucial factors for teachers and students engaging in the use of educational technology: (a) computer experience, (b) positive perception regarding technology, and (c) adequate access to functional technology.

School conditions can also be a contributing factor in teachers’ use of multimedia. In a study examining the school conditions associated with the effective use of computers, Becker (2000) measured a socio-demographically heterogeneous
group of American schools. While some were not technologically advanced, some were on the leading edge of Internet use, being among the first to have LAN-based, high-speed Internet connections linked to supportive intermediating organizations such as science museums, university research and development programs, and school districts with strong technology investment ambitions.

Becker (2000) found that in the United States between 1985 and 1989, the percentage of teachers requiring their students to use computers during class time doubled, from roughly 25% of all teachers to 50% of all teachers. Further, Becker measured variables pertaining to teacher use of computers by correlating the complex relationships among pedagogical beliefs, instructional practices, and teachers’ use of technology. Becker observed that “exemplary teachers” (p. 6) were better-educated, taught classes with fewer students, and were more likely to report constructivist teaching practice than were teachers who had not used computers with their students. As well, those teachers experienced more problems with their school's computer infrastructure than other teachers suggesting they “made greater demands on the support and maintenance team than other teachers did” (p. 4). Becker outlined the following recommendations for schools wishing to support teachers in the successful use of technology: (a) a full-time computer coordinator, (b) formal staff development that is ‘tool-oriented’ (rather than skills and knowledge testing), (c) teachers given school time and resources, and (d) establishing a pattern at the school of using computers for ‘consequential activities’ (for real world purposes in contrast to classroom drills).

Becker (2000) reported several findings regarding teachers who used computers in their teaching on a weekly basis for more than three years. These teachers were: (a) more likely to be student-centered in their teaching practice than
were teachers who had not used computers with their students, (b) were twice as likely to say they were more willing than they used to be to include a topic in their teaching that was new to them and to permit themselves to learn from their students, (c) much more likely than non-computer-using teachers at the same schools to report having changed their teaching practice over the previous several years, and (d) they were 50% more likely than non-computer-using teachers to say they increasingly had students explore a topic on their own, without giving close procedural directions. Pivotal to his findings, Becker (2000) concluded that exemplary teachers “generally see computers as helping them implement changes to their pedagogy that they wanted to accomplish but which they had previously been unable to accomplish” (p. 6).

Another contributing factor for teachers’ use of multimedia is promoted by Alvine (2000) who emphasizes the view that technology should be a tool for learning content, instead of making technology the content. Alvine endorses the need for educators to “rethink uses of technology” (p. 102). Further, Alvine suggests that “we can model an orientation toward embracing the new and being vigilant in our critical review of its impact on the teaching and learning” (p. 105). Most educators would concur, as Alvine suggests, that the classroom needs to be a ‘human community’ that prepares students to live in the ‘real’ world which is becoming increasingly technology-based.

Sheingold and Hadley (1990) emphasize the need to rethink the length of time it takes for teachers to become accomplished in using computers in classroom instruction. As mentioned in Section 2.4.2, Sheingold and Hadley stipulated that it takes five to six years of collaboration with colleagues in a functional technological
environment to achieve the integrated use of multimedia curriculum. Thompson (1999) supported this position and noted:

… the technologies employed in teaching are not neutral applications that simply guide the learner; rather, the artifacts of educational technology are themselves the products of social shaping, and are implicated in the reproduction and legitimation of social knowledge and equalities. (p. 25)

Dupin-Bryant (2004) asserts the view that teachers who are using instructional technology in classroom settings need high-level support from experts to keep hardware running and to learn various software programs. Peer mentoring, peer workshops, electronic message boards can inspire and support educators involved in multimedia curriculum development. Teaching styles, like learning styles, are highly personal and hence influenced by intrinsic and extrinsic factors (Burnston, 2003; Machnaik, 2002). A re-visioning of educational goals is one of the needed organizational and/or systemic changes required (Dillon & Morris, 1996; Hodas, 1993).

Carroll, Rosson, Dunlap and Isenhour (2005) studied human-computer interactions in American settings and affirmed that the “culture of autonomy” has come under pressure in the past decade giving way to a “culture of collaboration” (p. 162). The research by Carroll et al. identified three levels of knowledge sharing which involved: (a) “tangible resources (websites, construction kits, lab equipment); (b) plans and objectives (lesson plans, worksheet templates); and (c) prototypes (online reports, project summaries, and photos)” (p. 163). This collaborative model, facilitating the functional use of technology in education, is in direct contrast to the isolation typical of traditional teachers who manage their own resources and rarely share their pedagogical practices (Carroll et al., 2005).
Liu, Theodore, and Lavelle (2004) found patterns in teacher uptake of technology in elementary schools. Liu et al. surveyed twenty-three elementary and secondary teachers from different socioeconomic school districts with differing teaching experience in the United States using the Stages of Concern Questionnaire. Key amongst the findings from Liu et al.’s study were three elements: (a) newer teachers were more likely to utilize computers than teachers with twenty or more years of teaching experience; (b) teachers in wealthy school districts were more likely to use multimedia than in poorer districts; and (c) even when teachers attended college-level training, they did not benefit from exposure to models of effective technology integration in their content areas. The three elements found by Liu et al. suggest an overall lack of confidence in teachers regarding classroom applications which is similar to findings by researchers studying teacher uptake of technology in secondary and tertiary institutions (Becker, 2000; Jacobsen & Lock, 2005).

Over time, teachers exposed to integrated technology increase their awareness, gather information, understand the consequences and refocus their curriculum. Based on a study done by Allen and Seaman (2003), Table 2.3 shows teacher acceptance of the value of technology and the acceptance of online education in higher education in the United States in 2003. Allen and Seaman’s research indicates that 59.6% of faculty members surveyed accepted the legitimacy of online education indicating that exposure and time may be contributing factors to teachers’ uptake of technology.
In keeping with a constructivist learning model, Jacobsen and Lock (2005) suggest that in order to create a functional model which cultivates collaborative relationships between university faculty, classroom teachers, and student teachers, instructors in teacher preparation programs need to rethink how student teachers are trained for the knowledge era. Jacobsen and Lock further argue that technology integration in both language classrooms and other higher education settings should be “values driven and guided by a shared vision about learners and learning” (p. 77). Technology integration may be facilitated if teachers share similar educational values and endorse a collaborative vision of education.

Machnaik’s (2002) research showed that teachers were most successful using computers as a learning tool for their students when they had not fully mastered the technology and therefore did not act as experts. The fundamental consideration for Machnaik, in introducing computers as a learning tool, is whether or not adopting technology will better prepare students for their future. In addition, Machnaik encourages teachers to step out of their ‘comfort zones’ and to take risks in adopting innovative teaching techniques. Teachers need to be co-learners taking risks with
their students: such an attitude would likely empower students, raise their self-esteem, and make the teachers “more approachable” (p. 8).

In summary, several factors are essential starting points for teachers to adopt the use of technology in teaching. The process of transforming traditional classroom practices to places where there are functional integrated technological learning environments involves a myriad of interacting dynamics. While the lack of technological infrastructure in educational institutions previously made it prohibitive for many teachers to use technology in the classroom, the infrastructure in academia throughout much of the world has been gradually enhanced in the past decade. Thus, offering adequate computer access to hardware, software, and support coupled with positive teacher perception regarding technology, modeling, and teacher experience can lead to a functional culture of technology in schools.

Section 2.4.4 reviews the literature on electronic versus live classroom teaching in tertiary education.

2.4.4 Arguments for Integrated Use of Technology

Studies that compare online learning and traditional classroom instruction in university educational settings reveal a wide range of findings (Dupin-Bryant, 2004; Junaidu & AlGhamdi, 2004; Muirhead, 2004). Burnston (2003) did a meta-analysis of the effectiveness of electronic versus face-to-face teaching revealing that some studies show greater efficacy with face-to-face, others show better results with CAI, while a number of studies found no significant difference between the two methods of delivery.

Allen and Seaman (2003) conducted a survey with 994 chief academic officers in higher education institutions in the United States to collect data on the
extent and quality of online education in the United States in 2002 and 2003. Results of the study showed that fifty-seven percent of academic leaders believe that the learning outcomes from online education are equal or superior to those of face-to-face instruction. Even more compelling, based on preferences reported by students, nearly one-third of academic officers in the survey expected that learning outcomes for online education would be superior to face-to-face instruction by 2006.

As mentioned, Burnston (2003) found equivocal support for CAI in a review of over one thousand evaluative studies focused on broad comparisons between the effectiveness of computer applications versus traditional instruction conducted during the period between 1960 and 1990. Burnston noted that nearly all were quasi-experimental, quantitative ‘treatment method’ research design. Furthermore, the majority of the studies reviewed had “computer usage” as the independent variable and “learner outcomes” (p. 222) as the dependent variable. Burnston expressed caution over the methodologies noting that the studies had “uncontrolled variables such as novelty effects” as well as unacknowledged variables such as “the personal influence of the instructor, learner expectations, and motivation” (p. 222). Burnston emphasized the pressing need to evaluate the effects of CAI on language learning emphasizing that “conclusions are nearly always drawn in a theoretical vacuum without consideration of the cognitive and/or second language acquisition processes underlying reported linguistic performance” (p. 223). Burnston (2003) concluded that:

In recognizing the failure of proponents of IT to make an unequivocal case for its advantages, it is important not to jump to the conclusion that IT is a waste of time, effort, and money. The evidence does not justify that conclusion either. On the contrary, lack of significant difference can be taken
to indicate that computer-based instructional paradigms are just as good as traditional classroom teaching. (p. 221)

In drawing on a meta-analysis of research on CAI, Hill (2003) insists that learning is largely social and the absence of direct contact between teachers and students in online learning lacks ‘emotional’ substance. While research on the superiority of face-to-face teaching or online learning may be inconclusive, there seems to be no dispute over the importance of interaction to the learning process (Wang, 2004). In that respect, researchers seem to agree that meaningful communication and effective pedagogy leads to learning (Fang & Warschauer, 2004; Liontas, 2002; Wang, 2004).

Flowers, Jordan, Algozzine, Spooner, and Fisher (2004) assert that the primary assumption when comparing face-to-face instruction with online learning is flawed since the instructional effectiveness of each medium studied is not constant across all content and all students. Flowers et al. make two important points: (1) “there is insufficient evidence to support the idea that classroom instruction is the optimum delivery method,” and (2) “what makes any course good or poor is a consequence of how well it is designed, delivered, and conducted, not whether the students are face-to-face” (p. 57).

Machnaik (2002) expresses the view that computers have the potential to facilitate stimulation across multiple learning modalities (auditory, visual, and kinesthetic) and hence offer the opportunity for a higher level of learning. In focusing on learner needs, Royce (2002) stipulates that EFL professionals “need to help learners develop multimodal communicative competence” (p. 192) which is facilitated by computer-assisted instruction. Armstrong (2000) corroborates this claim asserting that well-designed e-learning programs are available to accommodate
all personality types, to all ages, and to people from diverse cultures. Based on research over the past two decades (see Adamson, 2004; Ely, 1991; Luppicini, 2005; Taylor, Jamieson, & Eignor, 2000), it appears that the trend toward e-learning and teacher use of multimedia in the classroom will continue to gain strength.

The trend toward using electronic materials in education sectors began decades ago. In his 1998 study, Tapscott (1998) outlined how members of the younger generation were “beginning to think, learn, work, play, communicate, shop, and create in fundamentally different ways from their parents” and that they were “influencing a whole spectrum of society: the way we create wealth, the nature of commerce and marketing, the delivery system for entertainment, the role and dynamics of our educational system, our culture, and arguably the nature and influence of government and politics” (p. 8). Further, Tapscott links the shift from the traditional passive broadcast medium of television to the new interactive medium of the Internet as the cornerstone of the next generation, or “N-Gen” (p. 4).

Hills (2003) supports the claim that multimedia and interactive forms of learning reflect a transformation in world culture maintaining that:

...e-learning will be successful not because it is superior to other forms of learning but because there are significant changes in society. Given that supposition, then e-learning design must be improved so that it is superior to other forms of learning. (p. 168)

If students are already proficient in using computers and oriented to using technology, making key resources available online potentially opens the ‘door’ to a complex world of learning (Bindé, 1998). The Internet is a powerful source of ‘authentic’ material for all students worldwide (Coppola, 2002; Dubriel, Herron, & Kerr, 2004; Kerr, 1999). Using online resources in teaching must be rooted in sound
pedagogical practice and be used to enhance the specific content of lessons instead of using computers as a short cut to lesson planning. Jonassen et al. (2003) comment on this practice:

The greatest educational sin that we educators commit is to oversimplify most ideas that we teach in order to make them more easily transmissible to learners. In addition to removing ideas from their natural contexts for teaching, we also strip ideas of their contextual cues and information and distil the ideas to their "simplest" form so that students will more readily learn them. But what are they learning? That knowledge is divorced from reality, and that the world is a reliable and simple place. But the world is not a reliable and simple place, and ideas rely on the contexts they occur in for meaning. (p. 8)

In almost all academic institutions around the world, many students are more adept with computer operating systems, word processing, graphic design and web building than their instructors (Alvine, 2000; Aust et al., 2005). The digital divide that exists between the older generation and the younger generation raises challenging issues for both teachers and students. Jacobsen and Lock (2005) coined the term "screenagers" to describe the new generation of students raised online who participate fluidly in interactive digital environments and virtual spaces in the "rapid-fire, nonlinear, chaotic, multisensory world of digital media" (p. 76). This generation of students has arrived on university campuses and students are equipped to be functionally conversant with technology whether or not their teachers struggle with basic functions on the computer. The digital divide across the generations can create a perceived ideological dichotomy that may detract from the overarching goals of education – to teach critical thinking skills, to make meaning, to communicate and to
promote life-long learning. If computers in education can contribute to these goals, they become useful teaching tools.

One of the main features of using technology in education is to appeal to various learning styles and multiple intelligences (Armstrong, 2000; Hills, 2003; Hyslop-Margison, 2004; Machnaik, 2002). Learning styles are discussed in more detail in the context of learning theory and language acquisition in Section 2.8. In terms of CAI versus face-to-face classroom instruction, CAI allows students to access material at their own ‘pace’ as well as offering auditory, visual, and kinesthetic cues appealing to the broad range of learning styles in any given group of students who cluster in a program (Hills, 2003; Machnaik, 2002; Royce, 2002).

Research has shown that using computers seems to naturally engage multiple sensory modalities, however, further research must be conducted to assess the impact of CAI on students with different learning styles (Traynor, 2004). Traynor’s view is that learner control results in a more positive attitude toward instruction promoting increased motivation: If a learner feels more competent and self-determined, they can generate more meaning and connect to personal interests. On that basis, if well-designed computer-assisted programs can facilitate student motivation and learner control, it, in turn, becomes a powerful vehicle that can propel education across the pedagogical bridge between teacher-centered teaching and learner-centered learning. However, for this to happen, a major shift in teaching and learning strategies that could lead to a profound transformation in the educational paradigm is needed. Such change almost inevitably would involve all the actors on the educational stage.

Technology integration requires systemic change in the educational paradigm. Fried and Sarason (2003) express the view that functional learning environments for students necessarily must be precipitated by functional learning
environments for teachers. In the traditionalist’s view of education, teachers complete their education and then become teachers. Functional use of technology necessitates constant upgrading and ongoing learning. Fried and Sarason argue that:

[…] unless teachers also feel that they, too, are part of a high quality and respectful learning environment, that they are learning in a sustained and productive way, we cannot expect more than a few of such teachers to create that environment for their students. (p. 5)

Teachers then, are not the only ones who need to adjust to new educational strategies. Students must develop skills to make the technology an effective learning platform, skills that are developed by learner-centered educational environments (Norton & Wiburg, 2003). Muirhead (2004) reviewed a series of studies measuring interaction in distance education students. Muirhead concluded that students who had greater anxiety when learning and communicating in online courses initially had lower computer skills and lower confidence levels. In describing the skill set that students need to benefit from integrated use of technology, Seaton (1993) argued that cognitive maturity plays a role in the level of interactivity in online learning:

Students who are cognitively immature are not as likely to be active participants in computer-mediated learning situations. They are likely to want faculty to provide the “right answer” viewing knowledge not as critical thinking but as a collection of information. (p. 51)

When educators design programs that stimulate multiple sensory modalities and allow for interactivity, studies are showing that computer-mediated situations can facilitate constructivist learning and the development of cognitive maturity in students (Duffy & Jacobsen, 1992; Hughes, 2005). Canadian researchers Norton and Toohey (2001) studied the cognitive traits of good language learners at the university
level by examining sociocultural and poststructural theory. As a result, Norton and Toohey argued that the “situated experience of learners” (p. 310) could predispose how learners approached language learning. Norton and Toohey suggest that “as people initially appropriate the utterances of others and bend those utterances to their own intentions, they enter the communicative chain and become able to fashion their own voices” (p. 311).

Using technology in education can help to train university students to become autonomous learners (Benson et al., 2003; Carroll et al., 2005; Coppola, 2005; Davis, Desforges, Jessel, Somekh, Taylor, & Vaughn, 1997; Lim, 2002; Machnaik, 2002). The overall goal in constructivist education is ‘learning to learn’ which empowers the learner as well as developing motivation for life-long learning. Self-monitoring and self-assessment are requisite for autonomous learning (Benson et al., 2003; Coppola, 2005). As noted earlier in Section 1.2, learning a language is a complex process of integration that occurs over an extended period of extensive input where motivation and personal commitment are key factors in success. Davis et al. (1997) hold the view that the flexibility of online learning offers features that can assist students to move from dependence on the teacher to self-reliance, self-pacing, and self-direction.

The studies discussed so far have been focused on computer-assisted instruction. Section 2.4.5 reviews the literature on the new generation of computer-mediated communication. After an introduction to the background issues, the discussion turns to how teacher-student interaction, which is essential to learning, can be facilitated by technology and online communities of learning.
2.4.5 Teacher-Student Interaction and Computer-Mediated Communication

Research has shown that interaction is central to learning (Blake, 2005; Thurmond & Wambach, 2004). Since interactivity is a key factor in learning, vital interactions between the student and the teacher; the student and the content; the students with one another; and the student and the learning interface can usually be effectively achieved with CMC (Bialystok, 2002; Fahraeus, 2004; Huang, 2000; Thurmond & Wambach, 2004).

The advent of computer-mediated communication (CMC) offers important educational opportunities for students and teachers in the Information Age (Cassell & Tversky, 2005; Miltiadou & Savenny, 2003; Mitra, Willyard, Panyameetheekul, & Herring, 2003; Platt & Parsons, 2005; Reiser & Dempsey, 2002; White, 2003). McLoughlin (2001) suggests that the Internet is a unique tool offering opportunities for immediacy of feedback and “networked learning” (p. 8). Specific to language learning, e-learning strategies are “the tools for active, self-directed involvement that is necessary for developing communicative ability” (p. x).

Thurmond and Wambach (2004) studied interactivity in both face-to-face and online contexts. Their findings provide strong support for the idea that students using CMC online can perform better than those in traditional classroom settings. Thurmond and Wambach (2004) assert that learner-content, learner-learner, learner-instructor, and learner-interface interaction (where the student interacts with the computer program) are facilitated by CMC. In observing face-to-face lecture settings, Thurmond and Wambach found “no attempts at social interaction” (p. 16). Using computers, high levels of interactivity between students and teachers were recorded by Thurmond and Wambach and “identified as a strong predictor for higher student grades” (p. 14).
Maurer and Davidson (1998) noted that CMC facilitates skill development in idea generation, intellectual convergence, and lateral thinking. Maurer and Davidson hold the view that knowledge goes beyond a collection of bits of information and argue that new educational models should strive to foster creative thinking and focus on communication. Muirhead (2004) describes successful online learners as usually being autonomous learners who exhibited good work ethics, the ability to both think reflectively, and work collaboratively. By increasing teacher and student strategic awareness, Pope and Golub (2000) commented that:

No longer will the teacher be the dispenser of information; teachers and students will be learners together. This shift to a learning-centered classroom does not mean, however that the teacher is obsolete. Instead, it demands that the teacher's role change from that of an "information-giver" to one of "designer" and "director" of instruction. (p. 95)

With technology as the ‘backbone’ of the online teaching and learning environment, CMC is able to become the gateway to functional virtual communities where relevant, meaningful learning can be generated in dynamic, interactive contexts. According to White (2003):

CMC provides the means to free students from centralized control of predetermined and constricted curricula as they develop their own learning opportunities through discussion online and collaborative learning experiences. (p. 51)

Online teaching and learning environments can give students direct access to vast amounts of information as well as being a means of support and a way of learning from others’ inquiry which White (2003) suggests can reduce individual students’ sense of isolation. Hough, Smithey, and Everston (2004) assert that
teachers’ sense of isolation is also usually reduced with CMC. In Hough et al.’s words:

Asynchronous conferences can bring together teachers who would not otherwise interact and, therefore, can reduce the problem of isolation so common in teaching. (p. 371)

In asynchronous learning environments, students have time to reflect and formulate their responses and to review their entries before posting them. Both the process and the product of learning can be enhanced with CMC contributing to participative, social, interactive, cognitive and metacognitive skills (Phelps et al., 2004).

In contrast, Hills (2003) cautions that “computers are unlikely to generate the same kind of emotional drive” (p. 5) as interacting with people. Yet, as discussed previously, it is not computers per se that generate emotional responses, it is the people interacting using the computer that can engender the stimulus. While Hill’s view that communicating online may initially seem impersonal, it may well prove to be an effective way to mediate authentic contact between teachers and students, teachers and colleagues, and student peer groups.

In CMC, students are provided with access to earlier recorded discussions and the time and space to ponder points that have been raised and to reflect on materials. Such a strategy provides a particularly important opportunity in language acquisition since both adult and child learners often go through a ‘silent period’ where time is required to process and digest linguistic information (Krashen & Terrell, 1983). White (2003) argues that reflection time can assist language learners to refine their own responses and inquiries which may lead to “greater precision and sophistication of expression” (p. 54).
Pope and Golub (2000) maintain the view that online teaching provides a strong role for the teacher which may be pivotal to the success of the program and may prove to be a solid precursor to improvement in language skills. The interactive aspects of CMC can provide an opportunity for immediacy of feedback and individual attention from which can bolster student confidence and motivation as well as foster online communities.

Virtual communities formed via asynchronous online learning networks can be a valuable tool for developing communicative competence in students. When working effectively, CMC is an excellent vehicle for discussion-based learning activities, often offering more reflection time for student responses than face-to-face communication in the classroom (Garrison, Anderson, & Archer, 2000). Rourke, Anderson, Garrison, and Archer (2001) highlight the view that online discussion forums can cultivate the development of critical thinking skills thus becoming functional environments for negotiation, social interaction and exchange of information. Collaborative learning in technology-mediated contexts can cultivate cognitive maturity, information production, and social interdependence (Rourke et al., 2001).

In summary, ensuring opportunities for high-level communication is of the utmost importance in the process of second language acquisition. If computers can facilitate communicative competence, those developing programs for second language learners may do well to consider CMC in program planning. When constructivist teaching and learning are already in place, computer-mediated communication can provide learners with additional resources for constructing knowledge.
Section 2.4.6 explores how computer-mediated communities of learning provide opportunities for shifts in teacher-student and student-student power relationships which could prove pivotal in the transition to a constructivist learning paradigm.

**2.4.6 Shifts in Role Structures with Computer-Mediated Communication**

Establishing virtual communities in online forums can contribute to shifts in social dynamics where teaching and learning relationships are less hierarchical, more transparent and personal thereby making the learning environment more egalitarian (Matei, 2005; Santally & Senteni, 2004). Hypermedia tools are increasing interactivity as well as enriching the process of learning, communication, and knowledge management (Dupin-Bryant, 2004; Flowers et al., 2004; Hardaker & Smith, 2002; Junaidu & AlGhamdi, 2004, Muirhead 2004; Young, 2001). Egalitarian communicative space, or settings where teachers are not the ultimate authorities, is likely to be empowering for many students, particularly tertiary level students with cognitive maturity, offering a sense of safety when sharing within the learning community.

Garrison, Anderson, and Archer (2000) suggest that learning through interaction requires three core components: cognitive presence, teaching presence, and social presence. Using text-based CMC, Garrison and his colleagues developed a model called “community of inquiry” which promotes critical reflection and knowledge construction (Garrison & Anderson, 2003; Garrison et al., 2000).

Schwier, Campbell, and Kenny (2004) conclude that learning communities “spring from and are maintained by interdependence and reciprocity” (p. 70). Although learning communities can conceivably be formed in traditional classrooms,
if the teacher is consistently the dominant authority and students are competing with one another for grades, collaboration is necessarily compromised. CMC is a valuable tool facilitating social participation and interaction fostering student motivation, self-determination, and learner autonomy, all of which are essential criteria in facilitating language learning. While most educational contexts are geared to student achievement represented by grades, computer-mediated discussion forums can provide an environment for open conversation which is not scored by the instructor. While discussions can also occur in face-to-face classroom contexts, there are significant differences in that CMC facilitates reflection time, shifts dynamics between students and teachers, and offers the ability to review recorded conversations.

Recent studies (see, for example, Blake, 2005; Hough, Smities, & Everston, 2004; Wang, 2004; Wildner-Bassett, 2005) have shown that CMC can establish more simple, open and reflective learning environments which are particularly conducive to language learning. According to Matei (2005), new online social networks have the “capacity to foster more authentic and deeper social involvement, while being deeply egalitarian, individualistic, less prone to prejudice, and more emotionally satisfying” (p. 3). Because the nature of computer-mediated communication is not hierarchical and teacher-centered, it can allow students to be less hindered, less constrained, and more expressive. Matei refers to a “techno-reversionary” attitude, a social revolution where the “oppressive patterns of culture that shape people’s most profound sense of self are destroyed or modified” (p. 6). The use of CMC is supported by Matei as a potential antidote for the “valuation and judgment” (p. 6) characteristic of test-driven traditional classroom settings which exemplify hierarchical role structures that can erode student confidence.
Van Deussen-Scholl, Frei, and Dixon (2005) argue that innovations in technology have a profound effect on student-teacher roles despite the fact that theoretical and pedagogical issues require further study. In a study examining student-teacher interactions in online discussion forums, Van Deussen-Scholl et al. noticed a “a flattening of hierarchies” (p. 673) occurred in these situations which, in turn, contributed to functional collaborative online learning communities developing where students became dynamic in their exchange of information. As a result of the research, Van Deussen-Scholl et al. proposed "spiraled interaction" (p. 673) which is the dynamic interplay of in-class activities that focus on meaning as well as focusing on form. Since both oral and written exchanges can be archived and preserved, Van Deussen-Scholl et al. state that students can become more aware of their linguistic production thus facilitating language learning.

Research (see for example, Payne & Whitney, 2002; Van Duessen-Scholl et al., 2005; Wildner-Bassett, 2005) is showing that in CMC, instructors do not usually take the stance of ultimate authority but instead, present themselves as mentors who model the dynamic acquisition of authentic information. This finding is important since the change in the teacher’s stance has a direct effect on students’ responses. Yet historically, power relationships between students and teachers in most classrooms in both Western and Asian educational contexts have been hierarchical (Matei, 2005; Payne & Whitney, 2002; Fried & Sarason, 2003; Van Deussen-Scholl, 2005).

Tong and Trinidad (2005) collected data for a qualitative case study in a primary school in Hong Kong doing in-depth observations of three innovative teachers and their pedagogical practices in three classrooms. In the sense that changing teacher roles changed student behavior, this finding is generalizable to university settings. According to Tong and Trinidad:
In many Hong Kong classrooms the student is seen as passive recipient of knowledge and the teacher as the subject expert who dispenses the truth to students. But now technology can change their roles and this change may be unavoidable and non-revisable. As the innovations showed students took a more active role and responsibility for their learning. Sometimes they might even become experts on certain topics. The teacher needed to be more sensitive to their students' individual needs and competency level, and provided optimum guidance and help. (p. 6)

Suanpang, Petocz and Reid (2004) investigated the relationship between learning outcomes and online access with 269 second year university students in Bangkok, Thailand, by comparing 113 students taking online instruction with 156 students in traditional classroom settings over a period of 16 weeks. Suanpang et al. found that students asked a significantly higher numbers of questions in online environments than in face-to-face classroom settings. Suanpang et al. concluded that hierarchical patterns of interaction that are common in traditional educational settings are not transferred into computer-mediated forums. When there is a shared purpose in a context of individual accountability and social interdependence, students and teachers can use CMC to engage in constructivist learning opportunities.

Research has shown (see for example, Boulter, 2006; Garrison et al., 2000; Rourke et al., 2001) that increased communicative competence in students results from factors including the shifts in hierarchical structures between students and teachers. Heckman and Annabi (2005) examined discourse processes in eight case study discussions (four face-to-face and four asynchronous learning networks) in a study of 120 seniors enrolled in Information Management in a large university in the northeast United States. Each student participated in a face-to-face discussion and an
asynchronous discussion on a bulletin board. As a result, Heckman and Annabi observed five measurable attributes of CMC that were indicative of social interaction. First, student responses included affective content which demonstrated group cohesion and a sense of social commitment. Second, students asked and answered questions posed by one another, signifying open communication, attentiveness and interaction among members of the virtual community. Third, there was observable exploration and critical analysis of information and ideas within the discussion forum. Fourth, students were able to connect ideas and construct resolution and meaning from the topics discussed. Finally, indicators of student motivation and personal involvement surfaced in the online discussions, in that they referred to each other by name, replied directly to each others’ thoughts, and expressed agreement. Results of Heckman and Annabi’s study showed a high-level of student interaction with 104 incidents of observable social processes by students in asynchronous learning environments versus ten in face-to-face settings. Heckman and Annabi found clear differences in teacher roles observing 134 social processes in face-to-face contexts and only twenty in asynchronous learning networks.

Heckman and Annabi’s (2005) research clearly showed that CMC shifted role structures making students more communicative with each other whereas in face-to-face environments, teacher communication was dominant and the students were significantly more passive. The research by Heckman and Annabi affirms the view that when technology is the primary means of group interaction, tertiary level students seem to engage in far more social processes than they do in face-to-face learning environments. On the other hand, in face-to-face settings, teachers usually dominated communication. These findings raise vital questions about the social dynamics of communication and how they are affected by learning context. With the
reduction of markedly hierarchical structures, students in CMC assumed the role of ‘teacher’ by both asking questions of other students and answering them. Heckman and Annabi’s (2005) findings support the use of integrated technology stating that “online collaborative learning can produce results comparable to or better than those in face-to-face environments” (p. 3).

In summary, research strongly suggests that CMC is a viable tool for altering the dynamics of communication in educational settings. When designing programs for second language learners, the use of computer-mediated communication may be a valuable option for developing communicative competence in students.

Section 2.5 explores notable issues which pertain to trends in learning English language learning around the world.

2.5 English Language Learning around the World

The culture in which students live usually shapes their disposition toward learning a second language and teachers must, therefore, consider cultural inclusivity when designing curriculum (McLoughlin, 2001). Literacy necessitates not only knowing a language but also to knowing how to functionally use the language in its cultural context (Kirkpatrick, 2002; Lim, 2002). Larsen-Freeman and Long (1991) suggest that student ‘culture shock’ is the first step in foreign language learning.

It is estimated that 60% of the world's population currently speaks more than one language (Richards & Rodgers, 2001). For example, in Europe, with seven official languages, bilingualism and even multilingualism are commonplace (Ellis, 2001). English is well-established as the common language of communication for international business. According to Ellis, English is spoken by 1.5 billion speakers
worldwide, 400 million of whom have English as a first language. At present, data identified by Ellis suggest that there are an estimated 125 million ESL speakers who live and work in English speaking countries. Over 1 billion people have learned English as a second language or English as a foreign language. EFL learners live in 70 non-English speaking countries and, according to Ellis (2001), many people learning English hope to work or study abroad. While many students who are learning English in foreign countries will use the language to interact in their own cultural contexts, research shows that learning any second language necessitates an understanding of the cultural metaphors embedded in the language (Lakoff, 1987; Littlemore, 2001).

As a result of globalization and English being the lingua franca of international business, a variety of English ‘dialects’ have evolved in distinct world regions. Diverse cultural groups of English language learners have not only their own first language but also have established a unique orientation to English. What is emerging, as a consequence, is a set of world “Englishes” (Kachru, 1992). As English anchors itself as a second language in most countries, the emerging Englishes have been given names, for example 'Singlish' is Singaporean English, 'Chinglish' is Chinese English. While many native English speakers may find unique English dialects difficult to listen to, variations such as Indian English are gaining acceptability (Kachru, 1992; Singh, 2004). Moreover, such localized appropriation of English is not necessarily problematic as having a common language through which to communicate can promote understandings between peoples from disparate nationalities.

The structure of language shapes key aspects the speaker's world view (Carroll, 1999). Thus, citizens’ world views from various nations, at least in part, are
simultaneously being imported into English while Western mass culture is being
‘exported’ by the media to almost every corner of the Earth. In that respect, the
impact of globalization is having a positive effect on English language teaching
around the world (Block & Cameron, 2002). There is a trend towards amalgamation
of groups of countries as depicted by the Association of Southeast Asian Nations
(ASEAN), the North American Free Trade Agreement (NAFTA), the European
Union, and the gradual inclusion of eastern block countries has necessitated the
establishment of a common language for conducting business. Thus, the probability
of English being a person’s second language is increasing around the world.

Murray (2000) declares that the Internet can function as a ‘cultural amplifier’
and that there is different social consciousness which dictates what literacy is and
how it functions in varying sociocultural contexts. If this is the case, students
learning English as a second language will have different needs, beliefs, and learning
styles dictated by their experiences, backgrounds, and other localized conditions in
which they grew up. The conviction here is that there is a pedagogic imperative to
develop models of effective curriculum which are culturally inclusive, catering to the
diverse needs of students from differing cultural backgrounds. Singh declares that
“educational knowledge has itself become a commodity that is produced, circulated,
and consumed on the global circuits of capitalism” (Singh, 2001, p. 111). Further,
Singh poses the question:

What then is the relation between a homogeneous global culture of education
based on ideologies of human capital theory and equality of opportunity, and
the global flow of ideas about educational rights, equality, and freedom? (p. 110)
Collective cultural paradigms have powerful implications for basic psychological processes such as cognition, motivation, and emotion. Language carries cultural benchmarks and “discourse is socially constructed” (Singh, 2001, p. 318).

The internationalization of English language teaching affects not only learners who go abroad, but also those who remain in their country of origin and learn English as a foreign language. While Lakoff (1987) and Littlemore (2001) argue that teaching English language skills is, in a subtle way, also about teaching Western culture, Kirkpatrick (2002) contends that only a relatively small number of EFL students are learning English in order to “develop an understanding of any ‘Anglo’ culture” (p. 222). Kirkpatrick (2002) suggests that:

English language teaching materials are therefore needed that promote the local or regional variety of English and that represent the cultural and pragmatic norms of the speakers of these new developing varieties. These materials also need to contrast regional cultures. The major focus of the curriculum becomes Asian cultures. The English standard becomes an Asian standard. (p. 215)

Participation in the global community necessitates that teachers and learners move beyond accepting the constraints which come from having ingrained cultural filters (Benson et al., 2003). An increasing number of universities have a high percentage of international students who are enrolled and for whom English is the common language of instruction. This presents a number of challenges in both EFL and ESL contexts. For example, in Australian universities referred to in data presented by Singh and Doherty (2004), “approximately 80% of students enrolled in Australian universities are from Asia with the majority of students (55%) from
Southeast Asian countries” (p. 9). While cultural awareness can be cultivated, globalization continues to complicate English language teaching in international settings. According to Singh and Doherty:

> It is proposed that teachers' different assumptions about the cultural processes of globalization contribute to the construction of a range of strategies and moral positions when managing such dilemmas. Moreover, it is suggested that holistic, tightly bounded notions of culture no longer adequately inform pedagogic practice in these globalized and globalizing sites. (p. 9)

When thinking about educating international students from a variety of cultures using English as the *lingua franca*, many issues need careful consideration. For example, autonomy in learning is a Western cultural construct and, motivated by a concern for cultural sensitivity, consideration has been given to the cultural appropriateness of emphasizing individual development with Asian students (Benson et al., 2003). Benson et al. explored the complex influence of target language cultures for students from Asian cultural backgrounds studying English abroad. As Asian EFL students cultivated autonomous interdependence, Benson et al. referred to them as “expatriate cosmopolitans” (p. 39). Globalization is creating increasingly complex sociocultural contexts which need to be considered when planning for EFL/ESL curricula.

Referring to the tenacity of enculturation, Lim (2002) stated that “after over 150 years of British colonial education, it is remarkable that only a minority of Hong Kong people are comfortable speaking or writing the English language” (p. 266). Further, Lim suggested that one of the reasons for this may include the “linguistic chauvinism” (p. 266) of local people. For Lim, the over-riding factor is the utilitarian approach to English teaching that has been historically characteristic of colonial
education in Hong Kong. This utilitarian approach rendered English language teaching to the realm of rote learning of common phrases rather than the successful implementation of functional language acquisition. If achieving English language proficiency is the goal in a complex world of interacting cultures, a deepening understanding of culturally-entrenched ways of learning becomes significant in planning English curriculum.

Some studies (for example, see Benson et al., 2003; Fang & Warschauer, 2004; Kirkpatrick, 2002) have shown that traditional Chinese education has characteristically been driven by memorization and examination. While changes to this way of learning are currently being instigated, Watson (2000) reports that Chinese students have typically been trained to regard memorization and understanding as separate but related processes. At the same time, those Chinese students have embraced the notion that repetition develops understanding through mental effort. Most Chinese students (especially those who live in China) are motivated to learn, but have usually been taught to believe there is only one right answer which has led them to avoid risk-taking and divergent thinking (Benson et al., 2003; Watkins, 2000). According to Wenden and Rubin (1987):

If learners are to be weaned away from their state of dependence to one of independence and learner autonomy they must not only acquire a number of relevant learning techniques but also experience a change of psychological attitude towards what learning is. (p.11)

Increasingly – and especially in Western nations – there is a view that successful language acquisition goes beyond getting the right answers on a test: It requires critical reflection, as well as the risk-taking, and divergent thinking. Research has shown (see Brown 2000; Krashen, 1985) that in order to successfully
learn a second language, students must be motivated, have confidence and self-esteem, and maintain a low level of anxiety. As mentioned in Section 2.11, performance anxiety can set up a filter to student comprehension. Overemphasis on grades has often perpetuated this problem and lowered the self-image of all-too-many English language learners (Fang & Warschauer, 2004).

Culture is defined as all learned behavior which is socially acquired and refers to a group’s shared beliefs and customs (Deal & Peterson, 1999). It adds the dimension of socialization to a subtle and complex interaction of cognitive, emotional, social, and physical factors. Native culture usually molds behavior to a lesser or greater degree and even when learners are exposed to materials from diverse cultures, most learners maintain a sense of ethnic loyalty holding fast to the culturally-defined preferences and values from their first language (Tong, 1997): Social and educational settings are thus culturally contextual and influence students’ learning styles.

The influence of globalization in educational spheres is manifesting itself in an increasingly diverse ethnic and linguistic composition of the student population on Western university campuses (Singh & Doherty, 2004). While it is important not to essentialize, it can be argued on the basis of evidence that the overarching cultural construct of Western education dramatically contrasts with that of Asian cultures (Adamson, 2004; Hawkins, 1974; Wilson, 1998). Nonetheless, Singh (2002) suggests that “through an analysis of the strength of the boundaries insulating categories of knowledge, students, and institutional spaces,” educators can mediate through the cultural fabric (p. 318). Whether English is taught in an Asian context or in a native English speaking context, educators must consider multiple levels of social and
cultural constructs. According to Singh (2001), teachers thus act as “recontextualizing agents” (p. 318).

Educational values and teaching styles differ across and within cultures as well as inside and between nations (Gutiérrez & Rogoff, 2003). In order to serve the needs of learners from various cultural origins, it is important to understand cultural differences and the tenacity with which students’ first languages influence their learning in second language learning environments. For example, when Western teachers give instructions to Asian students, the influence of cultural mores must be considered. It follows also that, as a general rule, when Asian teachers teach English to Asian students, an awareness of English cultural constructs should be taken into account.

Armstrong (2000) argues that “cultural diversity presents a great challenge for educators in designing curriculums that are not only content sensitive to cultural differences.... but also process sensitive (e.g., helping students understand the main "ways of knowing" that different cultures possess)” (p. 123). According to Oxford (1990), developing “cultural understanding” can assist second language learners to compare and contrast behavior in their native culture and the target culture, thus facilitating comprehension (p. 172).

Teachers of all nationalities who are engaged in teaching ‘international’ students will almost invariably notice distinct differences in the cultural groupings. Many of those teachers may know they are dealing with differing styles of learning that are contextually and culturally distinct. Nonetheless, in exploring learners’ sovereignty and the importance of moving away from stereotyping, Benson et al. (2003) argue that “Asian learners are, therefore, often unjustifiably viewed as
products of their cultural backgrounds in ways that learners from more ‘individualist’
Western cultures are not” (p. 24).

At present, an international model of language teaching is gaining momentum
(Block & Cameron, 2002; Singh & Doherty, 2004). Concurrently, “intranational”
modules are developing in Asian cultures as English is more prominent on the world
stage. At the same time, some research (for example see Dladla & Moon, 2002;
Kirpatrick, 2002) is showing there is a movement to preserve Aboriginal culture by
teaching local languages and dialects because it is known that the teaching of a local
language is related to competence in foreign languages. While learning English is an
increasingly important educational strategy in many countries, the preservation of
native languages is progressively receiving attention by educational planners.

Section 2.5 has briefly examined globalization and language learning. Section
2.6 discusses the relationship among culture, educational values, and learning styles.
It also examines collectivist and individualist cultural paradigms in an attempt to
further explain cultural values and learning styles.

2.6 Cultural Differences and Language Learning

If, as Dennett (1991) indicated, consciousness is a cultural construct, it could
be that understanding cultural differences among students’ perception within
education can strengthen EFL/ESL teachers’ ability to address the learning needs of
students of differing cultural backgrounds. These are important considerations,
because, as Warschauer (1999) argues:

For students of diverse cultural, linguistic, and class backgrounds to have a
voice, they need more than an Internet account. Rather, they need knowledge
of the languages and discourses of power and opportunities to reflect
critically on whether, when, and how to use them as well as opportunities to develop and use their own dialects and languages they wish. (p. 177)

As stated earlier, an expansion of consciousness and a more diversified view of how second languages are acquired is necessary to move beyond what Brooks and Brooks (1993) called a ‘cookbook approach’ to teaching languages. Successful language teaching must integrate cognitive, metacognitive, linguistic, social, psychological, cultural, interpersonal, intrapersonal aspects of communication. Further, sensitivity to cultural paradigms and consideration of differences between learners from disparate cultural backgrounds, with both distinct learning styles and unique levels of motivation is paramount. This is an enormous educational challenge. Yet, as teachers become more conscious of their students’ individual differences and are able to integrate theoretical perspectives into their practice (including having greater sensitivity to learner needs plus being more skilled at implementing technological resources), the quality of learning available will continue to improve.

According to some (see for example Kirkpatrick, 2002; Kumaravadivelu, 2003) culture is learned behavior which is socially acquired and includes norms, values, beliefs, artifacts, and histories as evidenced through thoughts and acts. A deepening understanding of sociocultural contexts and the cultural paradigms that have shaped educational systems across continents may assist educators to expand their capacity to become culturally sensitive to learners from a variety of cultural backgrounds. Participation in the global community embraces points of view and cultural values that extend beyond geographical borders (Block & Cameron, 2002; Singh, 2004).

Cultural values are tenacious despite philosophical and political biases, in so far as nation states contain the attitudes of the people and the systems within their
borders. Despite the impact of internationalization, many historical, philosophical, and cultural value systems remain embedded in those students learning English as a foreign language whether at home or abroad (just as they will for native English speakers who learn another language). Awareness by teachers of the sociocultural context of both the first language and the target language is vital when considering pedagogy in language teaching.

After analyzing twenty studies, Friesner and Hart (2004) argued that due to the effects of globalization, Asian cultures are gradually becoming more individualistic and self-oriented. In a similar vein, Benson et al. (2003) noted that while a high value is placed on social conformity and benevolence in Asia, there is a gradual shift to making autonomous moral decisions without being influenced by external sources of power.

If, as Bond (1986) argues, life begins inside the cultural filter of the collective, examination of collective cultural paradigms may be important in understanding how English as a second language or as a foreign language is learned. Collectivist and individualist philosophical frameworks permeate the respective education systems in regions worldwide cultivating differences in learner beliefs, motivation, and learning strategies that must be considered in the development of effective multimedia curriculum for EFL.

Even when exposed to materials from diverse cultures, most learners maintain a sense of ethnic loyalty, holding fast to the ethnic preferences and values associated with their first language (Tong, 1997). Learning styles which emerge have an element of socialization in them. This is a subtle and complex interaction of cognitive, emotional, social, and physical factors. EFL/ESL students have different needs, beliefs, and learning styles dictated by their home ethnographies.
It is clear that when teaching EFL or ESL, a cultural interface is generated. The re-engineering of English language curricula can make a conscious ‘bridge’ to/with other distinct cultures. The collective cultural psyche has powerful implications for basic psychological processes such as cognition, motivation, and emotion (Bond, 1986; Bond, Leuny, & Wank, 1982). As globalization continues to dominate, it is, in one sense, creating its own world culture. In this context, cultural portability of learning materials will meet the diversity of learner needs and cultural backgrounds. And in this way, teachers can contribute to the development or continuation of a thriving ‘world classroom.’

Section 2.6.1 examines the educational factors in collectivist cultural paradigms and 2.6.2 considers the educational factors in individualist cultural paradigms.

### 2.6.1 Collectivist Cultural Constructs

Confucian philosophy is deeply ingrained in Chinese culture, dictating that the needs of the group, particularly of the family, take precedence over the needs of the individual (Kumaravdivelu, 2003). The Chinese sociocultural context, in that respect, can be seen as predominantly collectivist. Bond (1986) argues that the overarching cultural preoccupation with social order and for “harmony-within-hierarchy” (p. 214) can be used to explain the ideology behind Chinese social behavior. Further, Bond distinguishes between “large power distance” societies which accept hierarchical allocation of roles without justification and “small power distance” (p. 228) societies, exemplified in Western culture, where power equalization is paramount and justification for power inequities is coveted.
Watkins (2000) describes the pressure to succeed in collectivist cultures as being a complex combination of “personal ambition, family face, peer support, material reward, and interest” (p. 168). Further, Watkins concluded that Chinese students see memorization and understanding as separate but interrelated processes and that repetition develops understanding through concerted mental effort.

Oxford (1996) explained the cultural aspects of learner strategies by stating that “Chinese people dislike learning strategies that involve theoretical models and prefer dealing with strategies that handle practical questions, because the Chinese language lacks implicational statements that allow people to discuss ideas contrary to fact” (p. 48). Benson et al. (2003) argue that, viewed through a Western cultural lens, when Asian students study to maintain parental approval or to pass exams, it promotes extrinsic motivation which holds less value than intrinsic motivation in many Western educational contexts. One implication of this cultural value system is that such learners may aim for a technical, shallow, and narrow form of English language learning which is a less than ideal way of communicating and understanding a culture and language.

In studying the issue of autonomy as a sociocultural process, Benson et al. (2003) questioned whether Asian students learning a second language who succeed in developing individual autonomy are deviating from the Asian cultural norm. In developing EFL/ESL curricula for Asian learners, it is important to consider the educational context they come from. In a global society, there is a pedagogical imperative to develop models of effectively teaching which are culturally inclusive, catering to the diverse needs of students from differing cultural backgrounds.
Section 2.6.2 distinguishes individualist cultural paradigms from collectivist cultural paradigms and how educators in the English language classroom can navigate the differences.

2.6.2 Individualist Cultural Constructs

Western cultures often have a strong preoccupation with individual freedom and individuation. The Western sociocultural context, in that respect, can be characterized as predominantly individualist (Benson et al, 2003; Bond, 1986). For example, when many Western educators (from the United Kingdom, Australia, New Zealand, South Africa or North America) teach Chinese students English, they often misinterpret learner strategies. Those educators seem to view them with a Western eye missing many underlying cultural imperatives that typically motivate Chinese learners.

Western cultures often have a strong preoccupation with individual freedom (Putnam, 2000). Similarly, Western education assumes that high level self-confidence and self-responsibility lead to achievement. In the Western education system, intrinsic motivation is thought to lead to academic and professional success. In a landmark study, Wenden and Rubin (1987) examined the conscious efforts made by good language learners when mastering a foreign language. Wenden and Rubin hypothesized that if the learner strategies and learner beliefs of successful language learners could be defined and categorized, they could, in turn, be taught to less effective language learners. The research by Wenden and Rubin showed that good language learners established a self-directed approach, set goals, defined their program, selected techniques to be used and monitored their progress. As learners become more self-reliant, in Wenden and Rubin’s model, they would be expected to
develop the psychological tools for critical reflection and self-motivation for
learning. However, if the overarching goal is creating culturally inclusive EFL/ESL
curriculum, consideration for the cultural paradigm of learners may be vital to learner
success (Benson et al., 2003; Bond, 1986).

Maurer and Davidson (1998) affirmed that teaching students to think is the
most important goal of education. In keeping with basic constructivist theory, Maurer
and Davidson made an important distinction between thinking and remembering.
Maurer and Davidson emphasized the view that “thinking is a process that involves
the active mental manipulation of the things we remember” (p. 167). McKenzie
(1999) suggests that “digital resources and networking may eventually transform
how students think, communicate and solve problems” (p. 11) yet paper resources
and human resources will continue to be crucial to the educational process.

Teachers, in a sense, function as architects and mediators providing
structured guidance without overly imposing control. Teachers who wish to appeal to
all types of learner preferences may benefit from the use of multimodal, interactive
approaches to language teaching. In doing so, teachers would not be preparing a
teaching method but a teaching repertoire. As well, teachers would be assisting
students to become aware of their own learning strategies and learning preferences.
‘Learner-friendly environments’ are fostered when the teacher makes a concerted
effort to provide opportunities which are relevant and meaningful to students and that
encourage their creativity and independence. That, in turn, can challenge students
from both Asian and Western backgrounds to take responsibility for their own
learning, a skill essential to survival in the real world in the new millennium
(Jacobsen & Lock, 2005; Leach & Moon, 2002).
Learning a second language is usually a long and arduous process, however, by appealing strategically to the individual needs of learners, obstacles to acquisition can be overcome (Van Deussen-Scholl, 2005). In order to captivate the learner, language must be meaning-centered, semantically motivated, and culturally elaborated (Armstrong, 2000). Learner autonomy should be fostered allowing students to proceed through material at their own pace (Benson et al., 2003; Carroll & Rosson, 2005). In formal academic second language programs, there should be a range of levels of instruction to accommodate different competence levels. Research is showing (for example, see Coppola, 2005; Davis et al., 1997; Howland & Wedman, 2004) that using multimedia in the EFL/ESL classroom can be an effective solution to addressing the multiple levels of intelligence that exists within individual learners.

The field of second language learning has become increasingly sophisticated as more research findings have been implemented in relation to learner needs and learner differences. Learning theory, in particular language learning theory, continues to evolve. As has been shown, technology can play a pivotal role in providing learning for millions of individuals who otherwise would not have access to formal language learning and authentic cultural material.

Section 2.7 will explore the range of individual differences in learning modalities and cognitive styles that, when addressed, can facilitate learner success in second language learning which is particularly accessible through computer-assisted instruction.
2.7 Learning Modalities

Norton and Toohey (2001) studied the learning characteristics of what disposes an individual to becoming a ‘good’ language learner. The focus by Norton and Toohey went beyond learning strategies and linguistic ‘outputs’ and also considered the sociocultural contexts of the learners. This was done in order to ascertain if sociocultural issues impacted on learner achievement. Brown (2000) emphasized the importance of attending to individual differences for success in second language learning when he stated that:

The conventional wisdom, it seems, has been that second-language acquisition theories should attempt to explain how “the learner” develops competence, as though learners were a relatively homogeneous lot. This assumption, however, is being challenged as more and more scholars recognize that differences among people might matter a great deal more than was once thought. (pp. 63–64)

There are three learning modalities which appear in various strengths in learners: visual, auditory, and kinesthetic (Dunn, 2000; Sarasin, 1998). Students can be dominant in one or more learning modalities, each with differing orientations to learning but traditional classroom settings favor the auditory learner. In traditional classrooms characteristic of Asian university settings, the teacher typically speaks and the students mainly listen. It can be argued that traditional teacher-centered teaching assists learners to have auditory learning strengths in particular. For example, a study was conducted by Boulter (2005) to ascertain the dominant learning style of a sample of Taiwanese university students. One hundred students at a university in Taiwan were tested using an auditory, visual, and kinesthetic scale. At
the onset of the academic year, 80% reported to be auditory, 13% were visual, and 6% were kinesthetic. After exposure to a semester of multimedia curricula, the posttest revealed 50% of learners were auditory, 32% were visual, and 18% were kinesthetic (Boulter, 2005). This is evidence that the way in which teaching is conducted in Taiwan contributed to a strengthening of the auditory domain of learners.

In a study with 150,000 elementary, secondary, and tertiary students, Dunn (1982) investigated whether or not students could identify their own learning style, revealing that most students’ personal classification was consistent with the researcher’s view of their learning style. Further, Dunn studied whether teaching through specific learning styles by matching modality strengths would increase academic achievement in students at the elementary, secondary, and tertiary levels and also finding positive outcomes. Dunn’s research showed that learning styles change with age and/or learning environment. As well, Dunn’s study found that younger children were more kinesthetic and less visual with visual strengths developing by grade five and six.

Constructivist learning theory assumes that students have individual learning styles (Blakeslee, 1982; Kang, 1999). Some students’ strengths lie in a combination of modalities (Dunn & Dunn, 1978; Joyce & Showers, 1995). The strength of multimedia language instruction is that it potentially stimulates all learning modalities simultaneously (Harasti, 2000). A key factor in learner-centered learning is that the learners feel a considerable sense of control. According to Hoven (1997):

In order to make the most of this control, learners need to understand their own learning processes, to be able to make informed choices about the paths
their learning takes, and to be proactive in managing and directing their own learning. (p. 184)

Curriculum, particularly for second languages, must be presented in ways that are appropriate to the learning characteristics of each learner. Further, flexible learner-centered environments are a practical solution to the inevitability of mixed-level groupings of students in any given English language class. However, according to Kang (1999), “the curricula of many EFL/ESL programs, (like those in China) are still linear or systematic and do not allow much room for individualizing instruction…research on learning styles, has provided teachers with a different view” (p. 6). Hence, learning styles have a dimension of socialization and individuals’ behavior can be shaped by the culture of origin (Kang, 1999). This is a subtle and complex interaction of cognitive, emotional, social, and physical factors.

Sarasin (1998) described three basic learning modalities – auditory, visual, and kinesthetic – as follows: A visual learner typically benefits from a visually appealing learning environments as well as exposure to color and sophisticated graphics. Most visual learners work best alone. They benefit from being able to scan ahead and review material at their own pace. They respond to graphically-rich charts, maps, websites, films, videos, posters, flash cards, slide shows. They like to write things down and/or type things out. Auditory learners like to work in group talking about material, reciting reading passages, and listening to others discussing material. They are content listening to people speaking. Auditory learners tend to be passive, listening for instructions from the teacher. By and large, kinesthetic learners need to move around, touch textures, and fidget. They usually enjoy dancing, drama, sports, and interactive activities. In general, kinesthetic learners need to take frequent breaks and do not work well sitting at desks. Further, kinesthetic learners tend to be risk-
takers and are perhaps the most compromised by traditional classroom settings. A key implication is that kinesthetic learners will potentially benefit greatly from the interactive nature of computer-assisted language instruction.

2.7.1 Cognitive Styles

In addition to the three sensory modalities, there are two further distinctions that can be drawn when examining learning styles. Students can predominantly be ‘global thinkers’ or ‘analytic thinkers’ each with specific needs and orientations to learning (Dunn, 2000). In a similar vein, Hills (2003) identified two distinct learner strategies, global and analytic, which, in turn, are discussed below.

Global thinkers, or holistic learners, are right-brain dominant (Hills, 2003): They are emotional, sensitive, have a high need for social interaction. As well, such learners enjoy doing several things at once. Moreover, right-brain dominant learners learn best when information is presented with humor, emotion, or an anecdotal story. These learners typically speak with their hands and they respond well to pictures. They are concerned about the ‘big picture’ and want to know why they are doing a task.

Analytic thinkers are usually left-brain dominant (Hills, 2003). Typically, they are intellectual, logical, and analytical. As a rule, ‘left-brain’ learners prefer step-by-step instructions and structured information. As well, left-brain learners favor quiet, formal learning environments and respond well to words and numbers. Further, left-brain learners tend to need concrete reinforcement like a handout. As serialist learners, left-brain dominant learners like to do one thing at a time and have a strong need to complete a task before beginning another. Such learners hold their bodies still when they speak, are detail-oriented, and tend to see the parts rather than
the whole. Blakeslee (1982) stressed that both modes of thinking must be developed interactively and that teachers should not classify students as right-brain or left-brain types since the “true basis of creativity is in the interplay of intuition and logic” (p.191). Further, Blakeslee emphasized that teaching styles can influence the organization of the hemispheres of the brain and that mental habits established in many schools can foster or hinder students’ creative capacity. For example, Blakeslee argues that both verbal (left-brain) and non-verbal (right-brain) processes are essential in the learning process and that fostering both capacities would lead to improvements in education.

2.7.2 Multiple Intelligences

Gardner’s (1983, 1996, 1999a, 1999b) theory of multiple intelligences (MI) posits that traditional education systems in Western countries fail to assess the full range of strengths students may possess while focusing on rote memorization and academic testing. For Gardner (1999b), intelligences are “biopsychological” constructs (p. 34). They include logical, linguistic, visual, spatial, musical, kinesthetic, interpersonal, and intrapersonal intelligences. Gardner’s way of understanding intelligences underscores a view about learners having multiple ways of learning, perceiving, and processing.

Educators can reinforce pedagogical materials in a variety of ways thus strengthening the learning stimuli. For Gardner (1983), “intelligences” are virtually indistinguishable from “learning styles” (p. 2). In addition, there is no ‘generalized memory,’ rather, there is a memory for language, a memory for music, specialized spatial memory, and so on. If correct, there are important educational implications nested within these categories of memory acquisition. Gardner (1996) questioned the
practice of rote memorization asking, which level of information was being memorized? It can also be argued that the purpose may be subsumed by preferred teaching styles of educators and culturally valued views of what constitutes knowledge and/or intelligence. It can further be argued that such learning serves to restrict the educational progress of many students in the Western world in particular (Brown & Lauder, 2001). For example, many students who have poor recall are at a disadvantage when teachers simply test for memorization instead of understanding and meaning.

Armstrong (2000) affirms that culturally-sensitive curriculum must include considerations of multiple intelligences, claiming that:

MI theory provides a model that is culturally sensitive to such differences. As such it provides educators with a valuable tool to help celebrate the ways in which different cultures think. All cultures in the world possess and make use of the eight intelligences in MI theory; however, the ways in which they do so, and the manner in which individual intelligences are valued, vary considerably. (p. 123)

The theory of multiple intelligences calls for a paradigm shift in thinking in academia and an expansion in the conceptualization of intelligence (Brualdi, 1998; Gardner, 1983, 1996; Hoerr, 1996; Meyerhoff, 2002). Educators in the primary, secondary, and tertiary sectors are being challenged to change the way they view students (and their potential) so that greater recognition is given to an expanded view of intelligence. This theoretical construct can serve as a guide to systemic change (and could contribute to a major alteration in how teachers view teaching and how learners view learning).
Mitroff (2001) proposed that intelligence is a process of reflecting on one’s creations. This view of intelligence assumes that creativity is, or needs to be, highly valued in education which is not always the case in either the Western world or in Asia (Kang, 1999; Song et al., 2005). In Mitroff’s analysis, what is required by learners is not just gathering knowledge or “knowing” that is crucial. Rather, it is meta-knowledge or, “knowing-that-I-know that I know” that delivers us from “a very pedestrian kind of knowledge” to a depth of perception necessary for higher learning (p. 6). In an allied way, Gardner (1983) posits that reason, intelligence, logic, and knowledge are not synonymous. One implication of this is that teachers need to be directing learning to these multiple ‘registers.’ Computer-assisted learning is well placed to be employed for the purpose of developing multidimensional learning.

Sternburg (2002) asserts the importance of moving beyond conventional theories of intelligence. Sternburg’s view is that successful intelligence is not a unitary construct and aptitude in language learning is an interaction between a number of factors. Sternburg argues:

In contrast, the notion of successful intelligence takes into account the ability to achieve success in life, given one's personal standards, within one's sociocultural context. One's ability to achieve success depends on one's capitalizing on one's strengths and correcting or compensating for one's weaknesses through a balance of analytical, creative, and practical abilities in order to adapt to, shape, and select environments. People have different patterns of abilities, and they will learn a language successfully when the way they are taught fits their ability patterns. (p. 15)

McKenzie (2005) considered the way in which digital technologies can support multiple intelligences in the classroom to enhance learning. Acknowledging
the impressive extent of multimedia tools available to teachers today, McKenzie pointed out that while it is tempting to make technology ‘fit’ the intelligences, it is crucial to start with the intelligences and incorporate the media which naturally supports them. McKenzie cites the six standards of the International Society for Technology in Education (ISTE) and shows how they align with Gardner’s multiple intelligences to assist teachers in harnessing the power of technology in the classroom. The standards are as follows: (1) basic operations and concepts – logical and naturalist manipulation of digital technologies for goal-oriented tasks; (2) social, ethical, and human issues – students learn to practice responsible use of technology to support life-long learning, collaborations, and productivity; (3) technology productivity tools – verbal, kinesthetic, interpersonal, and visual input to use technology to apply knowledge in a new way; (4) technological communication tools – using a variety of media and formats to communicate effectively to multiple audiences; (5) technology research tools – evaluate, locate, collect, and report on information; (6) technical problem solving and decision making tools – logical, intrapersonal and existential tools to solve problems in the real world. While multimedia materials do not automatically enable these standards to be achieved, they are, by design, able to be used to foster high-level learning.

McKenzie (2005) systematically describes each intelligence and links them with specific applications of digital technologies in educational contexts: (a) verbal intelligence – keyboards, e-mail, speech recognition software, and word processors; (b) logical – search engines, spreadsheets, graphing calculators, file transfer protocol (ftp); (c) visual – monitors, digital cameras, camcorders, scanners, video clips; (d) kinesthetic – mouses, joysticks, interactive exercises, video games; (e) musical – speakers, CD-ROMs, videos, creating and sharing music; (f) intrapersonal – online
forums, real-time communication; (g) interpersonal – message boards, instant messenger chats, Internet telephony; (h) naturalist – semantic mapping tools, databases, file managers, floppy drives; (i) existential – virtual reality, virtual communities, blogs, wikis, simulations, virtual field trips, MUVEs.

While this is theoretically appealing, it is ideologically challenging for many teachers due to the academic infrastructures regulated by the ministries of education in distinct regions of the world. Moon et al. (2001) measured Multiple Intelligences in a sample of 192 students in Korea analyzing differences in scores for various intelligences in each individual, between individuals and between genders. The goal in the study by Moon et al. was to develop a standardized measure which would influence curriculum development in terms of the presentation of content which includes multiple intelligences. Moon et al.’s results indicated that establishing social networks with strong peer interactions were important intervening variables that enhanced the learning effect.

Ryue (1996) studied 1165 students in elementary, middle, high schools, universities and graduate schools and found a significant correlation between school achievement and high scores on seven of the eight intelligences (with the exception of intrapersonal intelligence). Ryue’s study showed significant relationships among logical-mathematical intelligence, interpersonal intelligence and IQ. As well, Ryue found relationships among logical-mathematical intelligence, interpersonal intelligence and school achievement. Ryue’s data support Gardner's view that developing MI can have a positive effect on IQ and school achievement. It also suggests that education favors logical-mathematical intelligence and interpersonal intelligence.
In a study done by the National Center for the Study of Adult Learning and Literacy in the United States, Kallenback and Veins (2002) found that MI-inspired instruction increased the authenticity of learning experiences, reduced teacher-centeredness in favor of learner-centeredness, and enhanced students’ perceptions of their abilities. Further, while emphasizing teachers’ need to understand MI theory (and have a willingness to implement diverse learning activities), Kallenback and Veins state that “programs must express institutional support for teachers to engage in and sustain MI-based practices” (p. 1). While learning theory advances and becomes more multidimensional and sophisticated, bureaucratic imperatives in university and other education sectors may stand firm resisting change (Kerr, 1996; Song et al., 2005; Tucker, 1999).

Campbell et al. (1999) propose a holistic format that prompts educators to express their vision to transform educational systems. Yet, Hodas (1993) maintains that traditional education is notoriously resistant to change. What is required is a systemic change that will gradually occur as educators develop personally and professionally (Apple, 1990; Leach & Moon, 2005). What seems clear is that contemporary education throughout the world must increasingly reflect individual differences of students’ learning styles rather than attempting to make students conform to a well-established pedagogical mold.

Section 2.8 reviews the literature on computer-assisted language learning.

2.8 Computer-Assisted Language Learning

Computer-assisted language learning (CALL) can provide access to multimodal materials appealing to the entire gamut of learning styles (Chappelle, 2001; Freisner & Hart, 2004; Gunasekaran et al., 2002; Hardacker & Smith, 2002;
Hoven, 1997; Levy, 1997). CALL adds a number of dimensions to the wide range of disciplines related to language acquisition (Levy, 1997). Ruschoff (1993) provides the following caution:

[...] when designing IT resources to facilitate language learning and language acquisition processes it is also important to keep in mind that during this process learners make use of various types of competence: factual linguistic knowledge and world knowledge (declarative knowledge) on the one hand and strategies of language processing and production (procedural knowledge) on the other. (p. 7)

In its origins in the early 1960s, computer-assisted language learning and its evaluation methods were strongly influenced by Skinner’s (1958, 1963) programmed learning. CALL has undergone a steady evolution since its inception (Lionatas, 2002). Chapelle (2001) argued that the systems approach to instructional design with its “strong empiricist orientation” (p. 28) defined learning by breaking it up into its components which were described as observable behaviors.

As technology has evolved, CALL has become increasingly sophisticated (Daud, 1992). Put simply, CALL integrates computing and language learning while accessing psychology, instructional technology, computational linguistics, artificial intelligence, computer-mediated communication and an astonishing number of additional disciplines (Tucker, 1999). Measuring the effectiveness of CALL is an ongoing process (Bull, 1999; Byrom, 1997). During the period between 1960 and 1990, virtually all of over a thousand evaluative studies focused on broad comparisons between the effectiveness of computer applications versus traditional instruction (Burnston, 2003). While many of those studies showed no difference between face-to-face and CALL, Burnston (2003) claimed that such “conclusions are
nearly always drawn in a theoretical vacuum without consideration of the cognitive and/or second language acquisition processes underlying reported linguistic performance" (p. 222). In assessing the impact of technology on curriculum, Burnston claims:

… when evaluating the effects of IT upon the curriculum, it is important to recognize that more aspects need to be measured than immediate learning outcomes. The speed of acquisition, depth of acquisition, the long-term retention of acquired knowledge and language skills are equally important factors to weigh. Incidental learning, most notably as this kind of learning relates to the acquisition of technological competency resulting from experiences with IT, is also worth considering. (p. 224)

The implications here are extensive. Liontas (2002) proposed the following characteristics as inherently valuable in using effective technology in language learning citing that it is: (a) a constructive alternative to textbook-based learning; (b) it broadens appeal of language learning by allowing an interactive, context-embedded approach to simulate an authentic language-learning environment; (c) it enables the orchestration of various cognitive learning strategies; (d) it supports teacher modeling; and (e) it makes language instruction innovative and exciting. Further, Lionatas argues that CALL:

[…] empowers students to feel proactively involved, encourages creativity, presents structured opportunities to hone language and culture skills, offers unprecedented interactive possibilities, promotes engagement, collaboration, creativity, and opportunities for risk-taking, enables active participation by all students without labeling them weak or strong (p. 318).
Research (for example, see Jonassen et al., 2003; Machnaik, 2002; Thompson, 1999) suggests CALL helps teachers transform conventional classrooms from passive to active environments for students, fostering the creation of unique multimedia modules. Lionatas (2002) argues the importance of effective computer-assisted language learning with his view that it:

[…], enables teachers to optimize the learning process of language acquisition and classroom dynamics which helps students learn, improves their attitudes and perceptions toward the target culture according to their interests, and increases their affective motivation through a diversity of modes for contextualized interaction in the classroom […] (p. 318).

Recent studies show (for example, see Dubriel et al., 2004; Jung, 1993; Rilling et al., 2005) that using multimedia in language instruction empowers teachers to make the use of target language authentic, contextualized, and aimed at the specific needs and interests of students. While CALL is a vital tool in the development of linguistic and cultural proficiency, the way the material is mediated by the teacher is essential to its effectiveness. In Liontas’ (2002) words:

It is not enough simply to supply students with a rich digital source of authentic materials, all the while waiting on the sidelines for the sociolinguistic miracle to happen that somehow students' language and cultural proficiency will develop on their own by virtue of exposure to and manipulation of such digital materials. (pp. 322-323)

Using technology in teaching languages admittedly adds to the complexity of classroom dynamics transforming traditional learning environments to ones that invite both teachers and learners to share the responsibility of learning and teaching. According to Rilling, et al. (2005), “in language teacher education, a tension exists
between the expectations of faculty and students in balancing theoretical underpinnings of the field and practical teaching experiences” (p. 214). In that respect, Machnaik (2002) introduced the “new 3 R's: rethinking, retraining, and reflecting” (p. 5). Machnaik found that teachers’ personalities and beliefs were key factors in teachers using multimedia but that “technology did not create changes in instruction but provided a platform for teachers to step back and re-examine their own beliefs and practice” (p. 7). Similarly, in keeping with constructivist philosophy, Machnaik insisted that “students do not learn from computers or teachers but rather students learn from thinking in meaningful ways” (p. 7). A key implication from her finding is that technicist approaches, either in face-to-face teaching or via an online facility, are not likely to be as effective as meaningful learning experiences.

Huang (2001) analyzed styles of teacher feedback and discovered that they seldom provided positive feedback in relation to the strengths of compositions but, instead, tended toward criticism fearing that positive feedback would thwart students’ effort. Huang (2001) concluded that teacher comments profoundly affect students’ attitudes and responses. Colby (1986) emphasized that providing immediate feedback to students on their writing as a method of shifting students focus from mechanical accuracy to the creative expansion of ideas. In her studies on web-based writing activities, Chih-Cheng (2001) concluded that writing abilities improve because of comprehensible input and immediacy of feedback. Such feedback can either come from computer-generated, interactive exercises or from teacher communication.

As discussed earlier, computer-mediated communication can provide a bridge between the ‘silent period’ (Krashen, 1985) and face-to-face conversational ability in second language learners. As Payne and Whitney (2002) suggest:
The notion that learners can practice “speaking” in an environment where affect and rate of speech are minimized, is very appealing. Possibly more important is the realization that if we as second language instructors assume that face-to-face speech is the only way to develop conversational ability, we may in fact be disadvantaging a significant portion of our students. For the contingent of students who find L2 [second language learned] oral production an overwhelming task and tend to tune out when the linguistic data generated in face-to-face conversational settings becomes too great, the online synchronous interaction appears to give them a leg up on developing L2 oral proficiency. (p. 27)

Daud (1992) reiterated the position that while teachers may have initially been skeptical about using CALL, the advantages to them are becoming apparent. Further, Daud found that technology put teachers in the position of becoming ‘learners’ in their own classrooms. However, Daud’s research found that teachers reported that one of the main advantages in technology in teaching was that teachers could attend to the individual needs of students. Further, Daud found that students became more independent, rarely seeking out the technical assistance of teachers.

Section 2.9 will explore the relationships between student motivation and technology in education.

2.9 Student Motivation and Technology

Norton and Wiburg (2003) asserted that rather than particular cognitive traits, students’ attitude and motivation were the best overall predictors of success. In decades of research, the "situated experience of learners" (p. 310) was not a focus. However, Sears and Hilgard (1964) did not find that experimental research supported
a straightforward relationship between motivation and learning. Sears and Hilgard argue:

The problems of motivation are so intertwined with problems of personality that an adequate account of motivation in relation to learning cannot rest solely on the findings of the learning laboratory. A classroom is a social situation, with a power structure, including peer relationships, and adult-child relationships; hence the most favorable motivational conditions need to take all of these factors into account, recognizing that the teacher is both model and reinforcer and, in ways not fully understood, a releaser of intrinsic motives. (p. 209)

Traditional classroom settings, particularly those which embrace test-based educational methodologies, orient students to be extrinsically motivated. Intrinsic motivation, the pursuit of learning for its own sake, must be developed if life-long learning is to be firmly established in the hearts and minds of students. Lumsden (1994) declared that educational activities should be engaged in for the enjoyment they provide, for the learning they permit, and for the feeling of accomplishment that they evoke. According to Hoven (1997), “language learning, whether mediated by computers, teachers, or other people, needs to be learner-centered, culturally embedded, and goal-directed, and the instructional design needs to reflect this” (p. 275).

Encouragement is a key factor in language acquisition and in a test-based learning environment, students are often inadvertently discouraged. Test-driven pedagogy is the polar opposite of learner-centered pedagogy and it often destroys motivation in students. Yet, with standardized English tests often being a requirement for employment or further study, students develop clear goals to
improve their English skills, but all too often, they are easily discouraged by low scores which negatively impact their self-esteem and their future performance. Research conducted by Norton and Wiburg (2003) has shown that:

The proficiencies of the good language learners in our studies were bound up not only in what they did individually but also in the possibilities their various communities offered them. Our research and recent theoretical discussions have convinced us that understanding good language learning requires attention to social practices in the contexts in which individuals learn second languages. (p. 318)

Motivating students is the challenge of all educators. Learning theorists have emphasized that students need a reason for learning, a desire to attain the learning goal, a positive attitude toward learning, and perhaps most importantly, effortful behavior (Ngeow, 1998). Generating a positive attitude toward learning and encouraging students to put forth the necessary effort to continually develop their lexical skills is an essential step in long-term language acquisition (Kinsel, 2004). Strengthening students’ intrinsic motivation is paramount for successful learning. By receiving feedback that is directly oriented to them individually, students usually feel more acknowledged and this is thought to foster both motivation and learning. In contemplating language learning motivation theory, McIntyre (2002) concluded that:

Emotion has not been given sufficient attention in the language learning literature, with the exception of studies of language anxiety. It will be argued that emotion just might be the fundamental basis of motivation, one deserving far greater attention in the language learning domain. (p. 46)

McIntyre (2002) continued by defining "integrative motivation" for language learning which was said to be “a combination of motivational intensity, desire to
learn a language, and attitudes toward learning the language” (p. 48). Noticing the complex link between reason and emotion, McIntyre (2002) made a key finding that anxiety can play a causal role in creating individual differences in language achievement.

2.10 Conclusion

Chapter Two has reviewed the literature on constructivism, integrated technology in education, teacher change, cultural differences in language learning, learning modalities, and multiple intelligences. Chapter Two also reviewed the literature on issues of technology adoption and resistance plus shifts in teacher-student dynamics with CAI and CMC. A discussion on educational technology policies in the Asia-Pacific region, as well as issues in technology integration in academia was presented as well as educational technology policies in world regions.

While it has been argued that the use of multimedia in the EFL/ESL classroom is an educationally progressive and effective way to make a pedagogical bridge from simplistic transmission models of education to the sophisticated architecture of social constructivist and cultural constructivist learning theory, encouraging teachers to use technology is still a collegial, organizational, and systemic challenge.

Teacher-centered teaching is a largely one-way delivery of curriculum (particularly in cultures where there is little interaction between students and teachers other than the teacher ‘depositing’ information ‘into’ the students while the students passively sit). This minimizes the importance of individual learning modalities which have been presented in terms of cognitive styles, multiple intelligences, field dependence and field independence and the cultural aspects associated with them. To
illustrate cultural differences in SLA, a discussion on spatial constructs and how they affect lexical acquisition was presented. Understanding of the role of consciousness in second language acquisition which integrates the multidimensional aspects of the process was discussed. Finally, the complexity of cultural differences in second language acquisition was explored.

Chapter Three outlines the research methodology for the study. It outlines the research design, the hypotheses, the procedures, the model for the statistical analysis of the data and describes the pilot study.
CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

Research in language acquisition over the last two decades has evolved from a naïve search for a key teaching approach to studies that investigate the social nature of learning which takes the personal strategies of second language learners into account (Johnson, 1992). By and large, research now recognizes that effective learning of a second language hinges on many interacting factors such as teacher attitudes and instructional environments.

This thesis examines teachers’ reported use of multimedia in the classroom across specific regions in the Asia-Pacific, across nationalities, and across institutions. The sample included teachers on faculty at universities from three countries in the Asia-Pacific region: Taiwan, Thailand, and Australia. Surveying teachers from each of five universities provided a rich mixture of Asian and international teachers for comparative analysis. In this study, Institution 1 is an Australian university in Brisbane that has student enrollments from 54 countries, yet most of the faculty members are Australian. Institution 2 is a Thai university in Bangkok which is, by definition, an international university with teachers from a total of 30 countries and students from 56 countries. Institutions 3, Institution 4, and Institution 5 are three universities in Taiwan which provide a strong homogeneous group of Taiwanese EFL teachers teaching homogeneous groups of Taiwanese students. In contrast to this sociocultural grouping, a range of cultures is necessarily represented in the sample which was used in the study to obtain data. These universities were chosen in part because the researcher, who worked in a Taiwanese
university, observed shortly after beginning work there, that local Taiwanese teachers at her workplace used technology in limited ways. This apparent under use of technology was in evidence despite the ample resources which were available to those faculty members. The other universities in the sample were purposively chosen to provide a contrast between a university in one Asian country and one university in a Western country in the Asia-Pacific region.

3.2 Hypotheses

1. University EFL/ESL teachers whose professional values endorse constructivist teaching will use multimedia to a greater extent than those who teach more didactically.

2. Younger university EFL/ESL teachers will use multimedia in the classroom more than older teachers.

3. University EFL/ESL teachers who have less than 10 years of teaching experience will use multimedia in the classroom more than teachers with more than 10 years of teaching experience.

4. University EFL/ESL teachers who have received formal computer professional learning and/or professional learning in technology will use multimedia in the classroom more than those who have little or no professional learning.

5. Male and female university EFL/ESL teachers will use multimedia in the classroom to the same extent.

6. University EFL/ESL teachers born in Western world regions will use multimedia in the classroom more than teachers born in Eastern world regions including Taiwan.
7. University EFL/ESL teachers who access technical support will use multimedia more than those who do not access technical support.

8. University EFL/ESL teachers who collaborate with colleagues will use multimedia in the classroom more than teachers who do not regularly collaborate with colleagues.

3.3 Procedures

3.3.1 Participants

One hundred and seventy-nine EFL and ESL teachers from various cultural backgrounds from five universities in the Asia-Pacific region were interviewed. Demographic analysis of the teachers surveyed showed they came from eleven different countries of origin. Figure 4.4 shows the distribution of the sample of teachers across nationalities.

The Teacher Orientation to Technology Survey (see Appendix C) was developed, pilot tested, and refined by the researcher prior to being administered to each teacher in the sample. Institution 1 had three campuses in and around in Brisbane, Australia. Institution 2 had two campuses in and around Bangkok, Thailand. Three institutions in Taiwan, hereto referred to as Institution 3, Institution 4, and Institution 5 participated in the study. As mentioned earlier, since Chinese is a preferred first language for most EFL teachers in Taiwan, in select instances (n=22), the Teacher Orientation to Technology Survey was translated from English into Chinese and bilingual interviewers administered the questionnaires. The surveys were then translated back into English and the data were entered. This was done to make it easier for some teachers who were less confident in their capacity to communicate and be interviewed in English.
Each institution is considered as an individual case study. One of the advantages of using a case study approach is that it enables personnel from distinct organizational sites to be surveyed as well as provide observable data such as, in this instance, the amount and type of technological infrastructure on each individual campus. The researcher sought the assistance of each relevant institution in terms of getting permission to approach teachers who taught EFL/ESL students. In all instances, the institutions were exceedingly helpful and assisted in making sure that as many teachers as possible knew of the research and the invitation to take part in it. In all cases, the students who the teachers were teaching were being educated in English language programs.

Institution 1, in Australia, has a main campus and two smaller satellite campuses. With the cooperation of the Faculty of Education, access to ESL teachers was arranged. The nationalities of the teachers surveyed at Institution 1 were primarily Australian and British. Appendix E shows that Institution 1 in Australia had a total of 5894 foreign students from 54 countries representing 17.35% of the student body.

Institution 2 in Thailand has two campuses in the Bangkok area, one in the city and one in a rural location about an hour south of Bangkok. With the cooperation of the International Affairs Office and the Office of the President, formal permission was granted and schedules were made for interviews with selected EFL teachers. Since Institution 2 is an international university with all classes taught in English, teachers with students from 56 countries, this was an opportunity to collect data from a rich tapestry of cultural backgrounds. Appendix F shows the demographics of the total student enrollment at the time of data collection with 2232 foreign students from 56 countries representing 11.16% of the student body.
Institutions 3, 4, and 5 were all universities in Taiwan. Institution 3 is in Taipei. Institution 4 is in a suburb of Taipei. Institution 5 is located in west central Taiwan in a city of one million inhabitants. In order to survey EFL teachers, the departments of applied foreign languages in all three institutions were contacted and the teachers agreed to be interviewed.

3.3.2 Instruments

Two instruments were used to gather data for the study: (1) The Teacher Orientation to Technology Survey (Appendix C); and (2) The Campus Multimedia Capability Survey (Appendix D). Both instruments were developed over a period of months by the researcher in consultation with technology experts and supervisory faculty.

Feedback was gathered from respondents in a pilot project who were from Institution 5 using the first draft of the Teacher Orientation to Technology Survey. The teachers who participated in the pilot project were not part of the sample for the final survey. This revealed that some questions were ambiguous particularly for teachers who were not oriented to technology. The questionnaire was revised several times in an attempt to clarify the questions and to simplify the vocabulary removing the explicitly technological terminology. Questions that could have more than one answer were subsequently refined.

The four-page questionnaire was designed to gather information in a variety of areas. For full text of the Teacher Orientation to Technology Survey see Appendix C.

Qualitative data were also collected. As part of the interview, teachers were asked to answer the following two open-ended questions in their own words. (1)
What do you think prevents teachers from using multimedia in the classroom? (2)
What do you think facilitates teachers in using multimedia in the classroom?
Responses were categorized and numerically coded by the researcher.

The Campus Multimedia Capability Survey (see Appendix D) was compiled to assess the variance in technological infrastructure between universities participating in the study. Administrators at information technology centers were interviewed to attempt to get accurate information regarding inventories of hardware and software on the five campuses. In attempting to collect data, it became clear that some universities do not keep central inventories and that budgets are administered by individual departments within institutions. As shown in Table 4.8, some data were not able to be obtained (and are listed as ‘n/a’, meaning not available).

3.3.3 Data Collection Procedures

This research was made possible through an International Academic Cooperation Project with the support of the Department of Technological and Vocational Education, Ministry of Education, Taiwan. Collection of data required travel to Australia and Thailand and around Taiwan. An invitation letter (see Appendix A) was sent to a selection of universities in the Asia-Pacific region. A target of 35–40 teachers from each of the five institutions in Taiwan, Thailand, and Australia and all signed consent forms (Appendix B), were interviewed; as well with their approval, all were administered the Teacher Orientation to Technology Survey (Appendix C). As noted by Gay, Mills, & Airasian (2003), a sample of 30 is sufficient to establish credible claims in terms of statistical significance. Both quantitative and qualitative data were recorded in face-to-face interviews with questionnaires filled in by the researcher. Although, in theory, those participating
teachers may have provided answers to simply oblige the researcher, there did not appear to be any such behavior in existence.

While all the teachers at the institutions in Taiwan were teaching EFL in English, some teachers felt more comfortable answering questions in their first language, Mandarin Chinese. To accommodate for this language barrier, a bilingual PhD student translated the Teacher Orientation to Technology Survey into Chinese. A total of 3 bilingual PhD students were trained to interview the Chinese teachers from the universities in Taiwan, record their answers in Chinese, and to translate them back into English. These data were then added to the data from the universities in Thailand and Australia where interviews were conducted in English to complete the sample of 179 participants.

The Campus Multimedia Capability Survey (Appendix D) is an inventory of hardware, software, and availability of technical support describing the technological milieu on each campus. Centralized inventories of technological equipment were not readily available at the five universities; however, investigation by the researcher revealed the organization of the infrastructure in each institution. Information Technology (IT) administrators in the five universities were also formally interviewed to get a sense of the institution at the educational technology policy level across various departments in the five institutions. Again, the language barrier in Taiwan required that a bilingual faculty member translate the Campus Multimedia Capability Survey into Chinese, conduct the interviews with the IT personnel in Chinese, and then translate the answers into English for analysis.
3.3.4 Model for Data Analysis

Contrasting research paradigms of qualitative and quantitative orientations are integrated into the research design. The relationships among age, gender, teaching experience, formal computer professional learning and/or professional learning, technical support, collaboration with colleagues, and nationality/region were correlated to find interactions between the key variables that might influence the outcome. Qualitative research methodologies have gained a strong foothold in second language acquisition research (Gass & Selinker, 2001; Johnson, 1992). While some questions from the quantitative section of the questionnaire may appear to have been ‘leading,’ asking open-ended questions in the qualitative section gave teacher the opportunity to express their opinions in their own words.

A multivariate correlational approach was used to statistically analyze quantitative data which examined the complex interaction between the dependent variable, ‘teacher use of multimedia’ (MM), and several independent variables. Correlational research can establish to what degree relationships potentially exist between two or more quantifiable variables. The correlation coefficients among variables that influence EFL/ESL teacher uptake of technology were examined.

The Akaike Information Criterion (AIC) was used as a statistical model for the data analysis (Kondo, 1999; Sakamoto, Ishiguro, & Kitagawa, 1986). The AIC creates a series of stepwise regressions that allows direct comparison among different types of main effects and interactions among variables. Complex computation then deletes those terms that result in a decrease in the AIC. The AIC analyses the parameters rewarding fit and penalizing complexity thus establishing dozens of models within a unified framework that enables more factors of data variation (Kondo, 1999). This establishes a framework for a unified research model in which
the selection criterion is computed makes it possible to choose among dozens of alternatives. According to Sakamoto et al. (1986), the developers of the AIC model:

We use achieved confidence interval coverage as an integrating metric to judge what constitutes a 'properly parsimonious' model, and contrast the performance of these two model selection criteria for a wide range of models, sample sizes, parameter values and study interval lengths. AIC selection resulted in models in which the parameters were estimated with relatively little bias. (p. 1)

Another Information Criterion is the Bayesian Information Criterion (BIC) (Swartz, 1978). However, the BIC penalizes complexity more heavily and selects the simpler model. The AIC was chosen over the BIC because of the rigor of the analysis and the stricter parameters.

Information-based model selection techniques permit a systematic approach to data analysis (Kondo, 1999; Nelder, 1985; Sakamoto et al., 1986). These statistical analysis techniques are particularly useful when there are a number of different independent variables that interact as is the case in this study. Before the advent of computer-based calculations, researchers would have to laboriously analyze each model separately using a combination of objective and subjective criteria to select the "best" model. The power of computational statistics allows the complex number of models to be systematically analyzed in a few minutes producing multidimensional data with large number of observations. In Nelder’s (1985) words:

The developments and the introduction of informational modeling and recent advancements in personal computers have marked the beginning of an era of systematic approach to model evaluation and selection. These statistical and technological advancements are permitting researchers to efficiently address
questions such as, given a particular situation involving uncertainty and variability and a collection of possible parametric models of differing degrees of sophistication, how do we decide between these models on the basis of available data? This is the role of the "model selection." (p. 1)

Continuous-categorical and continuous interactions will be plotted for interacting variables shown using conditioning plots (Cleveland, 1993). Correlations of continuous variables will be plotted and smoothed using a “Lowess smoother” (Cleveland, 1979).

3.3.5 Pilot Study

A sample of eight teachers from various cultural backgrounds were administered a draft of the Teacher Orientation to Technology Survey (see Appendix C for the final version) to assess its appropriateness in preparation for the larger study. Teachers in the pilot study were from both Western and Asian backgrounds and worked in three of the universities which had agreed to participate in the study. The pilot sample, which had different participants from the main study, included both men and women who ranged in age from 35–50 and whose teaching experience ranged from 1–15 years. The pilot study revealed a range of values among the teachers. A few were very familiar with technology while others had considerable professional learning and still felt inadequate using multimedia in the classroom. Some planned to implement the use of technology in their teaching but had yet to do so. Though the sample was too small to do a statistical analysis, plotting the raw data revealed that there was a complex interaction among the variables.

Cultural considerations came into play when feedback from Asian teachers in the pilot study was considered. Also, when preparing the research team to administer
the questionnaires in upcoming interviews, a tendency toward ‘black and white’
thinking was revealed. For example, in an e-mail providing feedback, one research
team member asked: “If the teacher answers: ‘I don't use computers’ in Question 8
or ‘no, it's not my teaching style’ in Question 11, do they have to answer the rest of
the questions?” From the Western perspective of the author, this seemed illogical as
the subsequent questions addressed much about background, professional learning
and educational values. Participating teachers were given as much time as they
individually needed to reflect and comment in response to questions.

3.4 Conclusion

In conclusion, this study selected a methodology which enabled key factors
that lead EFL/ESL teachers from the Asia-Pacific region to use multimedia in the
classroom. In addition, the data were probed so as to be able to respond to such
questions as the following: What interacting variables (of age, gender, teaching
experience, formal computer professional learning and/or professional learning,
technical support, collaboration with colleagues, and nationality/region) lead to
teacher use of multimedia? Does teacher orientation to technology hinge on
nationality or region? Does teacher orientation to technology relate to the technical
infrastructure and pressures of the professional environment the teacher works in?
Despite adequate technological infrastructure, reliable technical support, and
progressive values, could it be that some teachers will not adopt technology?

Chapter Four presents the results from the statistical analysis of the data.
Results will hopefully shed light on the factors that facilitate the use of technology in
the classroom as well as the factors that discourage teachers from using multimedia
in their EFL/ESL programs.
CHAPTER FOUR

RESULTS

4.1 Introduction

Descriptive statistics pertaining to this study are shown in Section 4.2 of this chapter, while interactive effects are shown in Section 4.3. The relevant quantitative data are shown in Section 4.4 for the dependent variable, teacher use of multimedia (for the purpose of this study, these are listed as ‘MM’ scores). Individual tables show specific values for variables. The full model of the step-wise regressions is shown in Appendix G.

4.2 Descriptive Statistics

Table 4.1 shows the summary statistics for age, years of teaching, months of formal computer professional learning, reported computer experience, scores for reported use of multimedia in teaching, and cultural values scores for the sample of one hundred and seventy-nine teachers distributed across five tertiary level institutions in the Asia-Pacific Region. Institution 1 was a large university in Brisbane, Australia with ESL students from fifty-four countries (see Appendix E for student demographics). Institution 2 was an international university in Bangkok, Thailand with EFL students from fifty-six countries (see Appendix F for student demographics). Institution 3, Institution 4, and Institution 5 were all universities in Taiwan with EFL students.
Table 4.1

Summary Statistics by Institution

<table>
<thead>
<tr>
<th>By Institution</th>
<th>Age</th>
<th>Yrs Teaching</th>
<th>Months tr</th>
<th>Experience</th>
<th>Uses.MM</th>
<th>Cult val</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>44.68571</td>
<td>15.857143</td>
<td>2.858857</td>
<td>30.45714</td>
<td>25.91429</td>
<td>28.48571</td>
</tr>
<tr>
<td>3.</td>
<td>34.24324</td>
<td>7.783784</td>
<td>2.436486</td>
<td>27.16216</td>
<td>20.32432</td>
<td>28.81081</td>
</tr>
<tr>
<td>4.</td>
<td>44.59459</td>
<td>14.270270</td>
<td>17.667568</td>
<td>28.54054</td>
<td>19.18919</td>
<td>28.18919</td>
</tr>
<tr>
<td>5.</td>
<td>43.31250</td>
<td>12.093750</td>
<td>2.556250</td>
<td>27.21875</td>
<td>17.12500</td>
<td>27.21875</td>
</tr>
</tbody>
</table>

Figure 4.1 shows plots of the distribution across the five institutions of mean scores for teacher age, years of teaching, months of formal computer training, computer experience, teacher use of multimedia, and cultural value scores for all five institutions in the study. The ‘x’ axis shows the mean MM scores and the ‘y’ axis shows the institution.

Figure 4.1. Plots of mean MM scores across five institutions.

Figure 4.2 shows the distribution of MM scores across the entire sample of 179 teachers plotted against a bell curve. The ‘x’ axis shows the MM scores which
increase from left to right while the ‘y’ axis shows the number of teachers who have the same MM scores while. Note that teachers’ use of multimedia is skewed toward less use based on normal distributions and fewer teachers report high use than low or moderate use.

Figure 4.2. Distribution of MM use across sample plotted against a Bell Curve.

Figure 4.3 shows teachers’ reported access to software, access to hardware, whether or not they took in-service professional learning at their universities and whether or not they collaborated with colleagues. Data are shown in percentages across the sample for each variable.
Figure 4.3. Teachers’ perception of access to software, hardware, in-service professional learning, and amount of collaboration with colleagues.

Table 4.2 shows mean values for MM, standard errors, and t-values across the five institutions. Note Institution 2 shows mean score (27.763) for use of multimedia in the EFL/ESL classroom showing that those teachers used technology in teaching most.
Table 4.2

**Mean MM Scores, Standard Errors, and t-values across Five Institutions**

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>Estimate</th>
<th>Std Error</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institution 1</td>
<td>25.914</td>
<td>1.295</td>
<td>20.01</td>
</tr>
<tr>
<td>Institution 2</td>
<td>27.763</td>
<td>1.243</td>
<td>22.33</td>
</tr>
<tr>
<td>Institution 3</td>
<td>20.324</td>
<td>1.260</td>
<td>16.13</td>
</tr>
<tr>
<td>Institution 4</td>
<td>19.189</td>
<td>1.260</td>
<td>15.23</td>
</tr>
<tr>
<td>Institution 5</td>
<td>17.125</td>
<td>1.355</td>
<td>12.64</td>
</tr>
</tbody>
</table>

Table 4.3 shows correlation coefficients comparing MM scores from Institutions 2, 3, 4, and 5 with Institution 1. Table 4.3 shows that Institution 3 was lower in reported MM use than Institution 1 with moderate significance to the p<.01 level while Institution 4 and 5 showed strong significant differences in their MM use at the p<.001 level. Comparing MM use between Institution 1 and Institution 2, no significant difference was found. However, when comparing Institution 1 with Institution 3, Institution 4, and Institution 5, a significant difference in teacher use of MM is shown.

Table 4.3

**Comparison of MM scores of Institution 1 with Institutions 2, 3, 4, and 5**

| Comparisons with institution 1 Coefficients: | Estimate | Std. Error | t-value | Pr(>|t|) |
|----------------------------------------------|----------|------------|---------|---------|
| (Intercept)                                  | 25.914   | 1.295      | 20.007  | < 2e-16 *** |
| Institution 2                                | 1.849    | 1.795      | 1.030   | 0.304496 |
| Institution 3                                | -5.590   | 1.807      | -3.094  | 0.002303 ** |
| Institution 4                                | -6.725   | 1.807      | -3.722  | 0.000267 *** |
| Institution 5                                | -8.789   | 1.874      | -4.690  | 5.51e-06 *** |

---Significance codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1
e=number of decimals
The sample was 179 teachers who were from eleven different countries of origin. In order to ascertain if nationality was a factor in teachers’ use of multimedia, teachers were assigned to one of three regions. Region 1 includes teachers originally from Western countries namely Australia, Canada, United States, the United Kingdom and Argentina. Region 2 includes teachers originally from Asian countries namely Thailand, Singapore, Japan, China, and Myanmar. Region 3 includes teachers from Taiwan. Table 4.4 shows the summary statistics for nationality and for region across the variables of age, years of teaching, number of months of formal computer professional learning, use of multimedia, and cultural values scores.

Table 4.4

<table>
<thead>
<tr>
<th>Summary Statistics by Nationality and Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>By Nationality</td>
</tr>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>Australia</td>
</tr>
<tr>
<td>Taiwan</td>
</tr>
<tr>
<td>England</td>
</tr>
<tr>
<td>Japan</td>
</tr>
<tr>
<td>China</td>
</tr>
<tr>
<td>Argentina</td>
</tr>
<tr>
<td>Taiwan</td>
</tr>
<tr>
<td>Canada</td>
</tr>
<tr>
<td>America</td>
</tr>
<tr>
<td>Burma</td>
</tr>
<tr>
<td>Singapore</td>
</tr>
</tbody>
</table>

| By region         |
| Variable          | Age   | Teaching yrs | Months tr | Experience | Uses.MM | Cult val |
| Australia         | 45.66667 | 15.51852 | 14.902222 | 31.81481 | 27.96296 | 30.14815 |
| Taiwan            | 40.36735 | 13.06122 | 5.976531 | 30.73469 | 25.79592 | 27.65306 |

Figure 4.4 shows mean scores for teachers’ use of multimedia across regions. Teachers originally from Region 1 (Western) showed mean MM scores of 27.96,
while teachers from Region 2 (Asian) showed mean MM scores of 25.80 while teachers from Region 3 (Taiwan) showed mean MM scores of 18.96.

![Box plot](image)

*Figure 4.4.* Mean MM scores across Region 1, Region 2, and Region 3.

Figure 4.5 illustrates the linear relationship between teachers’ use of multimedia and teacher values on the left. High cultural values scores (as measured by responses to section IV questions 1–6 in Appendix C) reflect liberal values. Low scores in cultural values reveal more traditional values. Without considering other factors, it appears that more liberal values lead to increased use of multimedia.

Figure 4.5 also shows MM scores plotted against age (shown on the right). In looking at this linear relationship without considering other factors, it appears that use of multimedia decreases as teachers get older.
Figure 4.5. Linear relationships between MM and cultural values (left) and age (right).

Table 4.5 shows teacher profiles by gender. Looking only at the linear relationship between mean age and MM use, it appears that men (22.15) and women (22.22) teachers use multimedia at similar rates as shown in Figure 4.6. However, consideration of additional influences from the interaction of other variables.

Table 4.5

Gender Profiles and Teachers’ Use of Multimedia

<table>
<thead>
<tr>
<th>By Gender</th>
<th>Variable</th>
<th>Age</th>
<th>Teaching yrs</th>
<th>Months tr</th>
<th>Experience</th>
<th>Uses.MM</th>
<th>Cultural val</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Male</td>
<td>41.92000</td>
<td>13.12000</td>
<td>14.945333</td>
<td>29.84000</td>
<td>22.14667</td>
<td>27.70667</td>
<td></td>
</tr>
<tr>
<td>2 Female</td>
<td>40.71154</td>
<td>11.84615</td>
<td>3.403462</td>
<td>28.32692</td>
<td>22.22115</td>
<td>28.67308</td>
<td></td>
</tr>
</tbody>
</table>
Figure 4.6 shows the comparison of mean scores for males and females and their use of multimedia in the classroom.

![Box plot showing comparison of mean scores for males and females](image)

*Figure 4.6. Relationship between use of multimedia and gender.*

Figure 4.7 exemplifies the connection between teacher use of multimedia and computer experience. Experience refers to use of computers for any purpose whatsoever be it personal, e-mail, research, or work related. Without the consideration of other variables, it appears that there is a strong relationship between computer experience and teacher use of multimedia in the classroom.
Figure 4.7. Relationship between use of multimedia and computer experience.

Figure 4.8 plots MM scores and teaching years. Without considering other factors, it appears that teachers with fewer years teaching experience are inclined to slightly greater use of multimedia than teachers with more experience. In this study, the apparent trend flattens with more years of teaching. Analysis of the interactions among other variables within regions and institutions may help explain additional factors that influence teachers’ use of multimedia in the classroom.
Figure 4.8. Relationship of use of multimedia and years of teaching.

Figure 4.9 plots MM scores and years of formal professional learning. It appears that teachers with less than a year of formal professional learning specifically in technology used multimedia most while teachers with more than a year of formal professional learning in technology used it least. Teachers with no professional learning ranked a close second for use of multimedia.
Upon initial examination of the linear relationships between teachers’ use of multimedia and age, values, experience, teaching years and professional learning it does appear that younger teachers, those with more liberal values and more general computer experience use multimedia more in their teaching. The effects of all these factors can be greater when considered along with other variables. The interactivity of variables thus reveals more evidence of the complex patterns of use of MM.

Section 4.3 analyzes results from a series of step-wise regressions taking into account the complex interactions between multiple variables. As well, Section 4.3 examines interactions among particular variables and their influence on teachers’ use of multimedia in the ESL/EFL classroom.
4.3 Interactions among Variables

Figure 4.10 illustrates how the influence of age on use of multimedia is different in the males and females in the study. The use of multimedia tended to diminish as male teachers in the sample grew older whereas it tended to increase in older female teachers. Furthermore, use of multimedia in average age male teachers is at a minimum whereas the use of multimedia in average age female teachers is at its maximum. Data showed strong significant differences (p=.003) in the linear effect as can be observed in the slope and curvature of the lines plotting MM scores for males and age and females and age.

Figure 4.10. Interaction between age and gender and use of multimedia.

Figure 4.11 shows the interaction between age and collaboration among colleagues and the use of multimedia. Data showed moderate significance (p=.01) indicating that when collaboration is available, teachers use multimedia is greater. When the relationship of age and collaboration is examined, data shows that MM
scores increase with age when there is collaboration among colleagues while it continues to decrease with age when collaboration is not present. Without collaboration among faculty members, the use of multimedia appears to continue to diminish with age.

Figure 4.11. Interaction between age and collaboration and use of multimedia.

Figure 4.12 shows a weak but significant inverse relationship \((p=0.03)\) between age and multimedia use in teachers who do not receive in-service professional development. Teachers who receive in-service professional learning tend to use multimedia more at whatever age. However, data showed that teachers’ use of multimedia declines with age when in-service professional learning is not
available. Figure 4.12 shows that teachers who do receive ongoing professional development continue to use multimedia over time.

*Figure 4.12. Interaction between age and in-service professional learning and use of multimedia.*

Figure 4.13 shows a strong significant relationship (p=.0001) between in-service professional learning, teaching years, and teacher use of multimedia. With in-service professional learning teacher use of multimedia increases with teaching years but this is not so without professional learning. Without in-service professional learning, the use of multimedia continues to decrease with teaching years. Data
reveal that teachers receiving in-service professional learning tended to use multimedia more than those without in-service professional learning. Figure 4.13 illustrates how multimedia use in experienced teachers receiving in-service professional learning initially tended to drop off and then increased with years of experience.

Figure 4.13. Interaction between teaching years, in-service professional learning and MM use.

Figure 4.14 shows the influence of sufficient access to hardware as it interacts with teaching years and the overall effect on the use of multimedia. Data showed a mild significant relationship (p=.03) indicating that with sufficient access to hardware, the reported use of multimedia increases with teaching years. The data showed a strong trend for MM scores to be higher for teachers who reported
adequate access to hardware than in teachers who reported having access but who did not consider it satisfactory in quantity or duration.

**Figure 4.14.** Interaction between access to hardware, teaching years, and MM.

Figure 4.15 illustrates the relationship between formal computer professional learning, cultural values and use of multimedia. Formal professional learning refers to academic programs and computer classes held outside the universities where the teachers were employed. The sample of teachers was divided into three groups, those with less than a year of professional learning, those with more than a year of computer courses, and those with no computer courses. Data showed a weak but significant relationship (p=.02) indicating that teachers with less traditional values
and more than a year’s formal computer learning showed higher use of multimedia than teachers with more traditional values and none or less than a year of formal learning.

Figure 4.15. Interaction of formal computer professional learning, cultural values and MM use.

Figure 4.16 shows the interaction between cultural values and teachers’ use of multimedia across all five institutions. There is a strong trend in teachers from Institution 1 that tended towards more liberal values showing a corresponding increased use of multimedia. Comparing the other institutions with Institution 1, Institutions 2, 3, 4, and 5 tended toward more traditional values and lower MM scores. A statistically significant yet weak effect (p=.04) was found within Institution 3 whereby higher cultural values scores did not lead to increased use of multimedia.
Figure 4.16. Interaction between cultural values and MM use within institutions.

Figure 4.17 shows the interaction of age and teachers’ use of multimedia across all five institutions. Institutions 1 and Institution 2 showed high MM scores in general showing a strong statistically significant relationship (p=.00001) with older teachers continuing to use multimedia. Institutions 3, 4, and 5 all showed a significant but weak relationship (p<.05) indicating decreases in use of multimedia with increased age.
Figure 4.17. Interaction between age and use of multimedia within 5 institutions.

Figure 4.18 shows the interaction of computer experience and MM scores across the three regions. In Region 1 and Region 2, there are greater increases in the use of multimedia with more computer experience. When comparing Region 3 with Region 1 there is a moderate negative relationship significant to the p=.004 level. Region 3 shows teachers reporting less computer experience and, as can be observed below, Region 3 shows a smaller increase in teachers’ use of multimedia with increases in experience than does Region 1.
4.4 Qualitative Data

In order to collect a small component of qualitative data, teachers in the sample were asked two open-ended questions (see Appendix C questions V and VI). In interviews, teachers were asked: (a) “What factors do you think are barriers to teachers’ use of multimedia in the classroom?” and (b) “What factors do you think facilitate teachers’ use of multimedia in the classroom?”

Teachers either gave no response (and thus were given a score of “0”) or gave responses which clustered into five categories for “facilitates” and five for “barriers.” These were tabulated for each of the 179 teachers in the sample. Teachers in the
study suggested that barriers to the use of multimedia in the classroom were that teachers (a) lack time, (b) lack training, (c) lack technical support, (d) lack equipment, or (e) work in an institution with no culture of technology. Teachers in the survey reported that teachers’ use of multimedia in the classroom was facilitated by (a) modeling from other teachers, (b) educational technology training, (c) technical support, (d) access to equipment, and (e) a culture of technology in academic institution.

Figure 4.19 shows the tabulation of responses for the 179 teachers in the sample. The high incidence of “0” or “no response” indicates that many had not formulated clear opinions on what encourages teachers to use multimedia in the classroom. A score of “1” indicates that the teachers volunteered this as a reason.

Figure 4.19. Teacher responses about barriers (top row) and contributors (bottom row) to MM (0=No response and 1=Stated reason/s).
Table 4.6 shows the actual scores of teacher-reported barriers to the use of multimedia. These barriers clustered into five categories: (a) lack of time; (b) lack of training; (c) lack of support; (d) lack of equipment; and (e) no culture of technology.

Table 4.7 shows scores for teacher-reported factors that facilitate the use of multimedia in the EFL/ESL classroom. These factors clustered into five categories: (a) modeling; (b) in-service professional learning; (c) technical support; (d) access to equipment and software; and (e) teaching in a culture of technology and collaboration.

Table 4.6

**Teacher Reported Barriers to Use of Multimedia (0=No Opinion; 1=Stated Barrier)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Age</th>
<th>Teaching years</th>
<th>% EFL</th>
<th>Months training</th>
<th>Experience Uses Multimedia</th>
<th>Cultural values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>40.739359</td>
<td>11.59668</td>
<td>79.03143</td>
<td>6.31955</td>
<td>29.50420</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>42.16667</td>
<td>13.63333</td>
<td>71.85500</td>
<td>11.0583</td>
<td>29.86667</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lacks training</th>
<th>Variable</th>
<th>Age</th>
<th>Teaching years</th>
<th>% EFL</th>
<th>Months training</th>
<th>Experience Uses Multimedia</th>
<th>Cultural values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>41.66116</td>
<td>12.60338</td>
<td>76.02255</td>
<td>9.40692</td>
<td>29.75207</td>
<td>29.42042</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>40.29310</td>
<td>11.81979</td>
<td>74.29310</td>
<td>5.64931</td>
<td>28.39600</td>
<td>26.36207</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lacks support</th>
<th>Variable</th>
<th>Age</th>
<th>Teaching years</th>
<th>% EFL</th>
<th>Months training</th>
<th>Experience Uses Multimedia</th>
<th>Cultural values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>41.15646</td>
<td>12.72189</td>
<td>76.97379</td>
<td>7.20925</td>
<td>28.71429</td>
<td>21.70068</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>41.55050</td>
<td>10.61250</td>
<td>76.05060</td>
<td>12.97187</td>
<td>30.95575</td>
<td>24.43575</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lacks equipment</th>
<th>Variable</th>
<th>Age</th>
<th>Teaching years</th>
<th>% EFL</th>
<th>Months training</th>
<th>Experience Uses Multimedia</th>
<th>Cultural values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>41.86776</td>
<td>12.85710</td>
<td>77.02041</td>
<td>7.416204</td>
<td>28.15506</td>
<td>21.45578</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>40.40741</td>
<td>11.80247</td>
<td>77.32069</td>
<td>9.242716</td>
<td>29.93877</td>
<td>23.09877</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No culture of technology</th>
<th>Variable</th>
<th>Age</th>
<th>Teaching years</th>
<th>% EFL</th>
<th>Months training</th>
<th>Experience Uses Multimedia</th>
<th>Cultural values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>41.94965</td>
<td>12.47411</td>
<td>76.30928</td>
<td>8.23369</td>
<td>27.82757</td>
<td>20.70699</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>39.82856</td>
<td>12.17644</td>
<td>75.98246</td>
<td>6.465789</td>
<td>31.86596</td>
<td>26.19290</td>
</tr>
</tbody>
</table>
Table 4.7

*Teacher Reported Factors Facilitating the Use of Multimedia (0=No Opinion; 1=Facilitates Use)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mode</th>
<th>Age</th>
<th>Teaching years</th>
<th>% ESL</th>
<th>Months training</th>
<th>Experience Uses</th>
<th>Multimedia</th>
<th>Cultural values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has modelling</td>
<td>1</td>
<td>0</td>
<td>41.328521</td>
<td>12.39024</td>
<td>77.86179</td>
<td>10.01138</td>
<td>28.16260</td>
<td>21.39837</td>
</tr>
<tr>
<td>Has in-service training</td>
<td>1</td>
<td>0</td>
<td>41.328521</td>
<td>12.39024</td>
<td>77.86179</td>
<td>10.01138</td>
<td>28.16260</td>
<td>21.39837</td>
</tr>
<tr>
<td>Has technical support</td>
<td>1</td>
<td>0</td>
<td>41.328521</td>
<td>12.39024</td>
<td>77.86179</td>
<td>10.01138</td>
<td>28.16260</td>
<td>21.39837</td>
</tr>
<tr>
<td>Access to equipment and software</td>
<td>1</td>
<td>0</td>
<td>41.328521</td>
<td>12.39024</td>
<td>77.86179</td>
<td>10.01138</td>
<td>28.16260</td>
<td>21.39837</td>
</tr>
<tr>
<td>Culture of technology and collaboration</td>
<td>1</td>
<td>0</td>
<td>41.328521</td>
<td>12.39024</td>
<td>77.86179</td>
<td>10.01138</td>
<td>28.16260</td>
<td>21.39837</td>
</tr>
</tbody>
</table>

### 4.5 Diagnostic Statistics

In order to check integrity of the data analysis, a histogram of raw residuals was created. The assumptions of the mode are able to be checked by looking at the normality of residuals. The Shapiro-Wilk normality test fails to support any deviation from normality in the residuals. Figure 4.20 shows the histogram of raw residuals plotted against frequency showing that the assumption of normality was justified. Homogeneity of variance was also assumed and tested to ascertain if the variance in each group was the same (Bartlett, 1937).
Figure 4.20. Histogram of raw residuals (data: r; W = 0.9944, p-value = 0.7304).

Figure 4.21 shows the homogeneity of variance for each institution. Figure 4.22 shows the homogeneity of variance by region. Bartlett’s (1937) K-squared test fails to show a difference in variance between groups in either institution or region.

Figure 4.23 shows the residuals by gender. More variation in error is shown by women (12.06470) than by men (6.523457). This contradicts the assumption of equal variability within Bartlett’s test of homogeneity of variance. The errors for females have a greater variance than do the errors for males.

The assumptions of normality and constant variance have to be verified before results can be accepted. By doing diagnostic statistics and performing an
analysis of the residuals by gender, the validity of the conclusions can be certified. Thus, it can be concluded that the constant variance assumption holds for institution (see Figure 4.21) and region (see Figure 4.22). Therefore, the diagnostic statistics regarding the significance of the model factors for institution and region are perfectly valid whereas those for gender (see Figure 4.23) are not.

**Figure 4.21.** Homogeneity of variance for each institution.
Figure 4.22. Homogeneity of variance for each region.

Figure 4.23. Residuals by gender shows greater variability in females than males.
4.6 Data on Technological Infrastructure at Institutions

While considerable effort was invested to ascertain multimedia capabilities, no campus had a centralized inventory for hardware and departments had their own budgets and computer facilities which were updated according to variable funding. Analysis of the Campus Multimedia Capability Survey (Appendix D) revealed differences in availability of online computers, software and support in the five universities in the study. Table 4.8 shows the available data collected from the five institutions in the study.

Table 4.8

Data on Multimedia Capability in Five Institutions

<table>
<thead>
<tr>
<th>University</th>
<th>Institution 1 Australia</th>
<th>Institution 2 Thailand</th>
<th>Institution 3 Taiwan</th>
<th>Institution 4 Taiwan</th>
<th>Institution 5 Taiwan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total enrollment</td>
<td>29,437</td>
<td>20,000</td>
<td>9,404</td>
<td>26,843</td>
<td>11,599</td>
</tr>
<tr>
<td>Day Program students</td>
<td>29,437</td>
<td>20,000</td>
<td>5428</td>
<td>22,672</td>
<td>5479</td>
</tr>
<tr>
<td>Continuing Education</td>
<td>n/a</td>
<td>n/a</td>
<td>3976</td>
<td>2,719</td>
<td>4260</td>
</tr>
<tr>
<td>Weekend University</td>
<td>n/a</td>
<td>n/a</td>
<td>no</td>
<td>1452</td>
<td>1860</td>
</tr>
<tr>
<td>Full time teachers</td>
<td>n/a</td>
<td>n/a</td>
<td>248</td>
<td>739</td>
<td>355</td>
</tr>
<tr>
<td>Part time teachers</td>
<td>n/a</td>
<td>n/a</td>
<td>232</td>
<td>740</td>
<td>385</td>
</tr>
<tr>
<td>Online computers</td>
<td>1281</td>
<td>2600</td>
<td>6484</td>
<td>7129</td>
<td>2000</td>
</tr>
<tr>
<td>Classroom LCD projectors</td>
<td>n/a</td>
<td>no</td>
<td>37</td>
<td>140</td>
<td>42</td>
</tr>
<tr>
<td>Notebooks for teacher use</td>
<td>n/a</td>
<td>no</td>
<td>54</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>Portable LCD projectors</td>
<td>n/a</td>
<td>n/a</td>
<td>20</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Digital still cameras</td>
<td>n/a</td>
<td>n/a</td>
<td>37</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>Digital video cameras</td>
<td>n/a</td>
<td>n/a</td>
<td>34</td>
<td>3</td>
<td>22</td>
</tr>
<tr>
<td>Multimedia library resources</td>
<td>n/a</td>
<td>extensive</td>
<td>extensive</td>
<td>extensive</td>
<td>extensive</td>
</tr>
<tr>
<td>Multimedia language lab</td>
<td>n/a</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Multimedia recording studio</td>
<td>n/a</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Video editing studio</td>
<td>n/a</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Video conferencing center</td>
<td>n/a</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Hardware regularly updated</td>
<td>limited</td>
<td>limited</td>
<td>yes</td>
<td>limited</td>
<td>yes</td>
</tr>
</tbody>
</table>
Examining the ratio of number of computers per student also proved problematic: for example, some campuses ran day, evening and weekend programs distributing the number of students on campus at any given time rendering proportionately more computers available for use. By way of another example, Institution 1 had teacher professional learning and website building services, individual departments needed to pay for the services creating a barrier between teachers and multimedia curriculum development. As a consequence, it proved impossible to collect accurate and comprehensive data from all institutions.

Chapter Five offers a theory-driven discussion of the results that were given in Chapter Four comparing them to similar findings found in the literature.
CHAPTER FIVE

DISCUSSION

5.1 Introduction

Chapter Five explains the data and the statistical analysis described in Chapter Four outlining the principal findings and their relevance. Each hypothesis will be considered in turn to see if the data supports the hypothesis or not. Comparisons between data in the present study and key findings in related studies in the review of the literature are discussed in terms of the research questions. Finally, results are interpreted for each institution in an attempt to explain the interaction among variables.

5.2 Principal Quantitative Findings

One of the principle findings was that teachers’ use of multimedia is skewed toward less use based on normal distributions as per Roger’s (1995) model of diffusion of innovation (see Figure 4.2). Most teachers surveyed reported low use or low/moderate use of multimedia in the EFL/ESL classroom. Few teachers reported the extremes of almost no use and few reported high use. The variables that interact to explain this finding are discussed below.

Mean scores across institutions showed that teachers in all three universities in Taiwan used multimedia in the EFL/ESL classroom less than teachers in Australia and in Thailand. Examination of the data points to the weak culture of technology at the individual institutions in Taiwan.
While more than half (53.6%) the teachers reported having adequate access to hardware, far fewer (38.5%) teachers in the study reported access to software. Only one third (35%) of teachers reported that they collaborated with their colleagues in using technology in their teaching and less than a quarter (24%) reported that they took in-service professional learning at the universities they were employed at.

Sections 5.2.1 through 5.2.8 discuss the hypotheses in turn indicating which were supported by the data and which were not.

5.2.1 Hypothesis 1

University EFL/ESL teachers whose professional values endorse constructivist teaching will use technology to a greater extent than those who teach more didactically.

Without considering the interaction with other variables, it appears that teachers whose professional values endorsed constructivist teaching tended to use of multimedia more than teachers who teach more didactically (Figure 4.5, left). This finding supports the research done by Hughes et al. (2004) who measured the extent of constructivist values in 9 online university courses on 4 campuses of the University of West England. Hughes et al. concluded that the constructivist values contributed to students’ critical thinking skills and linked this to their success in learning online.

Allen’s (2005) research at universities in the UK targeting online learners as individuals found that constructivist teaching principles led to scaffolded models of learning, the transferability of knowledge, and cognitive-interactionist thinking. The finding in the current study is also similar to results found by Honey and Moeller
(1990) who revealed a link between teachers’ values and use of technology. Honey and Moeller concluded that traditional educational beliefs and practices, as represented through teacher-centered delivery of knowledge, created barriers for technology integration. The data in the current study appear to support the hypothesis.

Looking at interactions between variables, a significant interaction was found which illustrates the relationship among formal computer professional learning, cultural values and use of multimedia (Figure 4.15). Formal professional learning refers to academic programs and computer professional learning classes held outside the universities where the teachers were employed. Looking at teacher scores for formal professional learning, the sample was divided into three groups: those with less than a year of professional learning, those with more than a year of professional learning, and those who had received no formal professional learning whatsoever. Data showed a weak but significant relationship (p=.02) indicating that teachers whose professional values were more constructivist and who had more than a year of formal computer professional learning showed significantly higher use of multimedia than teachers who taught more didactically and who had less than a year of professional learning or no formal professional learning at all.

Data were also compared across all five institutions (Figure 4.16). A directional correlation was found in teachers from Institution 1 (Australia). The more teachers tended towards constructivist values, the greater the corresponding increased reported use of multimedia. Correlations between Institution 1 and the other institutions, Institution 2 (Thailand), and 3, 4, and 5 (all Taiwan) showed more traditional teacher values and less use of multimedia. Nonetheless, a weak yet statistically significant effect (p=.04) was found within Institution 3 showing that
even when more constructivist values were reported, this did not lead to increased use of multimedia. This point will be discussed in Section 5.4.3 in the discussion for Institution 3.

Even though a directional correlation was found in teachers from Institution 1 indicating that more constructivist values corresponded to increased use of multimedia, in Institution 3, more constructivist values did not correlate to more use of multimedia. This is similar to Becker’s (2000) finding that the relationship between pedagogical beliefs, instructional practices, and teacher’s use of technology was complex. Becker’s results agree with those of the current study in that teachers who reported constructivist and student-centered teaching practices were more likely to use computers than teachers who sustained more traditional pedagogical beliefs. Further, Tong and Trinidad (2005) found that technological innovations changed pedagogical practices and that there was a relationship between teacher use of technology and students taking responsibility for their learning. Further, the findings support research by Bullock (2004), Davis (1995), and Ruschoff (1993) whose research indicated that teacher use of integrated technology was linked to constructivist pedagogical beliefs.

It was also hypothesized that if teacher values were less traditional, less authoritarian, and more global, they would develop learner-centered programs which were facilitated by computer-assisted instruction. Examination of the data across groups on values (Figure 4.5, left) showed that most teachers supported global, learner-centered values yet this did not correlate significantly with use of multimedia in the classroom. While values may in fact influence teaching style, these data showed that teacher values which favor learner-centered programs may be insufficient to motivate a change in teacher practice so far as using technology as a
key means of providing learning for EFL/ESL students. One implication from this
finding is that there may need to be strong cultural support from university and other
institutional leaders so as to promote teacher experimentation and risk-taking in their
teaching in the course of trying to better use technology in the language classroom.

5.2.2 Hypothesis 2

Younger university EFL/ESL teachers will use multimedia in the classroom
more than older teachers.

In looking at this linear relationship of age and use of multimedia without
considering interaction with other variables, it appears that use of multimedia
decreases as teachers get older (Figure 4.5, right). Thus, this hypothesis appears to be
supported by the data. Examining interaction of age and teachers’ use of multimedia
across all five institutions, data showed a strong correlation (p=.00001) in Institution
1 (Australia) and Institution 2 (Thailand) with older teachers continuing to use
multimedia. However, all three universities in Taiwan (Institutions 3, 4, and 5),
showed a weak but significant relationship (p=.05) indicating less use of multimedia
with increased age.

What this finding may suggest is that, so far as the three Taiwanese
universities are concerned, it is not sufficient to simply provide an ample supply of
technological resources to faculty in the expectation that teachers will use that
equipment in their classrooms. This finding lends support to the view that ‘top-
down’ resource provision inevitably fails to attract a strongly supportive response
from those who are expected to use the resource.

This finding also shows that age is often a factor in classroom usage of
technology by teachers. Younger teachers in this study were much more active in
their use of multimedia. However, in the universities (in this instance the Australian and Thai universities) where there was more MM use by older teachers, there were other factors at play. In Thailand, for example, one distinguishing feature compared to Taiwan was that there was an established culture of technology with incentives for teachers to use multimedia. In Australia, it appeared that there was more modeling of technology usage among colleagues and relevant professional development was relatively easy to access.

5.2.3 Hypothesis 3

University EFL/ESL teachers who have less than 10 years of teaching experience will use multimedia in the classroom more than teachers with more than 10 years of teaching experience.

The data showed that teachers with fewer years teaching experience use multimedia more than teachers with more teaching experience. This apparent trend plateaus as teachers get more experience with more years of teaching. Thus, the data support the hypothesis. However, interaction among additional variables revealed a noteworthy trend. Data analysis showed a highly significant relationship (p=.0001) among the following variables: in-service professional learning, teaching years, and teacher use of multimedia (Figure 4.13). In the absence of in-service professional learning, the use of multimedia continues to decrease with teaching years. Conversely, with consistent in-service professional learning, teacher use of multimedia initially tended to drop off and then increased with years of experience. This is perhaps because of the initial steep learning curve when teachers first learn to adopt technology in the classroom. The data showed an additional interaction among variables. Figure 4.14 shows that when teachers reported sufficient access to
hardware, their use of multimedia increased with teaching years indicating a weak but significant relationship (p=.03).

This is consistent with Liu et al.’s (2004) finding that newer teachers were more likely to use technology in their teaching than teachers with twenty or more years of teaching experience. As well, this finding in the current research is supported by research conducted by the United States Department of Education (USDE, 1999) which reported that teachers with less than three years teaching experience believed that they had sufficient professional development and were prepared to seek opportunities to use technology in their teaching. Further, the USDE noted that teachers with fewer years teaching experience were more likely than their experienced colleagues to indicate that they felt adequately prepared to use technology in their teaching.

5.2.4 Hypothesis 4

University EFL/ESL teachers who have received formal computer professional learning and/or professional learning in technology will use multimedia in the classroom more than those who have little or no professional learning.

Results of the study showed a directional correlation for teachers who receive in-service professional learning and greater use of multimedia regardless of age. The evidence, then, appears to support the hypothesis. However, a weak but significant finding (p=.03) was that teachers’ use of multimedia significantly declined with age when in-service professional learning was not available (Figure 4.12). Further, while Bowman (2000) found that teachers in-service professional learning was related to multimedia use, his research indicated that professional learning needed to be not
only how to use the mechanical aspects of technology, but also that teachers needed exposure to the use of multimedia in context, modeling concrete examples of technology-enhanced lessons specific to the subject matter and grade level of their students.

This finding is aligned with Becker’s (2000) results indicated that ‘exemplary teachers’ were better educated. Contrary to the finding in the current study, Liu et al. (2004) found that even when teachers attended college-level computer-related professional development, those teachers did not necessarily integrate that technology into their content areas. Further, Hughes and Daykin (2002) research with third year university students at the University of West England supported the link between staff development and more effective and frequent use of technology in teaching.

From the analysis of the data, it seems that formal computer professional learning did not contribute directly to teachers’ use of multimedia in the classroom. Surprisingly few teachers had any formal professional learning yet most teachers had years of informal computer experience and were self-taught. While computer experience was correlated with the use of multimedia, it seems that internal motivation and personal drive were the greatest contributing factors for teachers to bring technology into their curriculum.

5.2.5 Hypothesis 5

Male and female university EFL/ESL teachers will use multimedia in the classroom to the same extent.

Mean scores for use of multimedia by males (22.22) and females (22.15) are almost identical (Figure 4.7). The preponderance of evidence suggests support for
this hypothesis. However, data showed a strong significant relationship (p=.003) indicating that the affect of age on use of multimedia was significantly different in males and females in the study (Figure 4.10). Results of the study showed that the use of multimedia in average age male teachers is at a minimum whereas the use of multimedia in average age female teachers is at its maximum. Data in this study showed that use of multimedia tended to diminish as male teachers in the sample grew older. The opposite was found to be true in female teachers in so far as their usage was sluggish initially. Data also showed that, over time, use of multimedia tended to increase female teachers as they grew older and thus gained more teaching experience.

This is similar to Hoffman et al.’s (2002) conclusion that the gaps in technology usage across genders are steadily decreasing over time with increased ownership of personal computers and increased access of computers in academia and in the workplace. However, Aust et al.’s (2004) found that men scored higher than women on their ‘perceived’ understanding of basic computer skills and use of presentation software which they attributed to an increased sense of modesty typical among women.

5.2.6 Hypothesis 6

University EFL/ESL teachers born in Western world regions will use multimedia in the classroom more than teachers born in Eastern world regions including Taiwan.

Teachers originally from Region 1 (Western) reported the highest use of technology (27.96), while teachers from Region 2 (Asian) scored mid-range (25.80), and teachers from Region 3 (Taiwan) showed the lowest mean scores in technology
use (18.96). Thus, this hypothesis appears to be supported by the data. Significant directional relationships were found between computer experience and multimedia use across the three regions in the sample (Figure 4.18). However, in Region 1 (Western) and Region 2 (Eastern), the more computer experience teachers reported, the greater the teachers’ use of multimedia. Region 3 (Taiwan), when compared with Region 1 (Western), showed strong significant increases \( p=.004 \) in teachers’ use of multimedia with increased experience.

It was hypothesized that if a university has a strong technological infrastructure, if there is a culture of collaboration with colleagues for the use of multimedia, and if there is sufficient technical support and professional learning, teachers will gradually use more technology in the classroom. All five universities proved to have strong technological infrastructure and technical support and professional learning. Analysis of the data did not reveal significant correlations between modeling by colleagues and use of multimedia. While availability of hardware and software, support and in-service professional learning did not vary within institutions, the ‘perception of availability’ did. This reflects Becker’s (2000) findings, teachers who perceived greater availability of technical support and access to hardware and software were more likely to use multimedia than those who did not.

Findings from the Campus Multimedia Capability Survey (see Appendix D) showed that all universities in the study had generous and well-developed technological infrastructures, maintenance and support, and provisions for future improvements. As shown in Figure 4.8, all 3 institutions in Taiwan had a far greater computer-to-student ration than either institution in Australia or Thailand. Regardless of whether, in fact, the universities in the study had up-to-date hardware and software and technical support for faculty and students, what varied widely from teacher to
teacher and from institution to institution was teachers’ perception of availability of equipment and services. This is noteworthy in that even when state-of-the-art facilities were readily available, all too many teachers did not take advantage of them and often were not aware that the technical facilities and support services were available. A relevant finding in this study, then, is that teachers who were less inclined toward use of multimedia in the classroom thought there was little or no technology and support available to them at their university. Possibly, teachers who thought there was little or no technology and support available to them at their university were less inclined toward the use of multimedia in the classroom. Conversely, teachers who were on the ‘front edge’ of multimedia let little stand in their way and actively sought out available resources.

5.2.7 Hypothesis 7

University EFL/ESL teachers who access technical support will use multimedia more than those who do not access technical support.

In the multivariate regression, no significant correlations were found between access to technical support and the use of multimedia. However, the qualitative data collected showed that 80% of teachers in the study reported that, in their opinion, a barrier to the use of multimedia in the classroom was lack of support (Figure 4.19, top). Similarly, 80% of teachers reported that technical support was essential for successful teacher uptake of multimedia (Figure 4.19, bottom). Hence, whilst the quantitative results did not find significant correlations between access to technical support and teachers’ use of multimedia, the preponderance of evidence from qualitative data suggests support for the hypothesis.
This finding is similar to Dupin-Bryant’s (2004) assertion that teachers using technology in instruction rely on high-level support. It also is similar to Jacobsen and Lock’s (2005) results showing that teachers need technical support to design and/or use multimedia curricula. Further, Bullock’s (2004) results showed that technical support, clear expectations, and easy access to technology were the key factors that enabled teachers to use multimedia in the classroom. As well, Adamy and Heinecke (2005) found that technical support was an essential factor in teacher uptake of technology in teaching. Results of the current study confirm that many teachers perceived a lack of technical support at their institutions and this seems to be linked to their reluctance to use technology in the EFL/ESL classroom.

This is similar to findings by Song et al. (2005) who observed that when strategies to guide educational leaders to effectively use technological support were in place, teachers were more inclined to use technology in their teaching.

5.2.8 Hypothesis 8

University EFL/ESL teachers who collaborate with colleagues will use multimedia in the classroom more than teachers who do not regularly collaborate with colleagues.

While 65% of teachers said they did not teach in a culture of collaboration and 35% said they did, data revealed a noteworthy interaction between age and collaboration among colleagues and the use of multimedia (Figure 4.11). Data shows that MM scores increase with age when there is collaboration among colleagues while it continues to decrease with age when collaboration is not present. When there was collaboration among colleagues, multimedia use showed weak but significant increases (p=.01). The data support the hypothesis. When there was collaboration
among faculty members, use of multimedia increased with age (over time). However, without collaboration, data showed that the use of multimedia diminished with age (over time).

Sheingold and Hadley’s (1990) research showed that the artifacts of educational technology are the result of social shaping. They asserted that, not only does the uptake of multimedia require an atmosphere of collaboration among colleagues in a technologically functional environment, but that this needs to occur over extended periods of time.

This is similar to findings by Carroll et al. (2005) who identified that collaboration with colleagues encourages teacher use of technology in education. Carroll et al. reported that traditional teachers who manage their own resources were isolated, rarely sharing their pedagogical practices. Further, Carroll et al. reported that tangible resources like websites, lesson plans and materials, online prototypes and templates needed to be shared by teachers to achieve a culture of collaboration among teachers.

Section 5.3 describes the qualitative findings as reported by the teachers in the study. Section 5.3.1 describes the factors the teachers in the study reported that were barriers to the use of multimedia in the ESL/EFL classroom comparing it to findings from the current research. Section 5.3.2 describes the factors the teachers in the study reported that contribute to the use of multimedia in the EFL/ESL classroom and compares it to the results of the research.

5.3 Qualitative Findings

Teachers were asked two open-ended questions about what they perceived (Appendix C, Sections V and VI). Teachers in the study reported on what factors
they thought contributed to or deterred from the use of multimedia in EFL/ESL classroom instruction. Reported answers clustered into five categories for ‘barriers’ and five for ‘contributors’ (Figure 4.19). Findings are discussed in Sections 5.3.1 and 5.3.1.

5.3.1 Barriers to the Use of Multimedia

Teachers in the study suggested that barriers to the use of multimedia in the classroom were that teachers (a) lack time, (b) lack training, (c) lack technical support, (d) lack equipment, or (e) work in an institution with no culture of technology use (Table 4.6). This is similar to Honey and Moeller’s (1990) finding that even when teachers claimed to be student-centered, they complained of lack of time to integrate technology and reported that hardware was not readily accessible. The finding is also supported by Apple (1982) who found that work intensification and increased demands on teacher time may be a factor in explaining teachers’ reluctance to use computers in their teaching.

Sheingold and Hadley’s (1990) study reported similar findings clustering around the problems of lack of time and inadequate access to hardware concluding that teachers could not accomplish more with technology without changes to the organizational system within their school with acceptance of educational technology evolving over the past two decades, Sheingold and Hadley reported on both ‘past’ and ‘current’ barriers finding that the highest rated teacher-reported ‘past’ barriers to use of multimedia were (a) too few computers, (b) teachers’ lack of time, (c) too few printers, (d) problems scheduling computers, (e) not enough labs, (f) teachers’ lack of interest in computers, and (g) weakness of teachers’ own knowledge. Sheingold and Hadley’s highest rated ‘current’ barriers were (a) teachers’ lack of time, (b) problems
scheduling computer access, (c) low computer-student ratio, (d) not enough computer labs, (e) inadequate financial support for computers from school and district, (f) too few printers and peripherals, and (g) not enough help to supervise student computer use.

The findings in the current study did not echo those of Bowman (2000) whose results showed that lack of technology integration manifested because of: (a) inappropriate fit of technology with course content, (b) inability to discern how to use technology in assignments, (c) resistance of the supervising teacher, (d) unavailability of computer labs, (d) students unprepared for computer technology, and (e) fears about classroom management.

Data collected in this study did not support the view that teachers are reluctant to use technology because of fear as a number of researchers have reported (Aust, et al., 2005; Bowman, 2000; Bullock, 2004; Machnaik, 2002; McGrail, 2005; Murray, 2000). Further, data from the current study did not show that fear of loss of authority was a barrier to use of multimedia as reported by Fang and Warshauer (2004), Bindé (1998), and Hodas (1993).

Similar to Bowman’s (2000) findings, Romano (2003) reported that a major barrier to teacher uptake of technology was that, when pre-existing software does not easily integrate into teachers’ lesson plans, it reduced the effectiveness and appeal. Further, results from this study add weight to Byrom’s (1997) findings which showed that reasons for underutilization of technology in teaching are: (a) inadequate technical support, (b) inadequate teacher training, (c) lack of time to experiment, and (d) a lack of vision of technology's potential for improving teaching and learning. What this shows is that nearly a decade later, the situation in terms of teachers who do not utilize technology in their classrooms to any notable extent, has remained
static. In addition, findings from this study add support to Becker’s (2000) research which found that teachers who did not use computers or the Internet were more likely to report: (a) insufficient availability of computers and (b) lack of time as the greatest barriers than teachers who habitually used these technologies.

5.3.2 Factors Contributing to the Use of Multimedia

Qualitative data analysis in this study showed that teacher-reported use of multimedia in the classroom was facilitated by (a) modeling from other teachers, (b) educational technology training, (c) technical support, (d) access to equipment, and (e) a culture of technology in the academic institution where the teacher worked (Table 4.7). Alvine’s (2000) findings were similar, emphasizing the importance of creating a culture of technology that includes and goes beyond the provision of adequate and functional hardware and software. Alvine’s results indicate that teacher use of technology required (a) endorsement from the school administration, (b) modeling and support from colleagues, and (c) an atmosphere of encouragement for students. Given the findings from this study, the challenge facing university administrators in Taiwan, in terms of promoting teacher usage of technology in EFL/ESL classrooms seems to be much more substantial than what the Australian and Thai counterparts need to deal with.

Just as Bullock (2000) found that a lack of modeling by a mentoring teacher contributed to pre-service teachers not effectively using multimedia, results from this study underscored the importance of teachers modeling specific subject-related uses of technology. Findings from this study add further weight to Adamy and Heinecke’s (2005) finding that university teachers’ uptake of technology was dependent upon:
(a) access to hardware and software, (b) technical support, and (c) positive organizational context of technology.

5.3 Comparison of the Key Findings in Related Studies

Responses to the original research questions and comparisons of key findings in related studies are taken in turn below in Sections 5.3.1 through 5.3.3.

5.3.1 Question 1

To what extent do EFL/ESL teachers use integrated technology in the classroom in (the participating) universities in Australia, Thailand, and Taiwan?

Looking at the distribution of MM scores for individual teachers across the sample plotted on a Bell Curve (Figure 4.2) shows that the majority of teachers regardless of institution, nationality, or region used multimedia relatively infrequently or hardly at all. Only a few teachers reported high to moderate use or high use of multimedia. While a few individual teachers used multimedia more, the evidence showed that most teachers in the study were reluctant to use multimedia in the EFL/ESL classroom.

Mean scores for teacher-reported use of multimedia (MM) for each of the five institutions in the study are shown in Figure 4.1. Individual teacher MM scores showed a wide range from 2 through 48 (Figure 4.2). Summary statistics by nationality showed a range of mean scores from 14–37 (see Table 4.4). The highest mean score was from Institution 2 in Thailand (27.76). The second highest was Institution 1 in Australia (25.91). Teachers from Institution 3 (20.32), Institution 4 (19.19), and Institution 5 (17.13) in Taiwan showed mean scores lower than the other regions.
Correlation coefficients compared each institution with Institution 1 (Table 4.3). Mean MM scores comparing Institution 1 with Institution 2 showed no significant difference. However, correlation coefficients comparing Institution 1 with Institution 3 showed a weak but significant negative correlation (p<.01). Correlation coefficients comparing Institution 1 and Institution 4 showed a strong significant negative correlation (p<.001). Comparisons between Institution 1 and Institution 5 also showed a strong negative correlation (p<.001) indicating a great discrepancy between the multimedia use at the two institutions.

Results were also calculated clustering teachers nationalities by world region, regardless of the country of the institution where they were currently teaching. This was done in an attempt to ascertain if trends in multimedia use were driven by institution or cultural values. Taken by region, the results show an even greater contrast as shown in Figure 4.4. Region 1, clustering Western-born teachers, showed the highest level of MM scores (27.96). Region 2, which clustered Asian-born teachers (with the exclusion of Taiwanese teachers), showed the MM scores (25.80) to be a close second. However, analyzing mean MM scores for Taiwanese teachers alone in Region 3, data showed that scores lagged behind (18.96). The reasons for this are discussed in Section 5.4.3 through Section 5.4.5.

By analyzing data across institutions, another distinct profile was able to be produced. Teachers working at Institution 1 in Australia, which had the second highest mean MM scores, had a well-established technology in education development program that had been operational since 1976. This created long-term ideological incentives and support for teachers to use multimedia. The extent to which the technology in education development program was accessed and the
conditions within individual departments that fostered teacher involvement in multimedia pedagogy varied as will be discussed in Section 5.4.1.

Teachers employed at Institution 2 in Thailand had the highest MM scores and, as will be discussed further in Section 5.4.2, this may have to do with the focus on technology in teaching, innovative e-learning initiatives, and the culture of collaboration which was fostered by the administration and policy makers of the university. Section 5.4 shows the interpretation of results by institution.

Data from the Campus Multimedia Capability Survey shown in Table 4.8 indicated that teachers employed in Taiwan at Institutions 3, 4, and 5 had a far higher student to online computer ratio. If access to hardware alone was the pivotal factor in multimedia use, teachers employed at the institutions in Taiwan would have been the greatest users of technology. However, this was clearly not the case.

Section 5.4.3, Section 5.4.4, and Section 5.4.5 discuss the possible reasons for this finding.

5.3.2 Question 2

How do variables (of age, gender, teaching experience, formal computer professional learning and/or professional learning, technical support, collaboration with colleagues, and nationality/region) amongst teachers promote or inhibit the use of multimedia in the EFL/ESL classroom within the Asia-Pacific region?

The findings of from this study related to each variable as well as similarities and differences with other research were addressed above in Section 5.3.1 through Section 5.3.8. Findings related to interaction among variables are discussed below.
A significant difference in the linear effect of gender and age was found with the use of multimedia tending to diminish as male teachers grew older whereas it tended to increase as female teachers grew older (Figure 4.10). Results showed that use of multimedia by male teachers who were in their mid to late forties was at a minimum while use of multimedia in female teachers of the same age was at its maximum. As females got older, their engagement with technology tended to decline whereas as males got older, their engagement with multimedia tended to increase. This is similar to Littleton and Barnett’s (1999) finding as females got older, their involvement with IT began to decline. Further, results of the current study found that younger males tended to use technology more than females and older males tended to use technology more than females.

A strong significance was found in the relationship between professional learning, years of teaching, and use of multimedia (Figure 4.13). Data showed that with in-service professional learning, teacher use of multimedia increased with teaching years but that it declined without professional learning. However, in teachers engaged in professional learning, the use of multimedia tended to drop off initially and then increased. This could be due to the steep learning curve when teachers are beginning to use IT.

Teachers with formal computer professional learning and high cultural values scores, particularly those teachers with more than a year of professional learning, showed significantly greater use of multimedia (Figure 4.15). This is similar to Strudler’s (1993) finding that sustained interaction and staff development were crucial factors in not only increased use of multimedia by teachers but also for effective use of technology in teaching.
5.3.3 Question 3

If teachers hold educational values which endorse constructivist teaching in relation to their professional practice, will they be more inclined to use technology than teachers who usually teach didactically?

Results from all five institutions showed that there was an interaction between cultural value scores and the use of multimedia where higher cultural value scores tended to correspond to greater use of multimedia (Figure 4.16). This trend seemed to be strongest in Institution 1 where higher scores in cultural values, indicating an inclination toward constructivist pedagogical beliefs, were positively correlated with higher MM scores. Becker’s (2000) research found a similar relationship between changes to teachers’ pedagogical practices and computer use. In broad terms, teachers’ comfort level with the use of computer-assisted instruction may, therefore, be pivotal in shifting the educational paradigm to accommodate constructivist pedagogy that may lead to overall gains in English language proficiency as was also found by research done by Hyslop-Margison (2004) and Coppola (2005). Nonetheless, it is important to acknowledge that there are many highly effective constructivist EFL/ESL teachers in universities who do not use technology in their classrooms.

However, a statistically significant event was shown at Institution 3 where higher cultural value scores did not correspond to greater multimedia use. Data in the current study showed that teacher resistance to technology use at this university in Taiwan seemed tenacious even in teachers who had more liberal values. Even if technology in teaching was shown to be an effective alternative to traditional classroom pedagogy, data showed that this did not necessarily lead to EFL teachers adopting multimedia at Institution 3. In an investigation of the relationship between
technology use and pedagogical beliefs, Hodas’ (1993) research led to a similar finding that extensive faculty training and technical support still do not prove effective for the uptake of technology if teachers’ beliefs conflicted with the assumptions of a professional learning program. Further, Hodas suggested that teachers who believed that teaching and learning was about transmitting facts were unlikely to benefit from networking opportunities, technological professional learning, and support.

5.4 Discussion of Results

In what follows, in Sections 5.4.1 through 5.4.5, a brief discussion is provided in relation to each of the institutions in this study.

5.4.1 Discussion for Institution 1

Institution 1 in Australia had the highest number of students and the lowest number of computers of any university in the study. However, even with a low ratio of computers (n=1281) to students (n=29,437), Institution 2 had the second highest mean MM scores (25.9) across the five institutions. Mean scores for number of months of professional development in computers at Institution 1 was low with teachers reporting a total of 2.9 months of professional learning (Table 4.1).

Institution 1 had a well established technology education integration institute on campus that had been operational for a full thirty years. However, this organization was operated on a fee-for-service basis and, depending on the strength of funding of individual faculties and departments, those services of the technology education integration institute were not evenly distributed across departments. In other words, faculties like medicine (that were more generously funded) were able to
make use of the program far more than departments with lower budgets like ESL. Also, if a technology-enhanced program was designed by the institute for classroom use, the multimedia curriculum ‘expired’ at the end of the semester and additional funding was required in order to recycle the program for additional use. This proved to be discouraging to university teachers who perhaps would have accessed the services more readily had the electronic resources been reusable.

5.4.2 Discussion for Institution 2

Institution 2 showed the highest mean scores for use of multimedia (27.8) of all five institutions in the study even though the computer (N=2600) to student (N=20,000) ration was relatively low. Institution 2 is at the forefront of e-learning in Thailand with the establishment of the College of Internet Distance Education. Three phases of development began in 2002. These continue to grow in sophistication, offering short courses and development for the human resources for the larger e-learning programs. These strong e-learning initiatives, however, are ahead of Ministry of Education policies in Thailand which do not allow degree-level e-learning for credit (Chorpothong & Charmonman, 2004).

As a consequence, Institution 2 has entered into cooperation agreements with many Western universities in order to offer distance degree programs to both local and international students. An ambitious plan is in place to offer online courses to 100,000 people a year. With courses being developed for both lay persons and students registered in degree programs, the culture of technology at Institution 2 is firmly in place.

Mean scores for number of months of professional development in computers (14.5 months) at Institution 2 was the second highest in the study (Table 4.1).
Teachers were exposed to these technological innovations and it was clear that a high value was placed on technology in teaching by the administration or the university. The data reflected these initiatives showing the highest mean MM scores compared with the other institutions in the study.

5.4.3 Discussion for Institution 3

Institution 3 in Taiwan had by far the highest ratio of online computers to students with a staggering 6,484 computers for a total of 9,404 students. While Institution 3 did have slightly higher mean MM scores (20.3) than the other institutions in Taiwan, data showed that access to computers alone is not the deciding factor in teacher use of multimedia.

At Institution 3, mean scores for number of months of professional development in computers (2.4 months) was the lowest of any of the institutions (Table 4.1). In the case of Institution 3, relatively little computer professional learning and a high level of access to computers led to the highest mean MM scores (20.3) of the three institutions in Taiwan, however, it still lagged behind Institution 1 and Institution 2.

5.4.4 Discussion for Institution 4

Institution 4 in Taiwan had the highest number of online computers (N=7,129) on any of the five campuses; however, these were shared among a student body of 26,843. This is still nearly seven times more computers than Institution 1, again showing that effective technology integration involves more than simply ensuring staff or student access to computers.
At Institution 4, mean scores for the number of months of professional development in computers (17.7 months) was the highest of all five institutions (Table 4.1). In the case of Institution 4, high level access to hardware and the greatest number of months of professional development in technology across the five institutions did not lead to increased mean MM scores.

5.4.5 Discussion for Institution 5

Institution 5 in Taiwan had the lowest computer (N=2000) to student (N=11,599) ratio of all the universities in Taiwan. Institution 5 also had the lowest mean MM scores (17.1) of the entire study. At Institution 5, mean scores for number of months of professional development in computers (2.6 months) was the second lowest of any of the five institutions (Table 4.1). Mean cultural value scores were also the lowest (27.2) of all five institutions in the study. Without considering the interaction of other variables, Institution 5 had a low computer to student ratio, low mean cultural value scores, and low scores in professional development with computers and the lowest mean MM scores of all the universities in the study.

5.5 Conclusion

Results of the study show that even if universities have state-of-the-art technological infrastructures, professional development opportunities, and technical support, language teachers still do not readily adopt technology. If teachers are typically traditional and have the tendency to resist innovation and the conventional educational paradigm is teacher-centered, fact-focused, and assessment-driven, promoting change in academic institutions will be a colossal challenge. Supporting constructivist and inquiry-based learning environments, promoting life-long learning
for both students and teachers, and moving toward a learner-centered ideology involves fundamental shifts in thinking about education. In a shrinking world driven by globalization, telecommunications, and technology, adequately preparing today’s youth to compete in tomorrow’s world likely involves proficiency in English and competence with technology. Preparing teachers for the challenge of effectively educating the next generation may hinge on the transformation of the educational paradigm shifting from traditional values to more progressive values represented in social and cultural constructivism.

Chapter Six gives a summary of the thesis, suggests directions for further research based on the data collected in the study, outlines recommendations, and articulates conclusions.
CHAPTER SIX

SUMMARY, FUTURE DIRECTIONS, RECOMMENDATIONS, AND CONCLUSIONS

6.1 Introduction

Chapter Six offers some final views on the research. Section 6.2 gives a summary of the dissertation. Section 6.3 suggests future directions in educational technology for EFL/ESL. Section 6.4 discusses new paradigms for professional development in education. Section 6.5 makes recommendations for future research. Finally, Section 6.6 gives the conclusions.

6.2 Summary

Chapter One argued that technology in education is a viable agent of transformation for educational systems which contribute to a changing global society. The transformative achievements of technology have been notable despite the fact that, in terms of teacher adoption of technology, learning is necessarily disruptive to familiar teaching practice in the EFL/ESL classroom. To reiterate, this study sought to answer the following questions:

1. To what extent do EFL/ESL teachers use integrated technology in the classroom in (the participating) universities in Australia, Thailand, and Taiwan?

2. How do variables (of age, gender, teaching experience, formal computer professional learning and/or professional learning, technical support, collaboration with colleagues, and nationality/region)
amongst teachers promote or inhibit the use of multimedia in the EFL/ESL classroom within the Asia-Pacific region?

3. If teachers hold educational values which endorse constructivist teaching in relation to their professional practice, will they be more inclined to use technology than teachers who usually teach didactically?

As indicated in Chapter One, the study was conducted within the framework of Rogers (1995) diffusion of innovations theory outlining patterns of uptake of technology which typically suggest five stages of acceptance: (1) knowledge, (2) persuasion, (3) decision, (4) implementation, and (5) confirmation.

Chapter Two reviewed the literature on teacher change and technology ‘resistance,’ barriers to teachers’ use of technology, factors contributing to teacher use of technology, electronic versus face-to-face teaching, as well as teacher-student interaction, and shifts in role structures with computer-mediated communication. Further, it reviewed research on globalization and cultural differences in English language learning plus shifting paradigms on methods of language teaching. As well, it reviewed the literature on cognitive styles, multiple intelligences, student motivation, and learner-centered learning and technology. These issues help to provide a context in which the use of technology in teaching, teacher work, and teacher professional learning exist. The reviewed literature showed that using multimedia in the EFL/ESL classroom is a potentially progressive way to make a pedagogical bridge from simplistic ‘transmission’ models of education to the sophisticated architecture of social and cultural constructivist learning theory and collaboration.
Chapter Three outlined the efficacy of the selected research method which showed that effective learning of a second language hinges on several interacting factors such as teacher attitudes, instructional environments, and academic infrastructure. The chapter also detailed the fact that quantitative and qualitative data were collected from interviews with English language teachers from five universities in the Asia-Pacific region. In addition, an inventory of hardware, software, and availability of technical support was collected for each university campus. The method was designed to effectively shed light on the interacting variables that lead to or detract from teacher use of multimedia.

Chapter Four used a multivariate correlational model to statistically analyze and chart the complex interactions among the independent variable ‘teacher use of multimedia’ and several dependent variables. Data analysis showed that multimedia in ‘average age’ male teachers was at a minimum whereas it was at its maximum in ‘average age’ female teachers. Further, teacher use of multimedia increased with age when there was collaboration among colleagues while it continued to decrease with age when collaboration was not present. However, data showed that teachers’ use of multimedia declined with age when in-service professional development was not available whereas it was sustained with regular professional learning. As well, data showed a strong trend for multimedia use to be higher among teachers who reported having adequate access to computers than teachers who reported insufficient volume and duration of access. Teachers who taught didactically and who had little or no formal computer professional learning reported using multimedia significantly less than teachers with progressive educational values and formal computer training. While data did show a strong relationship between more traditional values and less multimedia use, in one institution in Taiwan, other factors influenced the situation
and more progressive educational values held by teachers did not lead to increased use of technology. Qualitative data showed that teacher-reported barriers to the use of technology were: (a) lack of time, (b) lack of training, (c) lack of technical support, (d) lack of equipment, and (e) working in an institution with no culture of technology. Teachers reported that the following factors facilitated technology use: (a) modeling from other teachers, (b) educational technology training, (c) technical support, (d) access to equipment, and (e) a culture of technology at their university. All universities in the study demonstrated impressive technological resources; yet, in most cases, this did not in itself lead to individual teachers readily adopting technology in the EFL/ESL classroom.

Chapter Five outlined the findings in the study and offered a theory-driven analysis linking the constructivist theoretical framework to the findings comparing them to research from the literature reviewed in Chapter Two. Analysis of the data revealed complex interactions among variables which were fully discussed in Chapter Five. Nonetheless, data showed that significant directional relationships existed supporting all of the above-mentioned eight hypotheses:

1. University EFL/ESL teachers whose professional values endorsed constructivist teaching values will use multimedia more than teachers who teach more didactically.

2. Younger EFL/ESL university teachers will use multimedia more than older teachers.

3. University EFL/ESL teachers who have less than 10 years of teaching experience will use multimedia in the classroom more than teachers with more than 10 years of teaching experience.
4. University EFL/ESL teachers who have received formal computer professional learning and/or professional learning in technology will use multimedia in the classroom more than those who have little or no professional learning.

5. Male and female university EFL/ESL teachers will use multimedia in the classroom to the same extent.

6. University EFL/ESL teachers born in Western world regions will use multimedia in the classroom more than teachers born in Eastern world regions including Taiwan.

7. University EFL/ESL teachers who access technical support will use multimedia more than those who do not access technical support.

8. University EFL/ESL teachers who collaborate with colleagues will use multimedia in the classroom more than teachers who do not regularly collaborate with colleagues.

While the data in the study supported the abovementioned hypotheses, encouraging teachers to adopt technology is an enormous educational challenge for governments, universities, and educators. There is no one-size-fits-all way of successfully gaining such widespread implementation of technology by teachers. However, this study provides further evidence about ways of effectively promoting technology implementation by teachers.

Section 6.3 briefly considers future directions with educational technology in the field of EFL/ESL.
6.3 Future Directions in Educational Technology

In general terms, as more teachers achieve success with the use of educational technology and challenge entrenched beliefs about teaching and learning, it can be expected they will discover many advantages of computer-enhanced pedagogy. Predicting how EFL/ESL teacher concerns will change throughout the phases of the transformational process toward the use of integrated technology in the classroom will be an important precursor to program development. If teacher concerns are considered, this can lend itself to developing in-service and intervention activities appropriate to achieving the overarching goal of integrated use of technology in EFL/ESL teaching. For Dooley (1999), nothing short of a restructuring of the organizational structure of education is required in addition to a shifting of teacher values to keep pace with the broader social, political, economic, and technological changes that have been taking place in the past three decades. The influence of a myriad of communications technologies in people’s homes and offices may facilitate cultures of collaboration among colleagues, administrators, experts in the field, parents, and policy makers thus extending formal and informal avenues for professional development and collaborative interaction.

What the current research has shown is that educational change associated with information technology is likely to be extremely complex. A systemic approach which allows for interacting factors as well as increased acceptance of the potential value of using technology in teaching is essential for the paradigm shift to be fully realized. Yet, while systemic, ideological, and policy changes are pivotal, this transformation will, on current evidence from this study, most likely occur at a modest rate.
Overall, the study lends support for the view that most EFL/ESL teachers typically hesitate to integrate the full range of available technological resources into their teaching. Results are similar to the distribution patterns found by Rogers (1995) with few teachers readily adopting technology in teaching. By and large, whether or not the professional learning and support were available and whether or not the hardware and software were available, teachers in the study were resistant to the extensive use of multimedia in the classroom. What seems certain from the data is that all five universities in the study had adequate technological and human resources readily available to teachers who sought them out. In the main, data showed that teachers employed at universities with colleagues and students from a variety of countries of origin typically used more multimedia in their EFL/ESL teaching than Taiwanese teachers employed at universities in Taiwan who were teaching almost entirely local Taiwanese students. Further research into teacher values and attitudes toward technology across cultures is necessary to clarify the inquiry into teachers’ use of multimedia in the EFL/ESL classroom if there is to be more effective ‘uptake’ across various parts of the world.

While the issue of teacher uptake of technology in teaching is extremely complex, this study has shown how particular interacting variables (of age, gender, teaching experience, formal computer professional learning and/or professional learning, technical support, collaboration with colleagues, and nationality/region) affect teacher use of multimedia in the EFL/ESL classroom. By examining the profiles of five universities in the Asia-Pacific region, it seems clear that teacher use of multimedia goes well beyond simple access to computer hardware. Creating a culture of technology in universities over extended periods of time, modeling subject-specific use of technology-enhanced curricula, offering real-time technical
support, and using constructivist learner-centered teaching methodologies exemplified by computer-assisted instruction are key factors in promoting the use of multimedia in EFL/ESL teaching.

This study has contributed to the acquisition of new knowledge in the field by examining the interacting factors at universities in the Asia-Pacific region and refining the criteria for successful integrated technology in the English as a second language classroom. If policy makers begin with an understanding that many university language teachers are primarily traditional in their educational value system and usage of technology in teaching involves a steep learning curve, they may be more ‘realistic’ in terms of understanding how long it takes to create a functional culture of technology in universities. With globalization and technology being firmly established in business and English being the lingua franca on the world stage, initiatives that facilitate EFL/ESL learning will likely be of considerable value to subsequent generations of students. If computer-assisted instruction is one such tool, working within the context of a social constructivism, policy makers, administrators, teachers and students could – and need to – collaborate so as to shape a new paradigm for the future of education.

Section 6.4 describes new paradigms for professional development in integrated technology that will build a functional and productive ‘culture of technology’ in academic institutions.

**6.4 New Paradigms for Professional Development in Education**

If the overarching goal is for EFL/ESL teachers to master computer-based practices in the classroom, it is critical to consider key research findings which have examined the factors that contribute to create a culture of technology in academic
institutions. In this study, the findings underscore the need for ongoing support to be given to teachers as a way of achieving greater use of technology in classroom instruction. Given Fang and Warschauer’s (2004) finding that significant numbers of teachers prefer traditional teaching practices and are largely uninterested in computer professional learning, integrated technology in academia must be systematically developed within institutions over extended periods of time. Sheingold and Hadley’s (1990) finding that it took five to six years of teaching with computers for schools to achieve a culture of technology must be considered when planning for professional learning. Further, creating conditions, for example, in teacher preparation programs that encourage, facilitate, and model technology integration is crucial. Aust et al.’s (2005) research led to a series of recommendations for preparing new teachers to successfully function in a culture of educational technology. These were:

1. To interview pre-service teacher candidates and assess their perceptions and abilities concerning technology and to attract candidates who are interested in integrated technology
2. To improve technological literacy competencies in pre-service teachers
3. To empower existing faculty, educational technology students and mentoring teachers with tools, skills, and technical support for extending best practices in integrating instructional technology
4. To actively engage pre-service teachers in adopting and developing innovative approaches to teaching using technology
5. To apply information technologies to improve communication and collaboration within and among practicum placement schools
6. To use a variety of strategies for disseminating innovation in integrating technology in education

Jacobsen and Lock’s (2005) research set the following priorities for teacher preparation programs: (a) challenge the view that technology is an “add-on,” (b) move initiatives beyond creating educational technology specialists, (c) supply “more than adequate” human and technological infrastructure, (d) employ strategies that are systematic and sustainable, and (e) cultivate networking between “campus and field-based, technology-enhanced, inquiry-based learning environments” (p. 82). These professional learning initiatives offer a practical vision for systemic change.

Section 6.5 makes specific recommendations for future research and for professional program development for integrating technology into the EFL/ESL university classroom.

6.5 Recommendations for Future Research

Several recommendations can be made for future research which complements the research undertaken in this study by extending the regions of investigation. Further investigation would extend the research base in an attempt to delineate which variables are most influential in encouraging EFL/ESL university teachers to adopt technology in their teaching. In addition, studies which pertain to developing integrated technology professional development programs that employ mixed research methods to assess the effectiveness of the program should be undertaken. In all, six recommendations are proposed:

1. A similar study should be conducted at tertiary institutions in Canada and the United States to compare data and delineate which factors
contribute specifically to teacher use of multimedia in EFL/ESL instruction.

2. A pilot professional development program for teachers should be developed that models the applied use of educational technology in subject-specific and proficiency-level use of multimedia in EFL/ESL teaching.

3. A survey should be conducted of major professional learning initiatives in universities across North America to investigate the extent to which integrated technology is being modeled.

4. An in-depth, qualitative study should be conducted in three of the best faculties at selected North American universities that demonstrate a culture of collaboration in the implementation of integrated technology usage by teachers.

5. A qualitative study to investigate further aspects of teachers’ perceptions about technology in education (including what constitutes success or does not and ascertaining the academic environment that is either conducive or not conducive to technology integration) is also needed. Triangulated data could, for example, also be collected from administration and from students to get a wider perspective on the factors contributing to and discouraging the use of technology in English language teaching.

6. A study of a stand-alone online course for professional development specific to EFL/ESL teacher use of integrated technology could be undertaken. This study could develop a pilot program of instruction for both creating original materials as well as for accessing and
adapting copyright-free teacher-made shared resources and learning object repositories. Multimedia curricula created by participants in the program for all levels of English proficiency for reading, writing, listening, and speaking activities can be uploaded to the Internet and stored in a cumulative database for free access by EFL/ESL teachers around the world.

If further insight can be brought to the fundamental reasons that EFL/ESL teachers do or do not adopt technology in teaching, those designing professional development programs can make more informed decisions regarding content, duration, format, function, support, modeling, and collaboration. If academic institutions make solid commitments to achieve productive use of educational technology both from the ‘top down’ and the ‘bottom up,’ then cultures of technology at the tertiary level will be more likely to evolve from teachers’ collaborative endeavors.

6.6 Conclusions

This study set out to investigate to what extent EFL/ESL teachers at universities in the Asia-Pacific region, specifically in Australia, Thailand, and Taiwan engaged in the use of technology in their teaching. As noted in Chapter One, the stated purpose of the study was several-fold, namely to:

1. Identify the factors that contributed to teacher uptake of technology in English language teaching.

2. Identify the factors that were linked with university teachers’ inability or unwillingness to adopt technology in English language teaching.
3. Describe noteworthy aspects of university teachers’ explanations about their teaching, professional learning, and aspects of their work life that influence the extent of their uptake of technology in their EFL/ESL classrooms.

4. Provide an explanation of teacher values which are influential in their willingness to actively engage in university-based computer-assisted English language learning.

Within the theoretical framework of Rogers’ (1995) diffusion of innovation theory claiming that only 2.5% of most populations will readily and willingly adopt technological innovations as they emerge, it was expected that many teachers would hesitate to use technology in their teaching. According to Rogers’ theory, over extended periods of time, more members of the community gradually try the innovations, yet if there were any explicit difficulties, there was a tendency to revert back to past habits and practices. Taking into account that educational technology is, in one sense, no longer ‘new’ (having been introduced well over two decades ago), it was anticipated that most teachers would be using technology in their teaching to some extent.

The findings in this study lend support to the claim by Hodas (1993) that teachers were among the most traditional group in a nation’s population. Further, this study proved to be consistent with findings from Hodas’ which showed that teachers typically resisted change both personally and professionally. Data in this study showed that even with extensive, well-maintained, and supportive networks of technology in place, teachers tended not to use the tools provided. The investigation revealed that even when the technological infrastructure was fully operational and in place, teachers tended not to ‘perceive’ this to be so. Teachers reported that they
lacked the necessary time to learn to use technology. As well, teachers in the study reported that they lacked professional learning even when they had spent considerable time in both formal and informal in-service computer courses. In fact, in many cases, data showed that the teachers with the most professional learning used computers in their teaching the least.

It was considered at the outset of this research that teacher values may be a pivotal factor in the uptake of technology in teaching. The premise was that more traditional values, reflected in teacher-centered teaching and fact-based delivery, would discourage teachers from embracing multimedia use with its ability to cater to individual differences in learning styles. It was also considered that when teachers’ professional values endorsed constructivist teaching, teachers would be inclined to adopt technology in the classroom and their teaching methods would be learner-centered and recognize students as individuals with different learning needs. Data showed that this tended to be the case and that, by and large, more constructivist teacher values were correlated with increased use of technology in teaching. However, this was not always the case. In one institution in Taiwan, while some teachers reported holding values which are, in effect, constructivist, their stated educational values were not matched by the use of multimedia in teaching. This lack of engagement with technology in teaching can be explained in one of two notable ways. Either the teachers claimed to hold more progressive values while they were actually quite traditional, or, no matter how progressive the teachers were, the lack of modeling of technology use and the absence of a functional culture of technology at the university was a severe deterrent (regardless of the impressive amount of hardware available).
After considering all the literature and scrutinizing the data collected in the study, it is clear that teacher change is a decidedly slow process. Further, it seems that the amount of time it takes to functionally integrate technology in teaching has been typically underestimated. It appears that many highly optimistic administrators thought that offering a few ‘how to’ computer courses would be enough to encourage teachers to adopt technology in teaching. However, since the results of the study show an absence of modeling and collaboration with colleagues in regard to technology uptake over extended periods of time, it may be that extended periods of time are needed before teachers feel comfortable to adopt technology. This finding corresponds with results from a study by Sheingold and Hadley (1990) that showed a lengthy period of time was likely to be required before there was widespread implementation of technology in teaching. Perhaps more importantly, both the literature and the data from this study showed that courses teaching how to use a computer application did little to illustrate how to create content-based, proficiency-level specific multimedia EFL/ESL lessons. For the teachers in the study, it was not enough to learn how to add images and format a PowerPoint presentation. This suggests, for example, that in terms of professional learning, teachers need clear and complete examples of technology-enhanced lessons which reflect pedagogically sound and culturally-preferred ways of learning. Further, they almost certainly will need this new form of teaching to be modeled by colleagues teaching similar groups of students with similar learning challenges. The existing situation for many EFL/ESL teachers too often meant that their professional learning gave them access to technical dimensions of computer usage such as learning how to insert a picture in PowerPoint rather than observing a class lesson from start to finish which used a variety of multimedia techniques applied to a specific subject.
The results of this study have provided a contemporary explanation of the factors which are influential in activating teachers’ willingness to engage in university-based, computer-assisted English language learning tools. Creating models of collaboration for technology-enhanced language learning is within the reach of academic institutions and EFL/ESL teachers provided it is considered a major professional and organizational priority. In most regions of the world, the use of technology in education is on the increase, the younger generation is increasingly oriented to technology, and appropriate cultural materials plus interactive auditory and visual materials exist online: Hence favorable contextual conditions exist to enable greater acceptance and use of technology to be achieved in universities.

Therefore, it is now up to individual universities to organizationally create the ‘pedagogical bridge’ for education and technology to productively and harmoniously merge in language instruction. With such organizational success, more and more individual teachers are likely to confidently embrace technology for learning purposes with students across nationalities, across world regions, and across cultures. Of course, if a university is not successful at creating a functional culture of technology, then individual self-motivated teachers will nonetheless be able to forge ahead and use technology to enhance student learning. There have always been instances of teachers who were highly committed to a particular way of working and innovating. But to leave the issue of technology implementation in universities to only highly self-motivated teachers would, in effect, be a default strategy. A far more positive approach would be to attempt to widely implement technology via teachers. However, it is not clear whether or not the implementation will be quicker in the future. Yet almost certainly, universities and teachers will increasingly embrace
constructivism and move toward the integrated use of technology in EFL/ESL teaching.
REFERENCES


bridges: Media technology in language learning (Vol. 4, pp. 15-24).
Frankfurt: Peter Lang.


Constructivism and the technology of instruction: A conversation (pp. 1-16).


Machnaik, J. (2002). Investigating the effect(s) of technology integration on teaching practices that may lead to the development of a community of learners [Electronic version]. Saskatoon, SK, Canada: University of Saskatchewan.


Dear University Contact:

My name is Carmen Boulter and I am conducting an international study on teacher use of multimedia in the EFL/ESL classroom at universities in the Asia-Pacific Region. From looking online at the work being done at (university department) ________________________ at the (name of university) ________________________, it seems your institution has a focus of English language teaching. Hopefully we can cooperate on this project and each be enriched by the experience of evaluating to what extent teachers in your program use technology in English language teaching. Should you decide there is a fit, here is what we propose:

- A team of 4 researchers (including myself) would come to your university in August for 4-5 days
- During that time, we would like to survey faculty to assess their use of multimedia in the classroom through an interview
- We would like to see your facilities and programs in terms of hardware and software being utilized and to what extent

It would be a great pleasure to meet you and your colleagues and discuss use of technology in teaching. If you are interested having faculty at your university participate anonymously in our study, I invite you to contact me at tefl@cboulter.com.

Respectfully,
Carmen Boulter
I, ____________________________, an instructor/professor in the department of ______________________________ at __________________________ (university) in __________________________ (city) am willing to participate in the Teacher Orientation to Technology Survey. I agree to my profile and comments being included in the data collection on the understanding that confidentiality and privacy will be maintained. I am also aware that my name will not appear on any documentation and my identity will not be disclosed at any point in the research or data analysis and, thus, I will remain completely anonymous. I am also aware that I will be invited to participate in an interview and that this participation is voluntary. I understand that there will be no financial remuneration for my participation. Further, I am aware that results will be kept in a secure and private location. I understand I can withdraw at any time without prejudice and my decision will be respected.

Signature: __________________________

Date: ______ / _____ / ______
APPENDIX C

**Teacher Technological Orientation Survey**

The purpose of this survey is to explore what factors contribute to teachers’ use of multimedia in the classroom.

I Personal Background

Name of Institution ______________________________

1.2 Languages 1st___________ 2nd _____________ 3rd ____________ 4th

1.3 Nationality ______________ 1.4 Gender ___male ____ female 1.5 Age

1.6 Number of years teaching _____________ 1.7 Degree in

___________________________

1.8 Percentage of my students who are EFL or ESL

___________________________%

1.9 Subjects taught

___________________________

1.10 Formal Computer Training (length of course(s) in weeks or months)

___________________________

Computer Experience

The way I feel about my technological proficiency:

1. _____ I cannot live without computers.
2. _____ I am comfortable with technology.
3. _____ I am barely starting out and feel bad about how little I know
4. _____ I am timid and anxious around computers
5. _____ I don’t use computers and don’t feel I need them

The first time I used a computer was:

A. _____ over 12 years ago
B. _____ 7 – 12 years ago
C. _____ 3 – 7 years ago
D. _____ 1 – 3 years ago
E. _____ don’t use computers

I use computers for work or pleasure:
A. _____ almost every day
B. _____ 2 – 3 times a week
C. _____ once or twice a week
D. _____ less than once a week

I USE A COMPUTER FOR:
A. _____ word processing
B. _____ financial data organization
C. _____ playing games
D. _____ e-mail
E. _____ surfing and searching on the Net
F. _____ desk-top publishing
G. _____ learning
H. _____ chatting
I. _____ research
J. _____ other: (please state) _____________________________

I can perform:
A. _____ type
B. _____ click and drag with a computer mouse
C. _____ open a computer program, exit, save, print
D. _____ access different computer drives
E. _____ using Help function in a program
F. _____ using a new software program
G. _____ searching the Net
H. _____ recording and listening to self
I. _____ advanced e-mail (sending attachments, using backgrounds, sounds, animations, video clips etc. by e-mail) (any or all)

I am competent to use:
A. _____ Microsoft Word – basic level
B. _____ Microsoft Word - advanced
C. _____ PowerPoint - basic
Teacher’s teaching style and value of technology

3.1 In my teaching, I use:
   A. _______ PowerPoint
   B. _______ videos
   C. _______ LCD projected lessons
   D. _______ music or sound recordings
   E. _______ Flash movies

3.2 I make multimedia teaching materials:
   A. _______ for almost every class
   B. _______ at least once a week
   C. _______ maybe once a month
   D. _______ maybe once a semester
   E. _______ no, it’s not my teaching style

3.3 In my program, my students use:
   A. _______ e-mail
   B. _______ message boards
   C. _______ CAI/CALL software
   D. _______ writing labs
   E. _______ authentic materials from the Net

3.4 What has inspired me to use technology:
   A. _______ I have a technical support
   B. _______ My colleagues lead the way
   C. _______ Self-learning – I am fascinated by it
   D. _______ Students like it
   E. _______ Too much work to develop

3.5 The problem(s) I have with technology:
   A. _______ No one modeling techno use
   B. _______ No training whatsoever
C. ______ My training was ineffective  
D. ______ No support  
E. ______ No need  

3.6 I feel pressure to use computers:  
A. ______ From my department  
B. ______ From my students  
C. ______ From seeing what is on Internet  
D. ______ From myself  
E. ______ no pressure, don’t care  

3.7 What stops me from using multimedia:  
A. ______ equipment is unreliable or not available  
B. ______ takes too long to prepare  
C. ______ don’t know how to  
D. ______ afraid students know more than I do  
E. ______ nothing stops me  

3.8 I wish I knew how to:  
A. ______ Make a website for teaching  
B. ______ Use more Internet resources  
C. ______ Give multimedia lessons  
D. ______ Get students to use technology  
E. ______ Develop distance education curriculum  

3.9 In our university, we are supported to use technology:  
A. ______ computer technicians available  
B. ______ good access to hardware  
C. ______ good access to software  
D. ______ my colleagues share material  
E. ______ regular teacher training  

IV Educational Values
This section is looking to assess your “beliefs.” Answer all questions by stating whether you think the statement is more “yes” or more “no.”

1. I think it is important for teachers to have the ultimate authority in the classroom. Teachers have the knowledge and they deliver it to the students. Y/N
2. The most important thing in education is for students to pass exams and get good marks. Y/N
3. Developing skills in technology and multimedia contributes to lifelong learning. Y/N
4. I hesitate to use technology in the classroom because if students know more than me, I will lose face. Y/N
5. Quality education nowadays is facilitated by technology. Y/N
6. Traditional teacher-centered (lecture style) teaching works best. Technological innovations are over-rated. Y/N
7. Teaching is most effective when it stimulates students in multiple modalities – Auditory (listening), Visual (seeing graphics or images), Kinesthetic (interactive). AUD / VIS / KIN (choose as many as apply)
8. I learn best with Auditory, Visual, and/or Kinesthetic stimulation. AUD / VIS / KIN / DON’T KNOW (choose as many as apply)
9. Even though students may use technology for entertainment, I think they resist technological innovation in education. Y/N

Qualitative Data

V. What do you think prevents teachers from using multimedia in the classroom?
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

VI. What do you think facilitates teachers in using multimedia in the classroom?
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
APPENDIX D

Campus Multimedia Capability Survey

1. Name of Institution _________________________________________________

2. How many students attend this campus? ______________________________

3. How many full and part time faculty members? ________________________

4. How many computers are on campus? _________________________________

5. How many computers are available to students? _________________________

6. Of these computers, how many are online? _____________________________

7. Do teachers have their own computers? ______________________________

8. Describe your campus’ multimedia teaching facilities:

   ✓ Language Labs ____ yes; ____ no;
     • What functions? ____________________________

   ✓ Writing labs ____ yes; ____ no; # _____
     • Accommodates how many students? __________

   ✓ LCD Projectors in classrooms ____ yes; ____ no;
     • # _____ how many?

   ✓ Digital still cameras # ______

   ✓ Digital video cameras # ______

   ✓ Notebooks available to teachers # _____________

   ✓ Portable LCD Projectors available to teachers # _____________

   ✓ Multimedia Library Resources ___ extensive; ___ adequate; ___ minimal;

   ✓ Multimedia Self-study Center for students ____ yes; ____ no;

9. Describe your campus’ multimedia curriculum design facilities:
✓ Recording studio  ____ yes; ____ no;
✓ Video editing studio ____ yes; ____ no;
✓ Video conferencing center ____ yes; ____ no;

10. Are your computer facilities regularly updated and maintained? __ yes; __ no;
APPENDIX E

Foreign Student Demographics for Institution 1 in Australia

<table>
<thead>
<tr>
<th>Institution 1</th>
<th>Number of students</th>
</tr>
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<tbody>
<tr>
<td>Campus A</td>
<td>29,437</td>
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<tr>
<td>Campus B</td>
<td>2005</td>
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<tr>
<td>Campus C</td>
<td>2513</td>
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<tr>
<td>Total 2004–05 enrollment</td>
<td>33,955</td>
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<tr>
<td>Total foreign students</td>
<td>5894</td>
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<tr>
<td>Total number of foreign countries</td>
<td>54 +</td>
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<tr>
<td>Percentage foreign students</td>
<td>17.35%</td>
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<table>
<thead>
<tr>
<th>Student’s Country of Origin</th>
<th>Number from each country</th>
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<td>1</td>
<td>Hong Kong</td>
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<td>China</td>
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<td>Taiwan</td>
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<td>Total</td>
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APPENDIX F

Foreign Student Demographics for Institution 2 in Thailand

<table>
<thead>
<tr>
<th>Institution 2</th>
<th>Number of students</th>
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<tbody>
<tr>
<td>Total 2004–05 enrollment</td>
<td>20,000</td>
</tr>
<tr>
<td>Total foreign students</td>
<td>2232</td>
</tr>
<tr>
<td>Total number of foreign countries</td>
<td>56</td>
</tr>
<tr>
<td>Percentage foreign students</td>
<td>11.16%</td>
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<table>
<thead>
<tr>
<th>Student’s Country of Origin</th>
<th>Number from each country</th>
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<tr>
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<td>2</td>
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</tr>
<tr>
<td>3</td>
<td>India</td>
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<tr>
<td>4</td>
<td>Vietnam</td>
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<tr>
<td>5</td>
<td>Taiwan</td>
</tr>
<tr>
<td>6</td>
<td>Bangladesh</td>
</tr>
<tr>
<td>7</td>
<td>Korea S.</td>
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<tr>
<td>8</td>
<td>USA</td>
</tr>
<tr>
<td>9</td>
<td>Japan</td>
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<td>South Africa</td>
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## APPENDIX G

### Final Reduced AIC Statistical Model for Step-Wise Regressions

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<thead>
<tr>
<th>Residuals:</th>
<th>Min</th>
<th>1Q</th>
<th>Median</th>
<th>3Q</th>
<th>Max</th>
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<tbody>
<tr>
<td></td>
<td>-9.798e+00</td>
<td>-1.938e+00</td>
<td>-3.436e-14</td>
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<table>
<thead>
<tr>
<th>Coefficients: (1 not defined because of singularities)</th>
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<tbody>
<tr>
<td>(Intercept)</td>
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<tr>
<td>Age</td>
</tr>
<tr>
<td>GenderFemale</td>
</tr>
<tr>
<td>Experience</td>
</tr>
<tr>
<td>Support1</td>
</tr>
<tr>
<td>hardware1</td>
</tr>
<tr>
<td>Software1</td>
</tr>
<tr>
<td>Collaboration1</td>
</tr>
<tr>
<td><code>In service training</code>1</td>
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<tr>
<td>Region2</td>
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<tr>
<td>Region3</td>
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<td><code>-Age:GenderFemale</code></td>
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<td><strong>Age:Experience</strong></td>
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<td><strong>Age:Collaboration1</strong></td>
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<tr>
<td><strong>Age:Institution2</strong></td>
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<td><strong>Age:Region2</strong></td>
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<td><strong>Age:Region3</strong></td>
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<tr>
<td><code>-GenderFemale:Experience</code></td>
</tr>
<tr>
<td>GenderFemale: <code>Cultural values</code></td>
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<tr>
<td>GenderFemale:hardware1</td>
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<td>GenderFemale:Institution2</td>
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<tr>
<td>GenderFemale:Institution3</td>
</tr>
<tr>
<td>GenderFemale:Institution4</td>
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<td>GenderFemale:Institution5</td>
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<td><code>-Months training</code>: <code>Cultural values</code></td>
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<td>Months training:Collaboration1</td>
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<tr>
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<td>Cultural values:Institution5</td>
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<tr>
<td>In service training1:Region2</td>
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<tr>
<td>In service training1:Region3</td>
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</tbody>
</table>

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 1

Residual standard error: 4.587 on 82 degrees of freedom
Multiple R-squared: 0.8689, Adjusted R-squared: 0.7155
F-statistic: 5.663 on 96 and 82 DF, p-value: 2.285e-14