Rethinking teaching with information and communication technologies (ICTs) in architectural education

Tsungjuang Wang

Department of Architecture, National Taipei University of Technology, 1, Section 3, Chunghsiao E. Road, Da-An District, 10608 Taipei, Taiwan

Article info

Article history:
Received 3 September 2008
Received in revised form
10 March 2009
Accepted 8 April 2009

Keywords:
Architecture
Constructivism
Social change
Technological pedagogical content knowledge (TPCK)
Pedagogy
ICTs

Abstract

This paper attempts to answer three questions: (1) What are the benefits of fully implementing ICTs for the education of professionals, such as architects? (2) What are the difficulties involved with carrying out these technological changes? and (3) How do these benefits and difficulties interact in a rapidly developing Asian nation such as Taiwan? A brief literature review reveals that ICTs are especially well fitted to the educational paradigm of constructivism and that cultural considerations must always be kept in mind when attempting to implement ICTs. Particular attention is given to the increased potential for collaborative work that crosses international and cultural boundaries, molding studies and exercises to the interests of students and teachers rather knowledge that has recently evolved, and how this maximized use will benefit architectural education. Throughout the paper special attention is given to the possibility of fully implementing ICTs for the education of professionals in Taiwan.

© 2009 Elsevier Ltd. All rights reserved.

1. Introduction

Modern technology seems to have influenced every area of our society, but it has had very little effect on our conceptions of teaching and learning (Schank, 2007). Information and Communication Technologies (ICTs) have influenced nearly every area of our society. Unfortunately, they have not yet succeeded in transforming our concepts and practices of teaching and learning. Studies such as Becker (2000), Zhao (2003), and Zhao and Frank (2003) challenge teacher training programs, maintaining that we should not teach prospective teachers about technology, but instead, we should teach them to use technology so that prospective teachers not only gain skills in working with equipment and software, but also experience how technology can be used to explore, organize, and communicate knowledge by emphasizing discovery approaches to learning in a technologically astute environment. Mishra and Koehler (2006), building on Schulman’s classic (1987) concept of pedagogical content knowledge (PCK), develop the new concept of technological pedagogical content knowledge (TPCK) whereby technology, pedagogy, and content are no longer regarded as separate constructs but as one integrated knowledge base fundamental to teacher education. Many benefits may develop when instructors shift their pedagogical emphasis toward an ICT-rich instructional style.

Without taking this pedagogical shift into consideration, educators err by training future teachers to simply “use equipment” rather than taking an “instructional” approach to planning, designing, executing, and evaluating instruction. This unfortunate methodology often results in the pursuit of minute goals, such as operating courseware and classroom amusement (Means, Roschelle, Penuel, Sabeli, & Haertel, 2003). In this model, instructional technologies shoulder much of the responsibility for the failures of education reform. Teachers are increasingly expected to be lifelong, autonomous, and self-regulated learners with the ability to adapt readily to changing circumstances (Fullan, 2001). Unfortunately, these high expectations are ineffectively combined with teachers’ inadequate technology-based knowledge (Higgins & Moseley, 2001), their misguided focus on technology integrated into curriculum reform, and their teacher-centered classroom curricula, all of which result in students’ lack of achievement and learning (Suger, Crawley, & Fine, 2004; ChanLin, Hong, Horng, Chang, & Chu, 2006).

This paper attempts to answer three fundamental questions about the possibility of using ICT to transform the delivery of education to professional architects. First, what are the potential benefits of ICT for teachers and students in higher education professional programs such as architecture? Secondly, what are the issues that all too often act as barriers to the full development of an...
ICT-rich learning environment in higher education? Finally, what are the benefits and issues involved in implementing ICT to transform the teaching of architecture in a rapidly developing nation such as Taiwan?

The response to these research questions requires, at the outset, a selective literature review regarding the use of ICTs in professional education, specifically in architecture. The review focuses, first, on the relationship between the rhetoric and the practice of implementing ICTs in educational systems, and, secondly, on important cultural issues involved with this kind of implementation. One recurring theme is the idea that ICTs have the potential for radically transforming educational practice; another is the idea that ICTs promote the constructivist paradigm of epistemology. The review concludes with an examination of the use of ICTs in architectural schools, concentrating on both the successes and the difficulties that have been observed so far.

The literature review will be followed by a compact case study of how ICT has been used in the educational system of Taiwan to date. This, in turn, will be followed by a theoretical grounding of the discussion in the educational paradigm of constructivism. A full discussion of the use of ICT in professional education, particularly in relation to Taiwan, will conclude the paper.

2. Theoretical overview

The first thing a review of the literature reveals that there has been an abundance of positive claims published in recent years about the promise that ICT holds for transforming higher education in the twenty-first century. Almost all of this discourse – for example, Bates (2000), Abbott (2000), Fullan (2001), and McCormick (2004) – is normative to the point of ignoring practical matters of implementation. There has been a great amount of theorizing about the advantages of ICT for higher education, but all too little publication of empirical studies to verify the glowing claims of the champions of ICT. Stensaker, Maassen, Borgan, Oftebro, and Karseth (2007) sum up the situation very well when they describe their own findings about the difficulty of putting ICT theory into practice at universities: “... it are not the visions, the visionaries (institutional top-management) and the economic foundations that seem to be lacking, but an effective link between, purpose, people, and pedagogy inside the institution” (p. 431). Wong and Li (2008), in one of the more substantial empirical studies of how ICT is actually used in contemporary education, confirm the need for a multi-layered approach to instituting and assessing ICT, one that combines lofty educational goals with the day-to-day work of teachers in order to effectively manage change. Once again, however, it would seem that this is easier said than done. As Unwin (2007) observes, “... it is not the availability of the technology which is important, but how it is used” (p. 300).

The central claim that the advocates of ICT make in regard to education is that it has the power to radically change classroom practice. At the core of this change is the relationship between the teacher and the learner. Once ICT is introduced, its champions say, the complex process of learning will become more interactive – that is, learner-centered instead of teacher-centered and knowledge-centered. In terms of educational theory, this represents the paradigm of social constructivism. The experts seem to agree that the key to successfully introducing ICT to any educational system is the ability to manage change effectively and strategically. McCormick and Scrimshaw (2001) identify three levels of change that can be expected from the introduction of ICT: an increase in efficiency, an improvement of existing instructional practices, and a total transformation of the teaching and learning experience. Nevertheless, according to Means et al. (2003), “A case can be made that the uses of technology that have been most common in education to date are better characterized as extensions of education ‘business as usual’ than as groundbreaking innovations” (p. 175). These authors do, however, hope that ICT will, especially in the long run, transform the learning experience so that it might become more interactive than it has traditionally been, with not just top-down, but also bottom-up management of education. It is interesting to note here that Means et al. believe that ICT probably holds more potential for university education than it does for K-12 school education.

Dirckinck-Holmfeld and Lorentsen (2003) argue from their own teaching experience that ICT does indeed have the potential to transform university education by making it truly interactive. According to these authors, ICT is an agent of change capable of introducing new pedagogical methodologies and allowing much greater input from students into the learning process, much more collaboration among students and between students and professors, and much finer combinations of physical and virtual educational environments. Punie (2007) offers a carefully reasoned projection of the future benefits of ICT for education by firmly grounding this technology in the changing social realities of the early twenty-first century. In our time the world is being transformed from a late industrial society into a knowledge-based society, and Punie argues that ICT will necessarily be located at the center of what he calls “learning spaces,” where the educational needs of learners will have priority. At the same time, however, the guidance of teachers will still be essential. Moreover, these new learning spaces will only be able to function properly if they are embedded in a cultural and social context that is firmly committed to ongoing innovation in all aspects of life. The author admits that ICT has not lived up to its educational promise yet, but he believes that it will do so in the near future.

The idea that ICT is culturally embedded is taken for granted by experts in the field of education. For example, Zhang (2007) makes an important distinction between the pedagogical cultures of Western nations and Eastern nations. While the West has a long educational tradition, dating back to Socrates in ancient Greece, of individual discovery through debate between learners and teachers, the Eastern educational tradition, based on Confucius in ancient China, emphasizes what Zhang calls “group-based, teacher-dominated, and centrally organized pedagogical culture” (p. 302). In fact, in almost all Eastern nations the implementation of ICT in educational settings is controlled by central government agencies, and usually these agencies have national plans that are geared specifically to meet the economic demands of globalization and the social demands of the information age. To support the introduction of ICT the governments of Eastern nations have been scrambling to create an appropriate hardware infrastructure and to develop human resources capable of maintaining and developing this infrastructure. Most of the attention to date has been on K-12 education, but Asian universities are increasingly extending their services through ICT long distance learning.

It is interesting to note, however, that Eastern nations tend to use ICT to improve the effectiveness of their traditional paradigm of expository teaching, instead of using ICT to transform the existing pedagogical culture. Zhang views this resistance to profound change as an inevitable feature of Eastern pedagogical culture, one that values instructivist teaching and the acquisition of knowledge in communal groups much more than it values constructivist teaching and the development of critical and creative thinking in individual learners. The trouble is, the use of ICT in education almost always promotes change in the direction of student-centered interactive learning. This would seem to suggest that if Eastern nations are to take full advantage of the educational possibilities of ICT, they will have to radically transform their pedagogical culture. As Zhang observes, “... this will take a long time” (p. 309).
There have been three recent studies that specifically investigate the impact of ICT on the professional education of architects. In the first of these, based on research in the United States, Japan, and Europe, Andia (2002) reviews how the architectural profession has received and incorporated ICT over the past thirty years. His most significant finding is that professional architects have used ICT mainly for the purpose of enhancing existing practices that have been in place for at least one hundred and fifty years, while architectural schools have used ICT to transform both architectural imagination and architectural practical possibilities. Andia points out that ICT has dramatically affected architects at both the level of skills and the level of professional culture. From the 1970s to the mid-1990s architects developed computer-aided design (CAD) techniques, and since the mid-1990s architects have made great use of the networking capabilities of ICT to improve the design/build process. Architectural academia, however, has challenged the traditional tributary role of the profession. As the author puts it, “Schools have become experimental laboratories for creating design machines, promoting new architectural imagination and treatment of materials, and finally extending the architectural realm to cyberspace” (p. 7). Andia identifies five distinct discourses that have evolved in architectural academia since the 1950s: design methods, CAD visualization, paperless architecture, information architecture, and virtual studios. The trend of these discourses is to move the vision of architecture from the physical world to the virtual world. The question is, Can architects learn to design for both realities? This is the most important challenge that professional architectural education faces at the present time.

Madrazo and Vidal (2002) offer an empirical study of a fundamental way that ICT can be utilized for the professional education of architects, though by the authors’ own admission the experiment they describe is not unique to architectural courses. Students in a Sistemas de Representacion (SDR) course at Escola Tecnica Superior d’Arquitectura in Barcelona, Spain, defined five avant-garde architectural concepts through multimedia presentations, establishing a critical vocabulary and a concept map of the relationships among the concepts. Created through interfacing and networking in a web-based environment, the concept map became an artifact for interaction, and the teacher became a facilitator between the students and the construct. “The theoretical base of the course therefore conforms to the nature of the Web, where relationships between items become more important than the items themselves” (p. 346). Collaborative text analysis moved from text to metatext, from knowledge to metaknowledge. It is not quite clear why a similar construction of a critical vocabulary and a concept map and a similar analysis of the resulting relationships could not have been done without computers, but there is no doubt that ICT made the entire exercise easier and faster and probably more understandable to students accustomed to using computers in all areas of their daily lives.

Perhaps the most notable recent study of the impact of ICT on the professional education of architects is that of Wiske, Eddy Spicer, Joo, and Moore (2001). In this monograph analysts from the Harvard Graduate School of Education report on the ways that three professors in the Harvard Graduate School of Design incorporated ICT into the teaching methodology of their courses on professional architecture. The authors present extensive case studies of two courses, one on the analysis and design of building structures given by Spiro Pollalis and one on the fundamentals of computer-aided design given by Jeffrey Huang and Urs Hirschberg. In each case the authors focus on both the theoretical benefits and the practical challenges of using ICT to deliver professional courses for architectural students. Because the study relies on a wealth of empirical observation and includes a substantial amount of reflective comments by the professors themselves, as well as input from both the technical staff and the students, it captures the complex reality of using ICT to teach the profession of architecture.

In the end the authors emphasize the experimental nature of the use of ICT by the three professors, especially the need to listen to feedback and improve the methodology the next time it is tried. Moreover, the authors identify three cross-cutting themes or dimensions encountered by the professors in their use of ICT: namely, the educational dimension, the technical dimension, and the institutional dimension. Educational considerations involved balancing the need to meet goals with the need to allow students to discover necessary knowledge for themselves. Technical considerations involved a cost-benefit analysis for the time lost by students in learning to use complex ICT tools and the difficulty for teaching assistants and technicians of implementing and maintaining those tools. Finally, institutional considerations involved the tensions caused by the fact that the use of ICT in both these courses was funded by external initiatives that tended to disrupt the normal flow of resources within the university. The authors of this study come close to telling the whole story – not just the propaganda – of using ICT for the professional education of architects, and as such it is invaluable.

3. The case of Taiwan

The great economic growth enjoyed by Taiwan throughout the 1980s and the 1990s encouraged the national government to institute broad educational and social policies designed to place the country at the center of the new information age where it can take advantage of the wealth of opportunities offered by globalization (Tu & Twu, 2002). Most of the attention of implementing ICT in Taiwanese education has focused so far on the K-12 curriculum, with the principal use of ICT being computer-aided instruction (CAI). One empirical study indicates that CAI has provided a modest improvement over traditional teaching methods in Taiwanese schools (Liao, 2007). Nevertheless, it appears that, despite the Ministry of Education’s rhetoric about the benefits of ICT for education, ICT itself is seldom taught as a subject in the K-9 schools of Taiwan, thus delaying the learning of basic computer skills (ChanLin et al., 2006). The implementation of ICT in the Taiwanese educational system is still in the early stages, but it certainly has not yet realized its promise.

There is, however, some evidence that ICT has been incorporated, rather tentatively, into higher education settings in Taiwan. Yang (2008) reports that one university class was taught to use Socratic dialogues, the basis of constructivist learning, through asynchronous online delivery by a creative professor and several teaching assistants. Young and Ku (2008) describe a joint online distance education project carried out collaboratively by a university in Taiwan and a university on mainland China, something that would have been unthinkable without the benefit of ICT. Chiu (2002) discusses the ways in which computer-assisted design (CAD) has been used in one Taiwanese architectural school, though this article also emphasizes that CAD is only a tool and that human management skills for dynamic organization is actually more important than ICT.

Still, there is no shortage of inspired rhetoric promoting the benefits of using ICT to transform higher education in Taiwan, particularly the professional education of architects and engineers. The following passage from Wang (2008) strikes the typical note of optimism very strongly:

Observing the current educational situation in Taiwan, it is obvious that education only emphasizes the knowledge of the final result. It ignores the need to educate the students to look at the entire process of how knowledge is acquired. Today's
university students will be the backbone of tomorrow's society, and university education should be committed to the lofty ideals of seeking knowledge, fostering creative understanding, and nurturing the whole personality. Educators must cultivate humanity in students. Students should leave the university with senses of ethical responsibility and the aesthetic and qualitative standards they will need to contribute to society and enjoy meaningful lives. In short, education should be an agent for social change and growth. (p.101)

As we have already seen, this kind of rhetoric has haunted the implementation of ICT in higher education since the idea was first conceived. Wang's plea is embedded in a belief in social progressivism and educational constructivism, driven by the economic imperatives of globalization. Throughout this article Wang laments the poor training in ICT among many university teachers in Taiwan, while at the same time championing the virtues of collaboration among the teachers of professional architects and engineers.

We have already seen in the Literature Review how Zhang (2007) emphasizes the importance of relating the implementation of ICT in educational systems to the prevailing pedagogical culture of the society. To put it briefly, Western pedagogical culture – the dominant promoter of ICT in the classroom – is constructivist, student-centered, and dedicated to the discovery of new knowledge, while Asian pedagogical culture is instructivist, teacher-centered, and dedicated to the transmission of established knowledge. Moreover, Asian students, unlike Western students, are expected to prove their abilities through highly competitive examinations, leaving little time in the classroom for either individual or collaborative creative learning. This fundamental clash of pedagogical cultures is as evident in Taiwan as it is in other Eastern nations, and it creates a barrier to the full implementation of ICT in higher education that is unknown in Western nations today.

Richards (2004) argues that the focus of the implementation of ICT in East Asian countries like Taiwan is mainly cultural, and for this reason top-down implementation of government plans are insufficient. As he puts it, “The resulting gap or missing link between innovative rhetoric and policy, on the one hand, and actual implementation and practices, on the other, is other the source of much frustration for both teachers and students” (p. 342). The introduction of ICT in educational settings is often believed to precede cultural change, but it appears that in Taiwan, as in other Eastern nations, cultural change might need to precede the successful implementation of ICT.

4. ICT and constructivism

The hands-on, exploratory, interactive nature of IKTs, particularly the Internet, causes them to gravitate toward the postmodern epistemology and educational theory of constructivism. In fact, if constructivism had not already existed, it seems likely that IKTs would have invented it to explain how they operate. According to Murphy (1997), “Technology is increasingly being touted as an optimal medium for the application of constructivist principles of learning.” When educators speak about IKTs transforming the teaching and learning process, they always mean that the new process is learner-centered, not teacher-centered or even knowledge-centered. This is often called education from the bottom-up rather than from the top-down – in other words, education motivated by the realistic needs and interests of learners, not the political agendas of governments (Dirckinck-Holmfeld & Lorentsen, 2003). Moreover, constructivist epistemology contends that knowledge is not based on an objective reality that is discovered; instead, knowledge is created or invented by learners actively giving meaning to their engagements with problems (Jonassen, 1991). Some argue that this meaning is based on individual experience, while others believe that it is socially situated (Ernst, 1995). Either way, as Means and Olsen (1997) point out, constructivist pedagogy holds the promise of transforming the relationship between teachers and students in the direction of empowering learners to be much more active and interactive in the classroom. “Teachers will design the overall structure for project activities and provide the resources that students need to do them, but students will have much more responsibility for their own learning and for producing finished products that meet high standards. Teachers will function as roving coaches, helping individual students or groups over rough spots and capitalize on the ‘teachable moment’ within the context of the students’ engagement in their work.” (p.ix) This is what Means & Olson call “The Vision” of technology-supported constructivist classrooms.

Constructivism is not new. In fact, this epistemological and educational paradigm resides at the heart of Western civilization in the teaching method of Socrates who elicited knowledge from students by asking them carefully-chosen questions. As we have already seen, Zhang (2007) contrasts the constructivist teaching method of Socrates with the instructivist teaching method of his Chinese contemporary Confucius. Zhang argues that the East Asian resistance to the full implementation of IKTs in education can be traced directly to the fact that constructivist pedagogy is rooted in a profoundly Western epistemology. Human reason, leading to the discovery of eternal ideas beyond individual experience, after the manner of the ancient Greek philosophers Plato and Aristotle, was glorified during the European Renaissance, culminating in the philosophical writings of Descartes and the founding of modern science by Newton. Nevertheless, beginning in the seventeenth century European philosophers started to question what humans can actually know through the senses and rationality. Locke, Hume, and later Kant all argued that objective reality, independent of the person experiencing it, is unknowable (von Glasersfeld, 1989; Hawkins, 1994). Once this sceptical attitude became fairly well established among intellectuals, the development of constructivism as an epistemological and educational theory was inevitable. It seems fitting that the strongest progenitor of constructivism should be the early twentieth century American philosopher John Dewey whose teachings are known as pragmatism. This school of philosophy rejects the duality of ideas and objects in favor of the theory, adapted from Darwin, that human beings know the world by interacting with it. Dewey's philosophy is called instrumentalism, because he believed that the purpose of intellectual inquiry is not to understand reality apart from experience, but to learn how to function in the best possible way within any given situation. Dewey called his theory of epistemology instrumentalism, a term that has virtually the same meaning as constructivism (Field, 2007). In Democracy and Education Dewey (1916) developed the concept of lifelong learning that has become a common belief among constructivists; he also advocated the development of curricula to fit the needs of society at any period in time, another belief promoted by the constructivists. All things considered, Dewey must be regarded as the founder of contemporary constructivism.

The most important recent proponent of constructivism is Lev Vygotsky (1978) whose classic Mind in Society develops the idea that constructivism is essentially a social enterprise. Vygotsky's core concept is the Zone of Proximal Development (ZPD) that each learner is said to possess. If a learner works with an adult or more advanced learner on a project within the learner's ZPD, he or she is likely to acquire greater mastery of the subject through a refinement of language related to the topic. The learner advances through active social co-operation, not passive cognitive absorption.
Vygotzky’s theory of social constructivism is especially compatible with Schön’s (1984) theory of professional education through reflection-in-action.

5. Discussion

5.1. Expanding the learning environment with ICT

The ever-expanding use of new information and communication technologies in education has made both initial and continuing professional education more readily available in almost all disciplines. An initial search of the Internet (using one of the standard search engines) for almost any discipline reveals online offerings from major universities all over the world for courses that can be applied to such purposes as achieving professional licenses. A 2007 Google search on the exact phrase, “architecture continuing education,” produced 436 unsponsored hits, that is, simple links to sites that have not paid to be prominently displayed. A review of these sites indicates that most of them offer online courses that meet the academic accreditation requirements for obtaining or maintaining a license to practice architecture in some region or jurisdiction. The offerings are from professional graduate schools at both public and private institutions of higher learning, as well as from commercial, for-profit organizations that have found a ready market for such courses.

The same search turned up no fewer than 46 “sponsored links,” that is, paid advertisements from various institutions of professional continuing education that include architecture among their offerings. These institutions ranged from New York University’s School of Continuing Professional Education to an online Guide to Continuing Education, named simply, “GuidetoContinuingEducation.com,” a compilation of both public and for-profit organizations that offer continuing education in a wide variety of fields.

Another source of continuing professional education online appears to be professional associations themselves. On the first page of the 2007 Google search, the author observed a link to the site of the American Institute of Architecture. Numerous offerings of online courses and courses that can be taken by attending a variety of institutions can be found at that site. The architectural profession, at least in the United States, appears to be in the vanguard of offering professional education online. Drilling down into the links produced by this single search clearly will reveal hundreds, if not thousands, of opportunities for continuing professional education offered online to students from all over the world. Using ICT for the professional education of architects is already happening in a robust way.

Similarly, a review of both graduate and undergraduate course offerings at major universities around the world reveals that educators in professions such as architecture are currently committed to using ICTs for sharing knowledge with each other and with their students. Faculty members post course syllabi on the Internet for their students to access readily. University libraries offer online access to many of their resources. Moreover, major commercial search engines have started to digitize a very large volume of printed material, making access to an endless variety of research information much easier and much quicker than ever was imagined before the introduction of ICT. An excellent example is the long-term plan currently being developed by the United States Geospatial (USGS) Information Office for the digital integration, storage, and interoperability of data for the general enhancement of scientific inquiry (Gallagher, 2007).

None of this is surprising. After all, the invention of the Internet itself was the result of a desire by professional educators and researchers, most of them employed at universities, first in the United States, but subsequently all around the world, to share knowledge quickly and easily (Leiner et al., 1999). The use of ICTs for the education of professionals is a phenomenon that is maturing rapidly, both in traditional university settings and through distance education venues. The question is: What is the meaning of this ICT explosion? Will educators in professions such as architecture choose to make the best possible use of these new technologies and work to overcome the challenges they will meet, especially in developing nations such as Taiwan?

5.2. Academic benefits of ICT

It is entirely possible that the emergence of new information and communication technologies in the last several decades has had, and will continue to have, an effect on the attitudes of educators regarding both the practice of their profession and the substance of their own particular disciplines (Milliken & Barnes, 2002). As Becker and Ravitz (1999) observe: Teachers’ pedagogical philosophies and practices are not static. Despite patterns of teaching that persist across decades... the climate in which teachers practice their craft sometimes contains discourse that encourages or pressures teachers to modify their teaching styles and even their underlying beliefs about good teaching (p. 356). Cuban (1993) has noted a tendency for teaching practices to endure for very long times, but other researchers, among them Brooks and Brooks (1993) have noted a consistent tendency toward discourse that encourages such practices advocated by Dewey (1916) and Piaget (1952), and, more recently, Pea (1996). Becker and Ravitz (1999) identify these practices as standard constructivist devices, such things as making learning student-centered and project-based and encouraging students to think critically and to collaborate on problem solving.

Much recent pedagogical discourse has been written by enthusiasts such as Means and Olson whose (1997) book Technology and Education Reform strongly advocates the full integration of ICT into daily classroom practice in order to better realize the overall progressive vision of changing students into interactive learners capable of constructing the direction and the meaning of their lives. Enthusiasm breeds enthusiasm. Leask (2001), focusing on e-learning, sums it up the promise of ICT for education like this: “Virtually any one, any age, anywhere, at any time within the foreseeable future will be able to access learning resources and online expert tutorial support coupled with assessment to enable them to complete programs of study leading to internationally recognized accreditation” (p. xxii). Moreover, as Hendricks (2004), has pointed out, all young people today are thoroughly familiar with ICT in the form of the Internet; “They have been utilizing this technology since before they started kindergarten.” It seems, therefore, reasonable to conclude that the time has come for educators at all levels to incorporate ICT into their pedagogical practices.

A wealth of material discusses ways in which colleges, universities, and professional schools can use ICTs in expanding and intensifying their curricula. Among the researchers who have addressed such issues are Benenson and Piggott (2002) who note the value of technology itself as a subject for education; Carbone and Sheard (2002) who advocate a studio-based model for instruction in information technology (a concept to which professional architecture educators might well refer); and Fallows and Bhanot (2005) who, together with a group of collaborators, explored a variety of quality issues in teaching and research at the university level. These authors conclude that ICT is here to stay, and they are confident that it will, in the long run, enhance education. They see this happening mainly because students are coming to see themselves, more and more, as customers, and as such they will demand high quality education.

The benefit of ICT for students – at least according to the enthusiasts – is that it will help transform them from being passive
and uncritical receptacles of past knowledge into being active and creative learners, ready to take responsibility for the future. The benefit of ICT for teachers is that it will allow them to interact more freely and collaboratively with students to foster social change. But that is only the beginning. ICT networks offer the possibility of great professional development in the form of the immediate sharing of research and theoretical discourse anywhere in the world. Collegiality is fundamental to the profession of education, especially at the university level, and ICTs have already created vast networks of teachers and professors that span the globe. Abbott (2000) speaks of “post-geographical learning” (p. 2), but, as far as professional educators are concerned, ICTs have also made post-geographical research virtually instantaneous. It is impossible to overestimate the value of these networks to the education of professional architects. As Andia (2002) argues, architectural schools have already evolved into centers of experimental ICTs, particularly in the field of design. Leading architectural schools in America, Europe, and Japan are capable of sharing the newest technologies with architects, professors, and students in more marginal areas, such as Taiwan, and it would be foolish of universities in lesser developed nations not to take advantage of ICTs to keep them current and competitive in the profession of architecture. It must be remembered that architecture is project-driven and almost totally at the mercy of economic forces.

Architectural education should incubate the broad range of talents required by the nation to compete in a global economy. To accomplish this objective, architectural educational programs must respond quickly to competitive pressures, a process best enabled by a collaborative educational model and a diversified curriculum (Castellano, Stringfield, & Stone, 2001; McCormick, 2004). Such a model would be consistent with models of both architectural practice and education in business technology, especially as it relates to human resource management and collaboration across organizational lines. Such collaboration would be a vital catalyst to guiding economic development and encouraging the flexibility required in a rapidly changing global environment. The use of ICTs is the means of implementing many vital characteristics: the fostering of a broad range of talents, the speedy response to competition, and the introduction of a collaborative educational model and a diversified curriculum.

5.3. Some issues with ICT and some possible solutions

A recurring theme in the discourse on the use of ICTs in education is the frustrating, but apparently inevitable, gap between theory and practice (Condie & Livingston, 2007; Haydn & Barton, 2007). Less and Ellis (2001) sum up the situation perfectly:

We feel that the introduction of these technologies into classrooms and schools is having an impact on teaching and learning that does not necessarily reflect the ways in which children and young people experience and appropriate the technology in their lives outside school. Neither is the prophetic claims being made about the role of ICT in learning being realized in classroom practice as a whole. (pp. 1–2)

What then is the problem? There is a tendency among enthusiasts of ICT, who take for granted the belief that everyone should get on board and share the progressive journey to the future, to blame some teachers for being old-fashioned, Jordan and Jameson (2005) point out that radical change will not occur in the profession of teaching until it occurs among teachers as a whole, and they offer much practical advice about converting oneself and one’s colleagues to the cause through such practices as holding positive discussions with fellow teachers and avoiding political in-fighting about matters of authority.

In contrast, however, to the assumption that ICT is a given for contemporary education, Dale, Robertson, and Shortis (2004) argue that “learning,” “teaching,” and “ICT” are not de-contextualized absolutes, but are, in fact, all spaces that are constructed in any given situation, and therefore the relationships among them are negotiable. This means that educators need to be wary about any rhetorical claims about the implementation of ICT. These authors even suggest that the implementation of ICT in education might be more supply-driven, from an educator’s perspective, than it is demand-driven. In other words, policy makers, both at the institutional level and at the state level, might be more committed to implementing ICT than educators sometimes are. If this is the case, the problem might be at least as much vertical as it is horizontal. Unwin (2007) describes this aspect of the problem precisely: “Technologies in education have often been seen and used as providing the answer to all our educational problems. ICT is no exception, often being promoted by politicians (and sold by retailers/software manufacturers) as the solution to efficient learning” (p. 300). Both states and universities need to appear technologically descendant in order to “sell ‘higher education to the public in the marketplace of the global village. Unwin’s main argument, however, is that the implementation of ICT in higher education affects the professionalism of university teachers. He admits that constructivism provides a general theoretical framework for teaching with ICTs, but he also contends that even within this provisional paradigm higher education teachers often do not have the proper pedagogical training in ICT to be able to integrate these new technologies into their teaching, and even if they did have the training, they would still find it difficult to keep up with the constant and rapid changes of ICT.

Unwin believes that the best theoretical solution to date for the problem of ICT training for higher education professionals is TPCK, or Technological Pedagogical Concept Knowledge, a construct developed by Koehler et al. (2004, 2007) and Mishra and Koehler (2006). TPCK is a kind of knowledge that combines technology and content with pedagogy. Not just knowledge about the content of a course and knowledge about the technology available, TPCK is knowledge about the appropriate pedagogy for combining content and technology. In other words, TPCK integrates, in a complex fashion, what an educator should know and how he or she should use technology to teach that knowledge. The value of TPCK, according to Unwin, is that it does not treat technology as knowledge separate from content and pedagogy — the way that educators are usually taught ICT. He gives the example of learning to use PowerPoint but not learning the content and pedagogy for which it is best fitted. TPCK overcomes that failure, and Unwin believes it is a valuable pedagogical model for training future educators in ICT.

Laurillard (2002) calls into question the theoretical framework of constructivism itself as a proper pedagogical model for any but the highest form of education:

To support students properly in their own exploration of what is known in a field, where its frontiers are, and where they might be extended is extremely costly in staff time. Guidance is a labour intensive process, which means that any one academic can only service a small number of students. Assessment is also labour intensive, as each case must be judged on its own merit, not in terms of a pre-defined “model answer.” And working at the frontiers of knowledge is essentially a lonely task done by individuals and very small groups, not amenable to any form of mass education or support. That is the proper model of postgraduate education, but that is where it must be confined. (p. 2)

Laurillard’s practical reminders are sobering, and they tend to make the glowing prophecies of the many ICT enthusiasts sound glib indeed. It should be remembered here that even at the Harvard
Graduate School of Design architectural professors found the implementation of ICT as a pedagogical method extremely time-consuming and labor intensive, seriously straining the resources of the university (Wiske et al., 2001).

Certain questions about implementing ICT for pedagogical purposes will not go away. Why is there such a gap between promise and practice? Who is to blame for the gap? Is ICT being forced upon the education system by enthusiasts and policy makers eager to be up to date and to compete in the global marketplace? Is constructivism, the educational paradigm that is always associated with ICT, appropriate for any level lower than post-graduate studies? Scholars need to continue examining these issues carefully. They also need to examine another issue – the cultural context of ICT – perhaps even more carefully.

5.4. Technology is not neutral

Loveless (2000) argues that ICTs are not neutral tools for learning, but are instead “cultural artifacts” in the hands of both students and teachers. As such, they are affected by, and they affect, the culture in which they are found. These effects are likely to be profound in some cases. Studies on the ways that ICT affect educational systems, such as Davis et al. (1997) and Davidson (2003), generally agree that the new technologies hold considerable promise for enhancing the quality and availability of education in virtually all areas, but that they cannot simply be grafted onto old methods of teaching and learning. ICTs demand their own accommodations, and when these accommodations are recognized and used, the resulting enrichments can be manifold. And yet the cultural changes associated with implementing new technologies are bound to be materially transformative but ideologically disruptive. Indeed, Richards (2004) contends that culture is the principal issue related to the implementation of ICT in Asian nations such as Taiwan. Specifically, Zhang (2007) argues that the pedagogical cultures of the East and the West are in conflict, causing a certain reluctance among Asian nations to adopt ICTs because they are so closely connected with the theory of constructivism, an alien epistemology in that part of the world.

Professional education in architecture is not immune to cultural changes, and many schools of architecture have eagerly jumped on the ICT bandwagon both in their traditional course offerings and in courses designed to meet the continuing education needs of professional architects and designers. This enthusiasm is reflected in a flurry of publications on the subject in scholarly and professional journals in the field. Whole conferences have been devoted to the uses of information and communication technologies in architectural, engineering, and design education. Indeed, a review of such conferences reveals not only a significant number of them, but several separate organizations devoted to the study of, or advancement of, the use of information and communication technologies in professional education in architecture. Cheng (1995, 1997, 1998, and 1999) has been particularly prolific in advocating a stronger role for ICTs in architectural education. Her works have both described and advocated the use of ICTs in studio-based instruction and in instruction in graphic design.

The Taiwanese educational model for architecture has evolved from apprenticeship systems into a studio-based, tutorial environment. The design studio is currently viewed as a learning environment in which skills and values can be developed within a spirit of open inquiry. The model has served students and professionals well in many respects, but both constituencies need ways to incorporate rapidly-advancing technologies into both education and practice. These programs, like other professional education programs, are currently in upheaval, at least in part because of the perception that new technologies will inevitably transform them. Eagerness to adopt new methods, as well as fear of the outcomes in adopting them is characteristic of the professional architecture education in Taiwan today. We have already noted how disruptive the epistemology of constructivism, the ideological framework of ICT, can be to Asian educators. Taiwanese universities and professional programs often lack modern perspectives and remain mired in traditional methods, so much so that both teaching and professional practice fail to meet the nation’s needs, despite the government’s claim that the nation is committed to modernization and global economic competitiveness through the general adoption of ICT (e-Taiwan Project, 2005).

In Taiwan pedagogical changes are taking place in a setting of rapid social and political change. Not only is there a long-standing conflict between mainland Chinese communists and Taipei democrats (Gu, 1996), mirrored by the local conflict between the Kuomintang and the Democratic Progressive Party (Hsiao, 2008), but recently a neo-Nazi party, the National Socialist Association, has been formed by university graduates and students (Turton, 2007). It is significant to note that at the heart of this radical new party’s doctrine is a commitment to return to the traditional ideals of Confucius (Taiwan political protests, 2007). Such young intellectuals are not likely to be sympathetic to the Western ideology of constructivism underpinning the educational use of ICT. It seems reasonable to assume that these encompassing political and cultural changes will also affect how educational changes occur.

Will professional educators in Taiwan, specifically professional educators in architecture, embrace the changes and challenges attendant with the new ICTs, even while they are managing the political, professional, and institutional changes occurring around them? Wang’s impassioned (2008) plea for a total transformation of architectural education through the implementation of ICTs is certainly understandable in the context of Taiwanese society as a whole. Future research needs to focus on the acceptance and use of ICTs in architectural education in Taiwan in order to shed some light on how effective such technologies can be as they are adopted amidst a turbulent world of social change.

6. Conclusion

For some time now ICTs have been promoted as the almost magical agent of change for nearly all educational settings, including university schools for professionals such as architects. The trouble is, the promise of ICTs has yet to be fully realized in practice and yet to be verified by extensive empirical studies. The idea is that students will be transformed by ICTs into active, independent learners. No longer will they be merely the passive recipients of traditional knowledge. Instead they will use ICTs to create new knowledge. Moreover, professors will be transformed into coaches and guides, and they will enjoy much greater collegiality across geographical borders. Sometimes changes have taken place along these lines, but ICTs do not transform education by their mere presence. Both faculty members and students need to learn to use them for specific educational purposes. In this regard Mishra and Koehler’s (2006) TCKP model of educational practice provides hope for a genuine transformation through ICT.

One thing appears to be certain. ICTs are especially well fitted to the educational paradigm of constructivism with its emphasis on lifelong learning through individualized experience. This model has a long history in the West, going back to the teachings of Socrates in ancient Greece. On the other hand, in Asian nations such as Taiwan there is an equally long educational tradition, dating back to Confucius, of regarding students as passive accumulators of established knowledge. Therefore, the implementation of ICTs in Asian nations, even at the university level, is bound to be complicated by profound cultural differences in educational theory between the East and the West – differences that will not easily disappear.
Nevertheless, computers and other ICTs are here to stay. They are already an established fact of life in the global village. It is impossible to resist their advancement, so it appears to be both practical and wise for all developing nations, even those in Asia, to find culturally appropriate ways to accommodate their implementation in all educational settings, including schools for the education of professionals.

References


