

Review

Rethinking Teaching: How ICTs learning environments Can and Should Completely Alter Your View of Education in Architecture

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The expanding use of new information technologies has included both initial and maintenance professional education. The present article explores how these new information and communication technologies (ICTs) are transforming the process of professional education, delves into the primary sources of that transformation, and discusses how instructors should learn to teach using the new technologies. 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 teacher rather than solely to prescriptive mandates by external authorities, and altering the pedagogical process to fully utilize the vastly more accessible body of knowledge that has resulted.

Key words: Architecture, ICT, Pedagogy, Professional education, teaching and learning.

INTRODUCTION

ICTs seem to have influenced every area of our society, but it has had very little effect on our conceptions of teaching and learning. We don't lecture to our children; they need to learn by doing, by exploring their world under the guidance of adults who can help them reconstruct their experiences and thus make sense of them. We don't lecture to the people who work for us; we let them do their jobs and try to help as we can. How about us as educators today? There are some studies (Zhao and Frank, 2003; Becker, 2000) challenge teacher training programs should not "teach prospective teachers about technology, but instead, should use technology throughout the programs so that prospective teachers not only gain skills in working with equipment and software but also experience how technology can support the exploration, organization, and communication of knowledge" through an emphasis on natural and discovery approaches to learning in a technologically astute. ICTs have many benefits and disadvantages shifting a new ways of learning and teaching in terms of pedagogical improvement.

In these views, schools education err by training future teachers to use a technology and equipments rather than instructional approach to plan, design, execute, and feedback, to eschew direct instruction in favor of either cooperative or collaborative learning and to pursue minute goals like operating courseware and amusing yourself in classroom (Means, 2004). Instructional technologies should also shoulder a large responsibility for the failures of our education reform. Teachers' inadequate technology-base knowledge, their misguided focus on technology integrated into curriculum reform and teacher-centered classroom curricula, and their attitude of complacency shaped by a uniform as contributing to students' lack of achievement and learning.

The response to this research question requires a review of literature regarding the use of information and communication technologies (ICTs) in professional-level education, especially in architecture. This literature will be argued and examined in the context of learning to teach using ICTs and the broad contextual conditions of learning to teach with ICT as reported in this literature

and document analyzed. Identify issues associated with the use of ICTs in architectural schools and what is missing that makes these issues a significant area of research. An attempt is made to discover issues that affect and impede the effective use of ICTs in architectural schools and why those issues are of significant interest to researchers.

Sharing Information with ICTs Sharing Learning Environments

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. A quick search of the Internet using one of the standard search engines in almost any discipline reveals online offerings from major universities all over the world of courses that can be applied to such purposes as maintaining professional licenses. A Google search on today's date (May 05, 2007), for example, 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 cursory review of these sites strongly indicates that most of them offer online courses that meet the academic and accreditation requirements for contributing to 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 in their offerings. They ranged from New York University's School of Continuing Professional Education to an online Guide to Continuing Education, named simply, "GuidetoContinuingEducation.com," which appears to be a community effort by a large number 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 associations of such professionals themselves. On the very first page of the May 06, 2007, Google search, this writer observed a link to the site of the American Institute of Architecture. At that site can be found numerous offerings of online courses and courses that can be taken by attending a variety of institutions. The 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. Clearly, this is a concept that has "caught on."

Similarly, a review of both graduate and undergraduate course and library offerings at major universities around the world reveals that the world of professional education, and many of the professional educators themselves, have eagerly grasped the opportunities for sharing knowledge that have grown out of the Internet. Faculty members post course syllabi on the Internet for their students to access readily. University libraries, including, of course, the library at the University of British Columbia, offer online access to many of their offerings. One or more of the major commercial search engines has begun a project to digitize a very large volume of printed material. There seems almost no end to the drive to digitize information online.

This is not surprising in a way. After all, 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, around the world, to share knowledge quickly and easily. So, we are looking at a phenomenon that is, at the very least, maturing rapidly both with respect to formal, in-university training and initial and continuing education of professionals in almost every conceivable discipline.

Interpreting Technology Uses from Teaching and Learning Perspective

This, of course, is but one example of the use of emerging Information and Communication Technologies (ICTs) in professional education. Ever more sophisticated ways of sharing information are constantly under development, knowledge is stored and transmitted with increasing density, ways of depicting information graphically are becoming ever more precise, "higher definition," the developers call it, and these technologies clearly have applications in such professional fields as architecture and engineering. The question, then, is whether those who educate professionals, and their students, are using these tools to maximum benefit. Again, it should not be surprising to learn that a large body of studies on the effective uses of ICTs has grown up. The purpose of this research is to explore some of the relevant literature in that field with a view to discovering how effectively new ICTs are being used in professional education and how they may be used more effectively.

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 and Barnes, 2002, p. 234). Becker and Ravitz observed in 1999 that, 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) had noted a tendency for teaching practices to endure for very long times, but others, 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). Summarizing these practices, Becker and Ravitz outline them as follows:

- designing activities around teacher and student interests rather than in response to an externally mandated curriculum,
- having students engage in collaborative group projects in which skills are taught and practiced in context rather than sequentially,
- focusing instruction on students' understanding of complex ideas rather than on definitions and facts,
- teaching students to self-consciously assess their own understanding, (and)
- engaging in learning in front of students rather than presenting oneself as fully knowledgeable. (p. 356)

These are activities that are compatible with the "constructivist" theories of education espoused by some of our most innovative and influential educators. Obviously, both the state and a given profession have considerable in assuring that certain materials are covered in a curriculum. No one is arguing that the basics not be covered in either initial professional education or continuing professional education in favor of a freewheeling curriculum based entirely on student and teacher interests alone. That clearly would be tipping too far in one direction. But within the context of assuring that necessary facets of the discipline be fully covered, it should be possible to design courses and entire curricula that engage the creative energies of both students and teachers in the learning process.

It seems obvious that the new information and communication technologies have an important contribution to make in this respect. And, a review of both theory and practice in education reveals that many educators, in a great many disciplines agree. Professional education is no exception to the trend of incorporating these technologies in courses both at the professional school and online. Architectural education poses an interesting challenge: not only is the discipline being affected by the emerging information and communication technologies, there remains within the discipline contention regarding what the objective of architectural education should be. Some advocate that it should train primarily for creativity so that buildings

become works of art. But another school advocates that the "nuts and bolts" of the discipline, that is, how to get a project completed on time and within budget should be the primary objective (Architectural Education, 2005). The role of ICTs in architectural education will clearly be developed, and be influenced, by the interactions between these different schools in the discipline.

Changing Educational and Professional Standards

Clearly, though, new developments and technologies for sharing information and communicating with others will change education in important ways. Abbott (2000) noted as much in the title of his small volume: *ICT: Changing Education*. Among the changes he notes are:

1. that the very definition of "literacy" is being changed to include an understanding of diverse means of transmitting literature,
 2. that geographical separation is ever becoming less important in the formation of "groups,"
 3. that the very purpose of school may be changing as a direct result of ICT making the home or some other setting the base of education technology rather than the school, and
 4. that computers are changing the ways in which education takes place by concentrating the focus on interaction between participants in the process rather than simply on transmission of knowledge (pp. 1–2).
- Abbott goes on to observe that, Links between educational theory and the use of ICT are made, and the notion of post-geographical learning is proposed: learning, that is, which takes place through the online social interaction of groups whose members may not reside in physical proximity. (p. 2)

Abbott was focusing primarily on literacy training and mostly concerned with the ways in which ICTs are changing the educational environment for children and adolescents. But it is clear that such changes are taking place as well in higher and professional education as well.

A wealth of material discusses ways in which colleges, universities, and professional schools can use ICTs in expanding and making more effective their curricula. Among the researchers who have addressed such issues are Benenson and Piggot (2002), who noted the value of technology and a subject for education itself; Carbone (2002), who advocated a studio-based model for instruction in information technology (a concept to which professional architecture educators might well refer); Dirckinck-Holmfeld and Lorentsen (2003), who explored changes in university teaching practices and perspectives as a result of incorporation of ICT technologies; Pollalis, Huang, and Hirschberg (2004), who compared methods and outcomes in two courses that differed in both purpose and uses of ICTs; and Fallows and Bahnot

(2005) who, together with a group of collaborators, explored a variety of quality issues in teaching and research at the university level.

This list could be expanded almost indefinitely, because this is a field that has generated a huge amount of research and very recently. It seems likely that one reason for this wealth of research is that the development of ICTs has itself generated a great deal of just plain wealth. And that wealth is looking for things to do and for ways to generate ideas to generate even more wealth in what has become a dominant global industry.

One key, however, to understanding the importance that the new technologies have assumed in education, is found in this observation by Fallows and Bahnot in the introduction to their collection of scholarly works on the subject.

As academics we have come to view ICT as such a basic toolkit that it is almost impossible for us to envisage how our predecessors performed their various duties of teaching, assessment and research without it. But, of course, the previous generations were taught and did learn without technology - some would even argue that the teachers were able to get on with their responsibilities with greater efficiency than their modern counterparts. Education thrived without everyone having to develop the additional proficiencies that are deemed essential in the twenty-first century. However, most of us are not Luddites; we are willing to adapt to changing times even if not always keen to embrace every element of the new developments.... (pp. 1-2).

Among the questions they attempt to answer are the following:

- Can the use of ICT-based approaches enhance the quality of learning and teaching?
- Does the use of ICT-based approaches enhance the quality of learning and teaching? (Or are we using expensive equipment to achieve no more than our predecessors did with cheap and dusty chalk and talk?)
- How does the use of ICT-based approaches enhance the quality of learning and teaching?
- Are we (as teachers and learners) fully enabled to maximize the quality of the benefits that can arise from the use of ICT? (p. 2).

Concerned primarily with quality of education in the United Kingdom, Fallows and Bahnot deal with everything from uses of technology to enhance the learning experience to ways in which to counter the proliferation of sources students can draw on from the Internet to avoid doing their own work. But the conclusions that they and their contributors reach are several:

- The technologies are here to stay and by and large enhance the capabilities and educational experiences of both educators and students.
- Quality will be increasingly important to students, who are coming to see themselves as much as

customers as students.

- Ensuring that online and interactive offerings exhibit quality will be a continuing challenge for educators, and that meeting it will be carried out largely under the scrutiny of the customers (Fallows and Bhanot, 2005).

Barriers to e-Education

For the purposes of the research here, one of the most interesting articles in the Fallows and Bhanot (eds.) volume is by Gillian Jordan and Jill Jameson (pp. 61–73). In their article, titled “Unlocking Key Barriers for Staff on the Path to an e-University,” they note a near “stampede” to convert course content of all types for online delivery among universities. In such a rush, quality obviously becomes an issue, as do the things that prevent individual faculty members and disciplines from entering the current. They develop a “key barrier matrix” and identify a number of such barriers that characterize their university setting. They believe these to be generalizable, and they are worth noting here.

- Institutional Distractions: Events that are occurring institution-wide. In their own case, the university itself was undergoing a major restructuring aside from the application of ICTs. In their view, the key to unlocking this barrier is to stay focused on one’s own objective.
- Confused perceptions of leadership and decision-making: Over-involved strands of management responsibility contribute here. The key is to simplify and make clear; achieve consensus.
- Skills and staff-development issues: It is necessary to identify at the beginning the skills needed, the people who have them, or, lacking them in some respect, to be willing to develop them along the way.
- E-critics, communications, and overload problems: In this category fall such issues as perceived threats to their futures by some faculty members arising out of the necessary renegotiations of pedagogy and authority. Also critical is simply the added workload of participating in the project. Good communication and committing sufficient additional staff resources to relieve onerous workloads is critical to dealing with this issue.
- Quality problems faced by staff: Staff, while working hard, may very well be tempted into some shortcuts. The key is a simple commitment to quality and avoidance of such shortcuts. Make rules about it and be sure to get everyone to sign on to the commitment.

Others have explored the potential of, and the potential for disruption of the education process, that is inherent in the move to online curricula. Newman (1994), for example explored some of the ways in which computer networks can present both opportunity and obstacles to the educational process. Cuban (1987, 1988, 1993, and 1997) has devoted considerable energy to both the

promise and the perils of new information technologies in the classroom. Overall, he views their adoption as inevitable, but not without risk. Dale, Robertson and Shortis (2004) similarly view the adoption of these technologies in education as inevitable, but offer a number of cautions and advice on how management policy and pedagogy should interact at the institutional level to expedite the process.

In one of a series of such works published by Routledge Falmer in England, Loveless and Ellis (2001) have compiled a volume of articles on the ever-changing picture of ICTs, pedagogy, and curricula. Overall, the editors and their contributors argue, the new technologies will not catalyze radical change in education merely by their presence. Rather, they see these technologies as changing education in a continuous process, beginning with efforts of varying success to fit them into existing models of education and followed by a period in which the technologies will come to be used in ways that were not expected by anyone.

The editors were motivated in part by what they viewed as a disconnect between the ways in which ICTs are being introduced at the institutional level and the ways in which they are being used by students, others outside the educational institutions, and even individual teachers themselves. In their words,

We felt 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. There was a shared concern that the nature of teacher training in new technologies has focused more on skills and techniques. Radical change requires a deeper understanding of the challenges ICT makes to ways of knowing curriculum subjects and of the changes it might bring to the practice of the profession in terms of time, place and authority. (pp. 1-2)

Interestingly, they argue that the acronym that has become almost a word in the language (at least the language of professional educators and computer jockeys), ICT, is problematic. They argue that the uses for what has come to be described by this term reach far beyond merely storing and communicating information. In their view, the scope and uses of these technologies are so widely varied across users and disciplines that we do ourselves a disservice by limiting them with this description. Indeed, they argue that the description itself has too much of an Anglophonic tone and that it also builds a detrimental image of what constitutes literacy in a wildly varied world (p. 2).

In a 2000 article in the *Journal of Technology and Teacher Education*, Loveless argued that information and communication technologies are not neutral tools for

learning but are instead is “cultural artifact” in the hands of both students and teachers. As such they are affected by, and themselves affect, the culture in which they are found. These differences are likely to be profound in some cases (p. 380), a concept to which we will return when considering the proposed project in Taiwan.

A number of researchers have addressed the issues of quality in education and how ICTs can affect it either negatively or positively. Among the more recent publications that address these issues are those by Davidson (2003), Davis et al. (1997), and two major compilations by the United Kingdom Department for Education and Skills (2002, 2003). The general view expressed in these works and others like them is 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 the old ways of doing things. They will demand their own accommodations, but when those are recognized and used to advantage, the advantages will be manifold.

We can probably already see that a proliferation of unexpected uses of the technology is indeed the case, since the initial view of the new information and communication technologies was simply that they would be a way to transmit and store information more efficiently. They were not initially seen as vehicles by which the roles of students and teachers would be dramatically altered. Yet they are effecting such changes quite often.

Professional education in architecture, of course, is not immune to the changes, and in many areas schools of architecture has 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, both books and articles 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 number of conferences, 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 (1996, 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.

Medraza and Vidal (2002) described an exercise in “concept mapping” that utilized an ICT-based learning environment characterized by a specific theoretical framework built up from “theory bits,” “individual and collaborative exercises,” and “a web system that provides representation of the collective work.” The subject matter for their study used five texts on architectural theory and

examined how students treated them in this collaborative environment. Their conclusion was that the system yielded a pedagogy that could be extrapolated to most other disciplines. But they offered this caution:

The effectiveness of this learning environment, however, relies on the equilibrium between technology and pedagogy. Technology must be subsumed under a pedagogic program, whose ultimate goal is to develop the capacity of students to think creatively in collaboration, using information and communication technologies. (p. 387).

Chiu (2002) explored the organizational ramifications of using ICTs in design education. Holland and de Valasco (1999) explored the potential for ICTs in building a network of international studies in engineering, while Kvan et al. (1999) have advocated the use of computer technologies as a means of improving collaborative study and work in design. Other studies and presentations advocating the expanded use of ICTs in professional education, especially as instruments that encourage collaboration among professionals, include Mandour (2004), Schon (1987), and McCormick (2004).

A Broad Stream of Innovation and Study

From the above, it can be seen that the stream of study and application of information and communication technologies in education, and even specifically in education in architecture, engineering, design, and related fields is quite broad. A recurring theme in all the literature on this subject is that these technologies cannot simply be grafted onto a discipline, an educational institution, or into a culture without there being profound effects on all of them. Those effects will also be reflected in the technologies themselves and the cultures in which they are found.

Hancock (2002) argues we should take the position that teachers who are expected to redefine their ideas about teaching and learning must have opportunities to examine instructional methods in light of reform recommendations and current information about learning. It presents a developmental picture of a strategy for creating "beliefs" about how students learn and who should learn and what is important to learn, progressing from theoretical underpinnings of integrating technology with learning and instructional design to the issues of teacher preparation.

It is a characteristic of studies of ICT in professional education that they have been conducted in societies that are largely stable both politically and economically, and that have rich histories of professional education in just such settings. Taiwan is a society that is considerably less stable, and while there is a history of professional education in that society, everything there is done in the context of a society and an economy that has undergone rapid change in the last half century.

Until recently, the government of Taiwan was not formally democratic, for example, though it was certainly disposed toward alliances and affinity with the western democracies. That has been in spite of an expressed determination over the decades by the government of the mainland that the island would one day be reunited with that of the mainland. Indeed, for most of the last several decades, and even today, the official position of both governments has been that there is only one China.

Today, Taiwan is formally a democracy, with multiple political parties, a formidable domestic economy with strong technological manufacturing roots, a growing population characterized by both descendants (and still some survivors) of the retreat of what were termed the Nationalist Chinese and native Taiwanese, a sense of separate identity that grows more profound the longer the separation, substantial earned pride in its accomplishments and existence, and expressed desires to preserve some of its past for the future.

Taiwan has well-established professional education programs in many fields, specifically including architecture. Like other professional education programs, they are in upheaval as well, at least in part because of the perception that new technologies will inevitably transform them. Both eagerness to adopt new methods and fear of the outcomes in adopting them are characteristic of professional architecture education in Taiwan.

Unlike the other areas in which these changes have been explored by academics, in Taiwan they are taking place in a setting of rapid cultural and political change. It seems reasonable that the surrounding changes will also affect how these institutional and pedagogical 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 professional and institutional changes that are occurring around them? The future research for studying acceptance and use of ICTs in architectural education in Taiwan should shed some light on how effective such technologies can be as they are adopted in a world of change.

CONCLUSION

The choice to use information and communication technologies (ICTs) for curriculum construction has both a conceptual and a utilitarian rationale. As emerging information and communication technologies expand the dimensions of the classroom, demands that education professionals be familiar with not only their potential but their application increase as well. Because what is required of an individual to be technologically literate is something of a moving target, creating the curriculum in a constantly changing digital environment constitutes the kind of ongoing learning process encouraged by

constructivist pedagogy. As Dewey (1916) interprets living as having its own intrinsic quality and education should be kept up to that quality of learning and teaching. Providing quality education should be the ultimate target of educators. We shall be very active of seeking quality instruction of ICTs to pay us the competition strength.

Dewey (1956) views curriculum studies as something fluid, embryonic and vital. Therefore, the objective of the individual belief of school education must be consistent with that of the business world and the world of information and communication technologies industry in terms of human resources management and collaboration, which will have to be the vital catalyst for a flexible labor relation and the vertical integration. To control the steer of the economic development, integrated academic and practice accumulation plus high quality human resource are also required. In fact, when approached with its track of progress confront modern education, the development of the school education matches perfect with the social change. Life is a series of situations (Dewey, 1938, p.43). Within the conceptual framework of life learning, I believe that the general public shall develop the idea of always learning as long as one lives. The idea of the school education itself is the very life teaching material of life learning.

Finally, the researcher firmly believes that the school education in future plays the same important role as the upgraded industry does. Future school reform by encouraging free enquiry, critical thinking which results in creativity, imagination and innovation, this should be within the framework of rethinking and creating a critical pedagogy for the information and communication technologies age. To that end, this above augments provides varied opinions on the issue of assessing the impact of educational technology on the learning environment and how to rethink in teaching about how ICTs learning environments can provides the insight necessary for individuals to formulate the appropriate questions for themselves.

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