Distance Education, Vol. 25, No. 2, October 2004

Carfax Publishing
Taylor & Francis Group

Charting Trends for E-Learning in Asian Schools

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E-Learning is the confluence of many technology-based learning opportunities. It employs technologies as part of the delivery systems, as tools to assist with the representation of ideas, and most recently as the integration of processes and the topics to be learned. This paper reviews some of the approaches adopted by Asian schools and charts the trends that will guide instructional designers as they seek to effectively employ e-learning strategies. It also suggests a more integrated view of e-learning for those managing the learning and training systems within schools.

Introduction

Over the last few years, e-learning has been perceived to be the springboard for lifelong learning in schools, where learners learn how to seek out new information, think critically and show initiative to meet up with the challenges of the fast-changing world. E-Learning can mean asynchronous or synchronous facilitation of learning over the Internet to the learner's computer wherever it is located. It has the potential to provide students with access to up-to-date information anywhere and any time, to promote active and independent learning, and to support communication between experts and novices (Rosenberg, 2000).

Attracted by these opportunities, schools all over the world began to focus on the technological challenges of buying the right learning management system (LMS), getting enough bandwidth allocated to e-learning, and obtaining state-of-the-art learning tools and materials. In the context of this paper, e-learning in schools takes two different but complementary forms, in which e-learning tools are used to mediate:

- distance education where students and teachers are separated by time and place (McIsaac & Gunawardena, 1996);

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ISSN 0158-7919 (print); 1475-0198 (online)/04/020199-15

DOI: 10.1080/0158791042000262148

- classroom activities where students and teachers are at the same time and place but students are given the opportunities to work at their pace.

A Frost and Sullivan (*Business Times, 2003*) survey of the e-learning market in Asia estimated:

> the total market size to be US$1,321.82 million in 2003. This is expected to go up to US$2,761.87 million by 2005. The academic component of this market is about one-third at US$479.58 million in 2003, and is expected to go up to US$1,211.98 million by 2005. Taking 2001 as the base year, this represents a compound annual growth rate (CAGR) of 64.46 per cent through 2005. (http://it.asia1.com.sg/newsdaily/news003_20030408.html)

The academic component in the report referred to institutes of higher education, vocational institutions and schools.

However, we have to be aware that the value of e-learning does not inhere solely on the technologies and content, it depends a lot on the approaches adopted both at the micro and macro levels. This paper first examines some approaches that Asian schools are adopting towards e-learning, and attempts to chart possible trends for e-learning in Asia. These trends may be categorized as either the design of learning tasks, or the support and resources in the learning environment. The former spearheads the trends by addressing issues of authenticity, on-demand learning and assessment, while the latter includes knowledge management, digital libraries, learning objects, communities of practice and emerging technologies.

E-Learning Approaches in Asia

Asian countries are at different stages of development of the use of information and communication technologies (ICTs) in education. The UNESCO (2003) comprehensive report reviewed 90 ICT projects in education and concluded that the current stage of development means that countries can be roughly categorized into three types: those which are already integrating the use of ICTs into the education systems; those which are starting to apply and test various strategies; and those which have just begun and are more concerned with ICT infrastructure and connectivity installation. Needless to say, there are countries, especially in the Pacific, which have not started at all.

The UNESCO report continues with a three-level categorization, depending upon the main focus of their ICT initiatives:

- *Advanced countries (integrating ICTs into the education system)* include *South Korea* and *Singapore*. The characteristics include: almost all classrooms have been equipped with computers and other ICTs; they have a high student/computer ratio; there is a high level of Internet access to all schools; the curriculum has been revised to ensure that ICTs become integral nationwide; and delivery of education is increasingly online.
- *Countries with national ICT policies and master plans, applying and testing various*

strategies but not fully integrating ICTs within education, include *China, Thailand, Japan, Malaysia, the Philippines*, and *India*. While there is great variation, common features are: developed national ICT policies in education, and established goals and objectives about introducing ICTs in various aspects of education.

- *Beginning countries, either with national policies, but not enough resources to implement their policies and work plans, or without policies, but running pilot ICT projects*, include *Myanmar, Lao PDR, Vietnam, Cambodia*, and *Bangladesh*, among others. Some have developed national policies; some have ICT projects on a small scale. All lack the budgets to implement their policies and work plans, with infrastructure and ICT penetration as the main concern.

Regardless of categories, many schools in Asia are exploring innovative strategies to ensure the success of e-learning. Some examples of successful pedagogical, policy and technological approaches to e-learning employed by Asian schools include:

1. individualized learning (customizable learning paths and scaffolding templates);
2. greater emphasis on just-in-time learning and on-demand training;
3. increased collaboration between schools and industrial partners;
4. review of the modes of assessment with a shift towards formative assessment, learning process, and peer- and self-assessment;
5. building learning communities among teachers and learners;
6. pedagogical shifts with increased emphasis on meaning making and knowledge construction and less on practice and repetition;
7. reassessing and refining the curriculum towards interdisciplinary teaching and learning, and allowing for more flexibility;
8. acknowledgement of the complexities of the ICT learning environment.

Of course, these approaches are more common for countries around the region that have reached reasonable stages of establishing infrastructure, especially Singapore, Malaysia, Japan, Korea, India, Brunei, Thailand and Hong Kong. It is less true for those that are still striving to obtain more computers (or even electricity) to schools (e.g., Vietnam, Laos, Indonesia, and Cambodia).

Schools in Singapore, for example, have been working with industry partners to create and acquire Interactive Broadband Multimedia (IBBMM) content for their e-learning platform, to develop tools and platforms for teachers and students, to provide training for teachers and students to familiarize them with the tools and the content, and to provide technical assistance to maintain and update the content for the teachers and students. In many instances, the partners have explored—with teams of teachers and students—ways and innovations to improve upon the pedagogical aspects of IBBMM in the school curriculum. One example project at St. Andrew's Junior College, Singapore (http://onezine.s-one.net.sg/@School/Standrew/) consists of a set of 30 physics experiments with video illustration and online technical notes and worksheets. The experiments illustrate and explain basic physics principles, reinforce basic concepts, and allow for reflection of concepts and principles learnt. Students can work through the experiments at their own pace,

supported by a variety of scaffolding tools, to achieve the learning objectives of the online lessons. Similar projects between schools and industry partners to promote knowledge construction among students can also be observed in the Philippines, Thailand, and Indonesia. In the Philippines, for example, the Adopt-a-School Act of 1998 complements direct assistance packages from the government by encouraging firms to develop online resources for schools (Tinio, 2002).

To ensure that teachers and learners are equipped with ICT-related skills for teaching and learning online, many Asian countries have shifted away from "just-in-case" to "just-in-time." In Thailand, the new curriculum standards in 2003 have dropped ICTs as a separate subject in school and instead are encouraging the integration of ICTs into the curriculum as tools for developing decision making, critical thinking and communication skills. A particular set of ICT-related skills are now taught or learnt just before the commencement of the module or lesson that integrates a particular ICT tool. In some secondary schools in Singapore, a needs training programme caters to teachers' further development of ICTs and pedagogical skills. Such just-in-time learning ensures further professional development of teachers and minimizes the reliance on the less effective one-off workshop strategy without any follow-up. Changing the professional development model to include a range of activities over time is in line with current thinking about what approach would have the greatest impact on the professional development of teachers (see, for example, Hoban, 2002)

In South Korea, digital libraries for primary and secondary education have been introduced to support and deliver teaching and learning based on the enquiry-based approach. The initiatives of developing school libraries and adopting new pedagogical approaches are in response to the urgent need for education reform to meet the demands of knowledge-based society. The reform focuses on two main issues: first, greater freedom in choice of time and place in learning; and, second, knowledge conceptualized as something generated or constructed socially by individuals. EduNet is the backbone of this infrastructure run by the Korean Educational Research Information System (KERIS). The digital library supports the provision of instructional materials, while experts and novices meet on EduNet to share ideas and information. The participants in EduNet are usually teachers who support each other in subject-specific teaching and learning strategies and resources, and help each other in implementing new education initiatives. The digital libraries and EduNet complement each other and facilitate the building of a community of practitioners among teachers in Korea (UNESCO, 2004).

On a smaller scale, a digital library project has also been implemented in some schools in Thailand to provide them with a repository of Thai-based teaching/learning lessons contributed by a university (Kasertsart University, Thailand), a science-centre-based team and by other teachers and students. The project also offers these schools the opportunity to participate in international collaborative projects and training courses. At the national level, Thailand has developed science, mathematics and technology education materials that include e-books, e-journals and courseware. The recent project, entitled "Developing an Educational Resources Clearing

House," initiated by the Ministry of Education, offers a database of resources produced by all ministerial departments and organizations, and it includes curriculum and supplementary materials. These projects may gradually change the roles of the learner and teacher in education and training. The learner is no longer a passive recipient of information delivery. With the help of the teacher, knowledge is constructed in the minds of individual learners (Witayangkoon, 2003).

In Malaysia, the SchoolNet project aims at providing Internet broadband access to 10,000 primary and secondary schools. The project aims to link up all schools, including those in East Malaysia, to the SchoolNet to enhance their teaching and learning capabilities. These include catering to the different capabilities of students, allowing students to learn at their own pace, meeting the needs of both teacher-centred and student-centred learning environments, and allowing for the horizontal integration between subjects and vertical integration between learning areas in a subject.

While curriculum redesign is an important factor to ensure effective e-learning, assessment approaches also need to be reconsidered if effective change is to occur. Curriculum and assessment are interdependent and mutually supportive. There is often a greater role for formative assessment in an e-learning environment, as observed in Singapore and Thai schools, and an online programme in India. In Singapore, different modes of assessment such as project work, simulation software to assess students' ability to formulate hypotheses, and self-assessment software are being explored by administrators, teachers, and students in schools. In Thailand, the new curriculum standards encourage the use of authentic assessment across the curriculum. The traditional paper-and-pencil test methods are gradually giving way to portfolio assessment, group or individual observation, peer evaluation and performance assessment. In an online education programme on rehabilitation and resettlement offered since 2001, the mode of assessment is a formative-summative blend that includes an online computer marked assignment, participation in discussion forums and an online diary (Mishra & Jain, 2002).

E-Learning Challenges

The examples of the e-learning approaches of Asian schools discussed in the previous section suggest a need for the effective alignment between practice, policy, and technology, and a more urgent need for teachers to shift from traditional to rethought approaches to learning. These interrelationships and shifts are represented conceptually in Table 1. In rethinking approaches to learning, alternative pedagogical models may be constructed—models that will provide a better balance of control among teachers, students, schools, policy makers and industrial partners. Students will then no longer focus upon testing themselves within a traditional assessment regime with little concern for the situatedness of the knowledge, and also the social and network sharing of resources.

Rethought approaches require mixed modes of learning; they require the use of asynchronous modes to allow greater flexibility and shift the time demands; and they

Table 1. Aligning practice, policy and technology: from traditional to rethought approaches

Context of ICT	Traditional approaches	Rethought approaches
Pedagogy/classroom	Focus on incorporation of technology in classroom Discourse is on integration (adding on to existing strategies, teacher-centred Technology is used to deliver content Most popular tools are drill and practice or learning management systems Centralized design of resources	Focus on rethinking the strategies and curriculum to integrate in authentic and technology-enhanced learning systems Technology is used to support thinking and task completion Focus in on construction of personal meaningful artefacts Distributed instructional design
System/policy	Curriculum is based on knowledge lists and some processes. Content is decontextualized Focus is on organization and provision of equipment and resources Focus is on teacher skill enhancement	Curriculum is process oriented Focus in on learning outcomes and student choice Teachers are supported in their design of learning experiences with just-in-time skills provision Focus is on student-generated and researched texts Focus is on system texts
Technology/applications	Focus is on hardware and software Special technologies for specific tasks Content is designed for display on particular technologies "One size fits many"	Focus is on mobility, communication software, Internet linkages and shared communities of interests Technology is ubiquitous Content conforms to the available technology for display Software is focused on personal need and support of people in place

require learners to have access to authentic resources and to determine how and when they are used. Effective mobile and creative applications are more likely to be feasible with a focus on communities of practice, shared learning resources, and the increasing mobility and miniaturization of technologies. In rethought approaches, individuals are increasingly determining their own learning needs, seeking resources and choosing their own strategies that match these needs. Those who cannot identify their training and learning requirements are at a disadvantage. However, the learning tasks given to learners become more critical if the rethought approach is going to use the capabilities that access to networks provides. Therefore, for the

potentials of the rethought approach to be fulfilled, three issues become critically important for successful e-learning in Asian schools:

1. design of learning tasks;
2. support and resources in the learning environment;
3. reorganizing the ways we communicate.

Design of Learning Tasks

Several research studies have shown that learner engagement is paramount to learning success (Herrington, Oliver, & Reeves, 2003; Lim & Tay, 2003). Engagement here is defined as the "the mobilisation of cognitive, affective and motivational strategies for interpretive transactions" (Bangert-Drowns & Pike, 2001, p. 215) of the learning activities through interactions with others and worthwhile tasks (Kearsley & Shneiderman, 1998). In the e-learning environment, engagement must entail mindfulness, cognitive effort, and attention of the learners in that environment. When learners are engaged in the learning process, levels of learning and retention are possibly increased, and hence the whole learning experience is enhanced (Kearsley & Shneiderman, 1998). The question then is: "How do we design the learning task to engage learners in the e-learning environment?"

Authenticity

Authentic tasks have the capability to motivate and encourage learner participation by facilitating learners' engagement with the instructional message of the e-learning component. Learners need to know why they are learning something. Herrington and her colleagues (2003) claim that immersion in authentic tasks can provide motivation that is needed for the initial perseverance of an otherwise "discomforting and unfamiliar settings" (p. 69). When such familiarity is developed, learners are more likely to be engaged in the learning process and, as a result, more likely to apply the new knowledge and skills to their work or lives. In the context of problem-based learning, several studies have shown that the solving of authentic problems helps learners to see the meaningfulness and relevance of what they learn (Bransford, Brown, & Cocking, 2000; Jonassen, 1997). Unlike traditional direct instruction, learning by problem solving begins with the presentation of an authentic problem that is central to the learning goal. These problems serve as springboards for enquiry; information-gathering; and reflection of theoretical concepts and relationships, industrial standards, norms and practices, and culture. Increasingly, the choice of authentic problems focuses more upon ill-structured problems, which are messy and complex in nature, with no fixed and "right" solutions. The choice of authentic problems increases the cues around the learning task, increases the awareness of how elements are combined in different contexts, and increases the

intrinsic motivation of learners who feel the skills they are employing represent those they will employ in real-world contexts.

Just-in-Time Learning

Another aspect of learning task design is the time the knowledge and skills are to be employed. Instead of focusing on "just-in-case" learning, "just-in-time" learning may be more effective. For example, students who are taught to use spreadsheet programs just in case they need to use the spreadsheet in their mathematics or science lessons may forget much of what they learn if they have little chance to practise and employ these skills shortly after being taught. But "just-in-time" learning provides these students with more personal and relevant reasons for learning about the spreadsheet program to carry out certain learning tasks; in this case they are asked to learn the skills only when there is a need for them to employ these skills in a learning activity.

Gery (1995) has written extensively about the need to generate performance support systems that match the time and type of support needed. In particular, she has suggested structures for electronic performance support systems (EPSS) that can reduce the need for "just-in-case" training and convert more to "just-in-time" training, thus saving organizations on unused training. Once the approach is considered common within the organization, it also reduces the need to prepare huge amounts of e-learning training resources before they are really required. Laffey (1995) has also suggested that employing performance support tools can "act as an intelligent assistant responding to the needs articulated by the performer, and … act as a mentor guiding the performer to a higher level of the work being performed" (p. 40). Thus, the employment of a performance support approach goes beyond the distribution of information, for which many e-learning systems are currently used, so that they become modelled solutions demonstrating an awareness of situated cognition (Hedberg, Brown, Larkin, & Agostinho, 2001).

Assessment

As the processes of acquiring information and skills changes in the new world of e-learning, so does the concept of assessment and what should best reflect effective assessment. With the new e-learning technologies, assessment tasks can be progressively captured, reviewed, and shared. The record of progressive versions of an artefact not only explain the development of thinking but can be a powerful way of linking the processes through which they were constructed to a metacognitive awareness of why the process has been successful or unsuccessful. Not only does this shift employ metacognitive strategies but also, if the task has been well designed, then the learner will know when it has been effectively completed. This in turn will diminish the need to have repetitious feedback and support systems in place, reducing costs and ensuring that the learner is aware of their own solution patterns.

Support and Resources in the Learning Environment

As we have intimated above, the nature of the learning environment is moving beyond the static Web site managed by LMS as a repository of information. Increasingly, instructional designers are asked to scaffold solutions and encourage learners to actively search and actively contribute resources. In this area, trends are emerging at different levels of the information enterprise. At the micro level, learning objects are considered effective ways of reducing the need for high-cost reproduction of similar resources. Within each organization, we are becoming more aware of how we can manage our resources through the employment of knowledge management concepts, and at the macro level we are sharing resources in more intelligent and organized ways through the sifted and sorted world of digital libraries.

Learning Objects

Learning objects may be loosely defined as any digital resources that can be reused to mediate learning. Gerard (1969), in a surprisingly visionary statement early in the history of computer-based instruction, describes how "curricular units can be made smaller and combined, like standardised Meccano [mechanical building set] parts, into a great variety of particular programs custom-made for each learner" (pp. 29–30). Thirty years later, the value and practicality of this idea is becoming apparent. This trend leads the choice in the next generation of instructional design, development, and delivery of e-learning, owing to its potential for reusability, adaptability, generativity, and scalability (Lim, 2002).

Reusability is the fundamental idea behind learning objects where small instructional Web-based components are reused in different learning contexts. *Adaptability* refers to the individualization of instruction where the online learning system makes decisions about the nature of the subsequent events (linking to instructional objects) to be used in the learner's learning based on a set of response-dependent rules. *Generativity* refers to the ability of the online learning system to create instructional messages and interactions by combining reusable instructional objects and interaction elements rather than by storing pre-composed messages and interaction logics (Gibbons, Nelson, & Richards, 2000). And *scalability* refers to the possibilities of expanding the number of users who might learn with such systems while containing incremental development costs. In this case, online learning systems make use of learning objects through a number of mechanisms: "reusability, standardised connectivity, modularity to optimise transmission from central stores, and standardised manufacture" (Gibbons et al., 2000, p. 11).

How big or small the reusable learning object is—its "granularity"—will pose a trade-off between the possible benefits of reuse and the specificity of content and eventually the expense of cataloguing. In order to ensure that these objects are searchable, there is a need to consider their metadata—i.e. "data about data," the descriptive information about a resource. It allows one to locate the item very quickly without investigating all the individual items through which one is searching.

Most metadata created include title, author, subject, topic, version, and format. It may consist of filling out a form of 20-odd fields like "Semantic Density." However, there is a need to focus more on the pedagogy-related information such as objectives, target audience and approaches to support the decision-making process (Schatz, 2000).

Knowledge Management

Knowledge management is more widely understood within the industrial arena than education at this time. The move to training systems, which are derived from an increasingly participative workforce, which contributes to the knowledge base of the firm, is increasingly seen as a competitive advantage of modern firms. Bhatt (2001) has described knowledge management as the creation, validation, presentation, distribution, and application of knowledge within an organizational environment. As recently as 2002, in a survey of Australian universities (CAUL, 2002), only 10 respondents (38% of 26 responses) were aware of the issues and had any plans for capturing the knowledge generated within their organizations. No survey has been conducted in schools to date and it can be predicted that the situation may be similar to that of the Australian universities surveyed.

There is an increasing convergence of knowledge management and e-learning as managers become aware that they both depend upon similar underlying technologies (Barron, 2000). Indeed, Inglis (2003) has suggested that in addition to the regular functions of the university such as teaching, research, administration, and e-learning, knowledge management is essentially converging with

> e-learning at a time when capacity and graphical processing limits of computers and software have been lifted. [It] offers the prospect of very much more interesting solutions and, given the strong organizational learning orientation of Knowledge Management, solutions that are much more closely aligned with contemporary thinking on teaching and learning. (p. 9)

These opportunities provided by knowledge management for universities are also available to schools in which teaching is their central role.

Digital Libraries

At the most macro level we have also seen in recent times the combination and collaboration of individual repositories in interested professional domains. For example, the digital library for earth sciences (DLESE[1]) located in Colorado and supported by the National Science Foundation provides a meta-tagged index to several of their constituent institutions which is selected and annotated as being relevant to both professionals and novices in the field. Searches for "earth wind and fire" in this database will not return links to a pop group. Further, it can be expected that with more detailed meta-tags the materials returned could be identified by language and level of expertise of the user, thus ensuring that the materials can be

matched to the enquirer's language skills. The design of scaffolded "road maps" to the resources will be the next test for instructional designers, as they seek to provide useful paths that will support constructivist or didactic instructional strategies.

Reorganizing the Ways we Communicate

Changing Cultures: From learning communities to communities of practitioners

A community of practitioners is fundamentally identifiable by its activities, practices, and tools used. It is also connected by intricate, socially constructed webs of belief and ways of thinking. What is considered real and authentic within a community is framed by its culture and demands. Meaning is socially constructed through negotiations among present and past members. Activities thus cohere in a way that is, in theory, if not always in practice, accessible to members who move within the social network. Hence, every member in the community counts. Every member helps to frame the culture. However, in education, we really only have communities of learners unless they seize control of their own interactions and resource sharing. Realistically, the move from the types of linkages and groupings that are possible within formal courses are constrained and forced compared with professional groups determining their own agenda and activities. The move from learning community to community of practice, which might provide some exciting possibilities for professional development, is somewhat peripatetic (Hung, Hedberg, Koh, & Tan, 2003).

Emerging Technologies

New communication technologies such as Wireless Application Protocol (WAP) and General Packet Radio Services (GPRS) can facilitate the development of a community of practitioners. WAP is an open, global specification that empowers mobile users with wireless devices to easily access and interact with real, anytime, anywhere information and services similar to those on the Internet in a very thin client environment, "thin" meaning virtually no processor power and very limited display rendering capabilities. GPRS, on the other hand, is a standard for wireless communications which runs at speeds of up to 150 kilobits per second, compared with the current Global System for Mobile Communications (GSM) system's 9.6 kilobits. GPRS, which supports a wide range of bandwidths, is an efficient use of limited bandwidth and is particularly suited for sending and receiving small bursts of data, such as e-mail and Web browsing, as well as large volumes of data. The essential difference between WAP and GPRS is that WAP is a presentation service/browser while GPRS is a network technology.

The important educational opportunities of such communication technologies lie in their connectivity via micro-browser-equipped mobile phones or GPRS-enabled handheld computers: they connect learners at different geographical locations beyond the boundaries of classrooms, allow learners to exchange information within a

short period of time synchronously and asynchronously, and provide the flexibility for one-to-one, one-to-many and many-to-many communications. Connectivity among learners is critical for a learning community, without which social construction of collective knowledge will be greatly impeded (Lim & Lee, 2003).

From Trends and Challenges to Actions

The trends and challenges we have outlined in this paper are not just technological changes; they represent rethought approaches with conceptual shifts about the ways in which learning tasks are structured and accessed, and the strategies through which resources are generated, managed, and shared. We believe that the series of rethought innovations throughout the Asian region are indicators of the possible challenges suggested in the second section of this paper. Predicting the future is always fraught but the personal utility and the apparent simplicity of the challenges are indicators of the parsimony of explanation to support these directions. In addition, the growth of interest groups into learning communities in formal courses and communities of practice in professional contexts provides a ready vehicle for generating and sharing of resources, experiences, and expertise. The challenges we have outlined may substantially change the learning experience, but many actions can be undertaken without the need for high-technology solutions, making them possible within a wide variety of economic contexts. Particular strategies such as developing learning communities or collaborations between schools and other cultural institutions such as museums and libraries offer the possibilities of maintained cultural relevance at the same time.

Given also that access to technologies will always be a challenge for governments and individual schools, the changes in technology costs and more innovative strategies for their deployment can support a rapid move into the digital world. Already, students are more familiar with mobile telephony for social communications and resource sharing than their teachers. With the rapid changes in functionality of mobile devices, not only are our learning tools likely to be more affordable but they are also already beginning to change form to support greater integration of functions with increased miniaturization.

The challenge is both to provide skills and positive experiences for each teacher and learner, and at the same time to ensure that the cognitive demands of using the technology are not seen as an impediment. E-mail and discussion forums can enable learners to learn collaboratively with the need only for intermittent technology access. Thus, the real skill of modern teaching becomes the agility with which each teacher and student can weave into the learning environment these new resources and the insights that other people and places can provide. As the technology also subtlety changes the nature of processes and the actual content of the curriculum, emerging technologies can be employed to support more elaborate assessments of processes and the creation of artefacts which demonstrate higher order thinking and reflection on the outcomes.

As we have already admitted, this paper has pointed to possible directions of

future development in an area where prediction is inherently risky. We have suggested some challenges for the use of e-learning within the educational enterprise. The trends are dependent upon good choices of both new technological solutions and the increasingly integrated applications that help not only to collate the information resources for the schools but are also reusable as part of the learning systems in place in the schools. The recent experience with major interruptions to learning in school, an example of which is the severe acute respiratory syndrome (SARS) episode in Singapore and other countries in the region, has provided new impetus to support alternative methods of using the technology effectively and with speed. The ability of teachers to establish alternative links among their students and the availability of resources will prove to be the deciding factors in achieving success in the future much sooner than we might think.

Notes on Contributors

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Note

1. See, for example, http://www.dlese.org/dds/index.jsp

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