Planning the Wireless Campus:

Implications for EFL Learning Environments

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The introduction of campus-wide wireless computing networks, allowing students, faculty and staff the ability to maintain access to a university network or the Internet while traveling around the campus, has been one of the most successful additions to university life in recent years. In addition to a fast connection, a wireless campus supports a decentred approach to learning, allowing faculty and students to interact wherever they may be. While few substantive studies have examined the ramifications of the new technology for learning, case studies of individual institutions testify to the need to thoroughly plan educational technology initiatives of this kind, and to involve all major stakeholders in consultation. This article examines the importance of planning educational technology projects and the need to consider the pedagogical objectives of such projects prior to implementation.

The introduction of wireless technology in American universities and colleges in the 1990s has had a major impact in higher education around the world. Since Carnegie Mellon University introduced its wireless network, dubbed Wireless Andrew in 1994, the technology has both become more sophisticated and more popular with faculty, students and staff. Wireless technology is becoming a ubiquitous variable in modern university life, and more and more educational administrators are recognizing the need to develop a reliable educational technology environment with it at its base.

Wireless technology can help universities in a range of areas, supporting public safety, improving student and faculty recruitment, and providing educational technology leadership. In order to remain competitive, educational institutions are increasingly looking to campus-wide wireless solutions as part of "must-have" package to attract and retain students, faculty and alumni. 24/7 access to telecommunications and data has become an important recruitment tool that every educational marketing manager wants to have in his armoury. Given these high stakes, education institutions must take a comprehensive approach to developing a campus-wide system, which is ideally part of the overall strategic campus plan.

In the academic year 2003/4 Nagoya University of Commerce and Business Administration (NUCBA) began to introduce one of the first wireless campuses in Japan. In April 2003 *Wireless Ready* signs began to appear on buildings and students' Apple G4 iBooks were issued with integrated wireless LAN cards. The Blackboard Learning System was also introduced to provide an Internet-based Course Management System (CMS) for staff, students and faculty. The Fall Semester saw the integration of an Internet-based Enrollment Management (EM) system that allows staff and faculty to monitor students' course related-data (attendance records, student attainment and grades). The start of the following academic year 2005/6 has seen all Year 1 English major students receive an Apple MP3 player, the iPod Shuffle, with the specific intention that it be used to

motivate faculty and students to use digital audio content and mobile computing to advance English language learning. To enhance the use of multimedia course content, the university has also made Macromedia Breeze software available to faculty for use with Microsoft PowerPoint presentations.

With this educational technology infrastructure, the university has developed a strong link between students' course of study and preparation for the world of employment. Using a network that draws on over three thousand wireless connectors, students can use their mobile phone to request a variety of study-related information: the issuance of certificates, attendance records, credit attainment, lecture cancellations, supplementary lecture information and classroom changes. In fact, all of the student services normally available on campus from the Department of School Affairs, can be accessed by students from their mobile phones or iBooks. Wherever students happen to be on the undergraduate campus, they are able to use the wireless network to reliably access all Internet-based information systems including Library databases and the Blackboard Learning System.

Nevertheless, the development of this infrastructure has often been at the expense of a concern with its pedagogical implications. The secondary role played by pedagogical objectives is increasingly evident in a highly competitive market environment, where showcasing educational technology hardware is often interpreted as more important from the marketing perspective than dealing with its consequences for teaching and learning. This article reiterates the importance of planning a large-scale educational technology project and the need to develop a clear and coherent pedagogical concept. Such an approach will be especially important for the future development of wireless initiatives.

Planning Educational Technology Projects

Research on planning the introduction of major educational technology initiatives raises a number of important issues that educational managers in the field should not ignore if they are to be successful. These range from issues concerned with the relationship between the objectives of technology and pedagogy (Cohen & Bell, 1999; Fishman & Zhang, 2003; Levin & Arafeh, 2002), to implementation (Ely, 1999; Shibley, 2001), the role of staff development (Ali, 2003; Bracket, 1998), as well as criteria needed for the successful introduction of instructional technologies (Harmon & Jones, 1999).

Fishman and Zhang (2003) illustrate a familiar complaint of educational technologists when they argue that planning strategies in educational technology are often based on a discrepancy between "what designers of learning technologies usually intend for their inventions and the actual use of technology" (p. 14). Their discussion corroborates three main findings also evident in other prominent research studies on planning:

1. Most uses of technology in education do not in fact contribute to teaching and learning in any meaningful way. They may in fact be seen as extra-curricular (Earle, 2002).
2. Innovations in Information Communication Technologies (ICT) that are not directly connected to instruction do not benefit student learning (Cohen & Bell, 1999).
3. Teachers do not know how best to take advantage of new technologies so the uses are often not mainstream (Levin & Arafeh, 2002).

As a solution to these shortcomings, Fishman and Zhang argue that if institutions want to "realize the benefits from technology in terms of student learning, it is imperative that they achieve better alignments between their … intentions for technology and its actual use(s) by teachers and schools. One way to do this is through more effective technology planning processes" (Fishman & Zhang, 2003, p. 14). Technology planning is here defined as "a process of developing, revising,

and implementing technology plans in order to guide organizations toward their broader goals." More specifically, technology planning refers to "policy and strategic measures for implementing technology for educational purposes at multiple levels (e.g., national, state, district, school and so forth)" (p. 15).

The resulting document "describes the learning objectives for the use of the technology, implementation strategies (including professional development) … [and] regular evaluation to check to see if the plan is being met" (pp. 14–15). The planning process is positioned as central to the day-to-day organization of the institution: "in the best cases, the physical planning document is but one artifact of an ongoing process in which the manner by which a planning group is convened, input is sought from those who will be affected by the plan, and the work of the planning group becomes integrated into the regular, ongoing planning of the organization" (p. 15). Most plans, however, are created in order to satisfy financial needs or interpreted as external to the institution, whereas they should in fact be seen as an important "subset of regular curriculum planning and review."

Based on these presuppositions, Fishman and Zhang outline four characteristics of successful planning vis-à-vis the introduction of educational technology:

1. *Technology Plans are Policy Documents*: A good technology plan is required to harmonize "instructional and management practices" (p. 15), adding both "direction and clarity" to the process. The technology-planning document should be "developed in concert with other policy documents of an organisation."
2. *Technology Plans Exist at Multiple Levels for Multiple Purposes*: The commitment to an effective planning process requires institutions to adopt a decentralized planning process, which recognizes the multiple layers of institutional, regional and national technology expertise and planning.
3. *Technology Planning is an Ongoing Process*: The policy document should not be viewed as the final stage of the process. The high rate of technological change means that policy documents and plans should always be updated at regular intervals.
4. *Technology Planning Requires Collaboration*: Without collaboration and communication, the technology plan will not succeed. An educational institution is a complex web of positions and responsibilities and collaboration is needed to translate policies into practice. This is especially relevant as many of the people involved are usually non-specialist teachers. Collaboration and partnerships are also needed with agencies and experts external to the institution, as technology is "so complex that external help is needed to stay current about opportunities" (p. 16). Higher Education institutions are perhaps more able to have internal experts; however, this should not hinder them from establishing partnerships with external partners too.

Much current research on the issue of planning makes the point that an "explicit connection between the technical aspects of planning for technology and learning theory of the curriculum needs" to be made (p. 17). In an attempt to do so, Fishman and Zhang classify the existing literature on the subject of planning into three varieties: *Boxes and Wires*, *Vision and Process* and *Pointing Towards Theory*.

The "Boxes and Wires" approach is based on little or no consideration of the pedagogical aims of the project or knowledge of the curriculum. Instead, technology is acquired according to a shopping list approach "without any meaningful connection to how they might be used" (p. 17). This is an *ad hoc* notion of educational technology implementation, which does little to establish or recognize meaningful connections between technologists and the end users.

The "Vision and Process" strategy refers to a more sophisticated stage of technology planning, which as the name suggests, involves developing a correlation between the institution's vision and the overall vision of the technology plan.

The third variety of technology plan, "Point Towards Theory," goes one step further in that the vision and plan are firmly grounded in theory. Consequently, this type of planning is the most useful in that it advocates a "particular pedagogical position" and specifies how the "technology fits with and supports that position." This planning strategy is evident in its commitment to policy documentation and regular cross-party consultation.

As the two earlier notions of planning identified by Fishman and Zhang suggest, every phase requires a more thorough understanding. Ely (1999) focuses in particular on the importance of latter stages, arguing that every major planning model for the introduction of educational technology initiatives contains an under-emphasized *implementation* phase. His article is primarily concerned with the importance of implementation beyond the adoption phase of the planning process. Ely foregrounds the conditions that facilitate a successful implementation process and articulates eight key pre-requisites:

1. *Dissatisfaction with the status quo*: This first pre-requisite provides the impetus for innovation and to search for new solutions to the problem.
2. *Existence of knowledge and skills*: This stage refers to the necessary skills level of the ultimate user of the innovation.
3. *Availability of resources*: The availability of hardware, software, publications etc., necessary for the project's implementation.
4. *Availability of time*: The implementation process requires time so that those responsible for the process can acquire the necessary knowledge and skills.
5. *Rewards or incentives exist*: A reward refers to something given for performance whereas an incentive serves as an expectation of a reward or fear of punishment.
6. *Participation*: This variable refers to shared decision-making, and communication among all parties involved in the process.
7. *Commitment*: Participants must show that they are willing to demonstrate firm and visible evidence that there is endorsement and continuing support for implementation of the innovation.
8. *Leadership*: The final condition is twofold: leadership by the Executive Officer of the organization, and sometimes of a board, as well as project leadership of the day-to-day issues, is required.

According to Ely, further research studies have largely confirmed the existence of these eight conditions, and no significant additions have been made to the list. On the down side, however, no hierarchy has emerged for the eight conditions, and the relative strength and importance of each condition, when considered together, have not been determined.

Ali (2003) also addresses the implementation phase by describing a study in which faculty members from an institution adopting new educational technology were mentored by graduate students in Instructional Technology. Ali's study is based on the notion that "the benefits of technology might not be realized if appropriate designs and teachers' skills and interests are not in place *prior to the introduction of technology*" (p. 51). Following Brackett (1988), Ali argues that "prior to using technology, there should be a reason to consider the need and the way to use it, and only thereafter should it be introduced" (p. 51). The clear implication is that "technology should not be introduced for technology's sake," or merely as a marketing device (p. 51–52). Faculty training programmes should address the emergence of new educational technologies from the perspective

of teaching and learning, and teachers should be continually involved in programmes so that the imbalance in knowledge between themselves and students is reduced. One problem evidenced by the study was that the absence of full-time technical support "results in less interest for technology integration" (p. 52). Additionally a further nine context-dependent problems were identified as a result of the research:

1. Faculty's lack of confidence in integrating technology that students may know more about than themselves.
2. The possibility of encountering technical problems.
3. The time needed for continuous skill development to be too time-consuming.
4. The investment of time could be better used for research.
5. The investment of time in technology and skills that are changing too quickly.
6. Resistance from faculty because the learner-centred instruction implied by the new technology may lead to a diminishing role for the faculty.
7. Technology may therefore be interpreted as a threat to the supremacy of their position.
8. The introduction of educational technology often leads institutions to consider faculty needs to be secondary to that of students and staff. This can in turn create indifference or even hostility to technology by some faculty.
9. Faculty should not be treated under one umbrella, without individualizing the needs, abilities, and interests of each member.

These problems point to the need for a "reassessment of current practices of technology implementation" (p. 53), such that new procedures should be encouraged in this area. Ali concludes by offering the following recommendations arising from the research study:

1. Faculty should be trained to use educational technology *before* it is provided, and certainly before it is expected to be used by students.
2. Adequate technology support should be provided to faculty for an ongoing process of training.
3. Faculty should have the freedom and the will to use technology in their classes.
4. There is a need for greater institutional support for faculty, students and staff throughout and immediately following the introduction of such projects.

Across all four areas the main presupposition of Ali's findings is that "for technology to be successfully used by faculty, there is a need to change the focus from providing technology first to *training faculty first*" (p. 53).

Harmon and Jones (1999) continue the theme of implementation by considering the conditions that would facilitate the effective introduction of Web-based instruction (WBI) as an example. They outline a model based on five levels of web use and a variety of factors that should be considered to determine which level is appropriate. These five levels, representing a continuum from basic occasional use to advanced continual use, are:

1. *Informational*: This level consists of providing usually administrative information to the student with little or no course content. The material refers to items such as a syllabus, course schedules, and contact information.
2. *Supplemental*: This level provides supplemental course content such as course notes and handouts. The use of materials in PowerPoint are examples of this level. Instructors require slightly more technical competence and are required to update their site on a daily or weekly basis.
3. *Essential*: This stage means that the student "cannot be a regular or productive member of the class without regular Web access" (p. 29). Most, if not all, of the course content

is accessed from the online learning environment. Instructors are likely to have skills in HTML, instructional design, graphic design and information literacy. Students will meet face-to-face at this level, as well as on the Web, but they are required to "take a more proactive approach to ensuring their own learning."

4. *Communal*: Students meet face-to-face and online and often generate much of the course content themselves. Teachers and students will be using Internet chat, bulletin boards, and even video conferencing, and have higher level skills than those at level 3.
5. *Immersive*: Classes meet exclusively in an Internet-mediated learning environment. All discussions and interaction takes place online, which is akin to a virtual learning environment. At this level, learning often consists of learner-centred, constructivistic pedagogies, and both instructor and students must have a high level of technical expertise and sophisticated learning strategies.

As shown in Table 1, in addition to these five levels, Harmon and Jones have articulated a further eleven factors that are used to influence the desirability of web-based instruction.

Table 1: Factors and Levels of Web-based Instruction (WBI)

FACTORS	*LEVEL 0*	*LEVEL 1*	*LEVEL 2*	*LEVEL 3*	*LEVEL 4*	*LEVEL 5*
Distance	Low	Low	Low	Medium	High	High
Stability of Material	Stable	Stable	Stable	Dynamic	Dynamic	Dynamic
Need for Multimedia	None	Low	Low	High	High	High
Need for Student Tracking	None	Low	Low	High	High	High
Number of Students	Large	Large	Large	Large	Small	Small
Amount of Interaction	Low	Low	Low	Low	High	High
Social Pressure to Use Web	None	High	High	Medium	Low	Low
Need for Offline Reference	None	Low	Low	High	High	High
Infrastructure	None	Low	Low	Medium	High	High
Comfort Levels	None	Low	Medium	Medium	High	High
Access	None	Low	Low	Medium	High	High

These factors "play the largest role in determining whether and at which level to use WBI" (p. 29). The eleven factors can be summarized as follows:

Distance: This variable refers to the impact of geographical proximity on the instructor and students.

Stability of Material: This refers to the type of materials being used. For example, high stability is provided by textbooks rather than via a network or screen. The Web does offer the advantage of being able to update information more frequently, a factor that can save time for distribution and money.

Need for Multimedia: The need for a combination of pictures, text, graphics, sound and video can range from low to high. The Web offers a good platform for hosting multimedia content.

Need for Student Tracking: This refers to the collection of data about student progress, learner attributes and grading. The Web is well-suited to collecting and displaying student record information of this type.

Number of Students: The number of students is an important determiner of the type of learning

environment to be used. Harmon and Jones point out that "the more students a course has, the lower the level of WBI that is appropriate" (p. 31).

Consequently, they recommend that a single instructor should have between 10 and 20 students under his supervision in an ideal teaching situation that draws heavily on the use and integration of an educational technology learning environment. Levels One, Two and Three therefore have larger numbers of students. Levels Four and Five, where more interaction is required, need smaller class sizes.

Amount of Interaction: Similarly, more information-oriented or didactic courses are normally located at Levels One, Two or Three of WBI. More interactivity is found at the higher levels.

Social Pressure to Use the Web: Many developments in WBI are driven by increasing social pressure to make pedagogical institutions fit with the changing times. Institutions that do not keep up with the latest developments are considered old fashioned. In such an environment, educational technology should be introduced for good pedagogical reasons.

Need for Offline Reference: The Web provides a great deal of content-rich learning materials and resources. While much of it exists without the need for the teacher to construct it, he does have to manage access to it and provide resources in a clearly defined strategy.

Infrastructure: The institutional infrastructure needs to be in place so as to be able to deliver the course content and to provide the necessary technical support for faculty and students.

Comfort Levels: Faculty, students and administrators require the relevant training so as to be able to have appropriate levels of comfort with the learning environment.

Access: This final variable focuses on providing appropriate access to instructors and students. For example, is the learning environment campus only? Do participants require access from home, office and on the road as well? Technical support needs to be available for all eventualities so as to maintain the functioning of WBI.

Harmon and Jones foresee that the non-use level will cease to exist in the future but the other five will continue to remain consistent and relevant. Responsibility for the different factors will exist at different levels within an institution. Likewise the eleven factors will be subject to technological changes and thus malleable, according to the rapidly changing context of educational technology.

Should these factors outlined by Harmon and Jones be largely ignored, then a poor implementation process will result. Shibley (2001) continues to focus on what contributes to such an outcome by exploring a number of contextual factors. While substantial sums of money have been poured into educational technology initiatives around the world, the lack of adequate staff training and the absence of clear pedagogical objectives have seriously hindered successful implementation. The failure of a variety of leading projects demonstrate that implementation is often concerned with the technology first and education much later, if at all. Shibley's study of responses to President Clinton's e-learning initiatives in 2000 mirror those found in Great Britain in that the widespread availability of funds to connect pedagogical institutions to the Internet and introduce more educational technology into classrooms across the educational spectrum have seriously underestimated professional development, planning and target markets. Such a conclusion is evident, for example, when one considers the failure of the UK's e-University initiative, in which fifty million pounds of government money was lost (MacLeod, 2004). As Shibley argues, educational institutions can "have the best software ever made and access to the Web on every computer. But it won't see much difference in student learning … unless its teachers know how to use the digital content in their classroom" (Shibley, 2001, p. 62). To avoid such consequences, effective planning has to be met at every stage in the developmental process with

a broad consultative approach, that seeks to integrate all major stakeholders and find appropriate connections between educational and curricula objectives.

Conclusion

It is clear that the university campus of the future will be filled with many mobile and wireless devices, a higher degree of connectivity and greater collaboration. How will it be possible to make sure that pedagogical considerations rather than technological on market initiatives are primary? As the brief review above demonstrates, tomorrow's university educators do not necessarily see technology as the whole answer to initiatives such as the wireless campus. Rather, it is in fact only part of the solution. Along with the introduction of new hard- and software, increased bandwidth and innovation, educators should remain focused on the people, the educational partnership process and pedagogical considerations. This conclusion serves as a reminder that no matter how wireless technology rapidly changes the future landscape of the university campus, it remains only part of a learning equation that must be based on effective planning and pedagogical processes.

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