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PUBLISHER'S DECLARATION

Research and innovation in teaching and learning are prime topics for the *Journal of Instructional Technology and Distance Learning* (ISSN 1550-6908). The Journal was initiated in January 2004 to facilitate communication and collaboration among researchers, innovators, practitioners, and administrators of education and training involving innovative technologies and/or distance learning.

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Editorial

From Theory into Practice

Donald G. Perrin

When I started to research the topic, from Theory into Practice, for this month's editorial, I found a perfect example. If this tool had been available when I was training teachers, they would have mastered the writing of performance objectives in a fraction of the time.

I was impressed to see Wikipedia Commons and Creative Commons permissions for educational use! I was especially delighted to see recognition for the author, K. Aainsqatsi. Unfortunately the link is awaiting a connection

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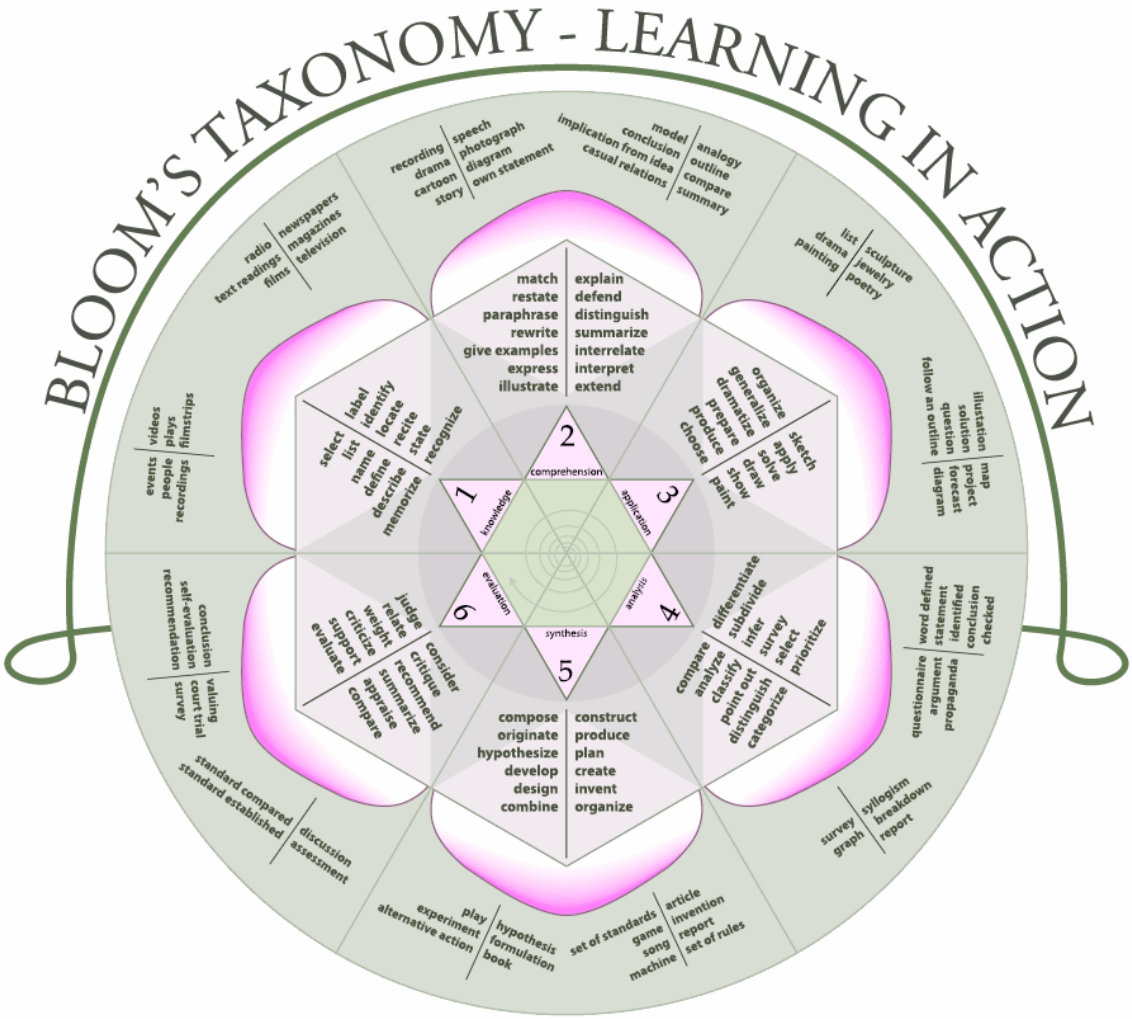

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INVITED ARTICLE

Periodically, IJITDL editors identify articles of special interest that deserve immediate widespread attention and discussion. This article envisions the importance of technology and distance learning to offset budget reductions and improve the quality of teaching and collaborative learning in higher education. Dr. Bates argues for radical change in the academy to increase cost-effectiveness of post-secondary education. He suggests concrete ways in which cost-effectiveness can be improved and identifies barriers that prevent e-learning from being used to improve the cost-effectiveness of public systems of higher education.

Can or Should e-Learning Improve the Cost-Effectiveness of Higher Education?

Tony Bates, Tony Bates Associates Ltd
Canada

Is e-learning failing to meet expectations?

There is a growing feeling among some important commentators that e-learning is failing to meet expectations in higher education. David White, Director, EU Commission DG Education and Culture, Lifelong Learning, in his keynote presentation Innovative Learning for Europe at the 2008 EDEN conference in Lisbon, expressed his concern about the lack of return on investment. He pointed out that national governments and the European Commission have invested over a billion dollars in Information and Communication Technologies (ICTs) for education, but have seen little change or improvement as a result.

The other related issue is the lack of innovation. The World Economic Forum's Global Advisory Committee on Technology and Education at its meeting in Dubai (November, 2008) commented:

> *'Education is in a state of transition from a traditional model to one where technology plays an integral role. However, technology has not yet transformed education'.*

In particular, although there are many innovative 'projects', often dependent on the work of inspired and hard-working individual instructors, and although many institutions have put in place learning technology and faculty development initiatives, there appears to be little systemic change (see Sangra, 2008). As the Canadian Council on Learning (CCL) puts it: 'The growth of e-learning has not significantly altered the way in which Canada's institutions organize or deliver learning.' Nor is this peculiar to Canada.

The CCL report concluded that Canada is falling behind other countries and the adoption of e-learning is slower than predicted. Both statements were made without any conclusive evidence. However, perception is as important as reality in this business, especially when investment in technology is dependent on public funding and support. In any case, Terry Anderson, a Canadian research chair in e-learning, in response to the CCL report, commented in his blog that he was saddened by Canada's 'lost decade in e-learning'.

Thus, while plenty of evidence (e.g. Allen and Seaman, 2008; Instructional Technology Council, 2008) can be provided to show that computers and the Internet are now widely used by a majority of faculty and students in post-secondary education, there is also at the same time widespread dissatisfaction with the results.

Expectations for e-learning

I think the first thing to examine is whether expectations about e-learning – defined here as the application of information and communications technologies (ICTs), and in particular computers and the Internet, for teaching and learning – are realistic.

First, it should be appreciated that there are many different stakeholders in post-secondary education: learners, instructors, educational support staff such as instructional and web designers, IT support staff, senior managers, government and employers. You can probably think of others, as well, e.g. parents of students.

Each set of stakeholders brings different expectations about the role and use of technology in teaching and learning, and these different stakeholders will have different values that will influence their evaluation of e-learning's effectiveness. Nevertheless, it should be possible to collect the different rationales for e-learning, and examine the extent to which expectations have or have not been met.

Below are some of the more common rationales or expectations for e-learning that I have encountered, both in the literature and in discussion with different stakeholder groups.

Possible goals for e-learning

1. Increase access to learning opportunities and increase flexibility for students.
2. Develop skills and competencies needed in the 21st century to ensure that learners have the skills required for their discipline, profession or career.
3. Meet the learning styles and needs of millennial students.
4. Improve the cost-effectiveness of the post-secondary education system.
5. Stay at the leading edge of educational technology developments to digitalise all learning and respond to the technological imperative.
6. De-institutionalise learning to enable self-managed learning.

In my blog (http://tonybates.ca), I have discussed and 'graded' e-learning on each of these goals, but in this article, I want to focus particularly on goal 5: improving the cost-effectiveness of the post-secondary education system, because it could be argued that all the other goals could be subsumed under this one broad goal. Indeed, I will argue that this is the most important and valuable of all the goals for e-learning, but is the one that is furthest from being achieved.

Using e-learning to increase cost-effectiveness

To understand the rationale for this goal, it is necessary to look at the recent history of post-secondary education. It will be argued that universities and colleges have not changed their organizations and structures sufficiently to accommodate to the new realities facing higher education. Information and communications technologies provide opportunities and potential for both improving the effectiveness, in terms of better qualified graduates and higher completion rates, and also for reducing unit costs, i.e. the cost of each graduating student. However, this cannot be done without major changes to post-secondary educational institutions.

I will make the argument for radical change in the academy, in order to increase the cost-effectiveness of post-secondary education, I will suggest some concrete ways in which cost-effectiveness could be improved, and will look at the barriers that are preventing e-learning from being used to improve the cost-effectiveness of the system.

The problem

Why do universities need to change? I think there are several compelling reasons.

From elite to mass higher education

Up until the middle of the 20th century, entrance to university in many countries was limited by and large to a small, elite minority of upper class or rich middle class students. As late as 1969, less than 8 per cent of 18 years olds (children born in 1951) were admitted to university in Britain (Perry, 1976). As a result, teaching methods in particular were suited to what today would be considered small classes, even at the undergraduate level, with seminar classes of 20 or less and even small group tutorials of three or four students with a senior research professor for students in their last year of an undergraduate program. This remains today the 'ideal' paradigm of university teaching for many professors and instructors.

In the USA and Canada, the move to a mass system of higher education began earlier, following the Second World War, when returning servicemen were given scholarships to attend university. For the last half of the twentieth century, access to universities and colleges expanded rapidly. For a mix of social and economic reasons, from the 1960s onwards, governments in Europe also started again to expand rapidly the number of university places. By the end of the century, in many Western countries, more than half the 19 year old cohort were admitted to some form of post-secondary education. (In 2006, 55% of Canadians between the ages of 25 and 34 had completed a post-secondary program of study – OECD, 2008.)

This represents a massive increase in numbers and governments are spending ever more each year on post-secondary education. However, they have not been able or willing to fund staffing of universities and colleges at a level that would maintain the low class sizes common when access was limited. Thus in many North American universities, there are first and second year undergraduate courses with more than 1,000 students, taught mainly in large lecture classes, often by non-tenured instructors or even graduate students. At the same time, undergraduate completion rates (the proportion of students who enter a four-year degree program who go on to complete the degree program within six years) remain below 60 per cent in the USA for many public universities (Bowen, McPherson, and Chingos, 2009). In other words, universities are failing a significant number of students each year.

With this widening of access to post-secondary education, the diversity of students has increased immensely. The biggest change is in the number of older and part-time students (including students who are technically classified as full-time, but who are, in fact, also holding down part-time jobs to pay for tuition fees, books, and living expenses). The mean age of students in North American post-secondary education institutions now stands at 24 years old, but the spread of ages is much wider, with many students taking longer than the minimum time to graduate, or returning to study after graduation for further qualifications. Many are married with young families. For such students, academic study is a relatively small component of an extremely busy life style. By definition, many of the students who now attend university or college are not in the top ten per cent of academic achievers, and therefore are likely to need more support and assistance with learning. With the growth of international students, and increasing numbers of students who are either recent immigrants themselves, or children of immigrants, there are now wider differences in language and culture which also influence the context of teaching and learning.

Lastly, in most economically advanced countries, the unit costs of higher education have steadily increased year over year, without any sign of abating. Between 1995 and 2005, average tuition and fees rose 51 percent at public four-year institutions and 30 percent at community colleges in the USA (Wellman, 2009; Johnson, 2009). The average cost per student per year in tertiary education (excluding R&D costs) in the USA in 2006 was just over $22,000 per student (OECD, 2008, p. 202). Thus although there are now many more post-secondary students, the average cost

per student continues to increase, putting excessive pressure on government funding, tuition fees, and hence costs to parents and students. More disturbingly, these increases in overall costs have not been matched by similar proportions of spending on direct teaching and learning activities (such as increasing the number of faculty). Most of the increased costs have gone into other areas, such as administration, fund raising, and campus facilities (Wellman, 2009). Thus post-secondary education has become larger, more costly, but less academically efficient.

The predominant teaching model

Yet, despite the larger classes and the increasing heterogeneity of the student body, the predominant organizational model of teaching is the same today as in the nineteenth century. It is no wonder then that unit costs are increasing. Modern universities and colleges still have many features of industrial organizations (Gilbert, 2005). For instance:

- Classes are organized at scheduled times in a fixed location on the assumption of full-time attendance.
- Students receive (at least within the same course) a 'standard' or common product, in terms of curriculum (same lectures, same reading lists, etc. for each student in the course), delivered at the same time and place, irrespective of the needs of different kinds of students (full-time, part-time, working), following Henry Ford's classic model-T car strategy: 'you can have any colour you want, so long as it's black'.
- To deal with large classes, another classic industrial strategy is used: hiring low-paid and less 'qualified' workers – adjuncts and graduate students – to take up the extra load.
- The institution is divided into departmental silos, with a hierarchical management structure of heads or directors of departments, deans and vice-presidents. Academic staff is also organized hierarchically: research student, post-doc, associate professor, full professor, departmental chair.
- The Spellings Commission in the USA (US Department of Education, 2006) even pushed (unsuccessfully) for standardized measurements of output, to allow comparison in 'performance' between institutions, reflecting a classic industrial mentality of 'standardized' products.

Program delivery

The 'old' university is built around the delivery of programs through campus 'residence', i.e. the physical attendance of students at lectures, seminars, libraries and labs. ICTs now though enable students to access information and services, including interaction with instructors and other students, at any time and any place. Programs can now be delivered in a variety of ways to an increasingly wide variety of students, through face-to-face, blended or fully online learning.

Furthermore, instructors no longer have to create all their teaching material from scratch, and duplicate the process every year. They can increasingly select 'ready-made' modules of free, open access online teaching materials, and organise teaching and learning around the vast resources now available over the Internet. Even better, as we shall see in the next section, they can give learners the freedom and responsibility to select the learning materials that they feel to be of interest and relevance.

Given the potential and benefits of digital learning, a radical re-thinking of the benefits and limitations of physical presence, related to the nature of the subject matter and the type of learner being targeted (e.g., high school leavers or lifelong learners, full-time or part-time students) is needed.

Learner-centered teaching

The recent development of web 2.0 and mobile technology tools, such as blogs, YouTube, mobile phones and cameras, virtual worlds, and e-portfolios now enable learners to collect, create, transform, and adapt their own learning materials (Lee and McCoughlin, in press). These tools can be used for collaborative learning, group work, projects, problem-solving, and creative thinking, all skills needed in a knowledge-based society.

These tools enable the role of the instructor to change from that of a provider and controller of knowledge, to one of facilitator and guide. Increased time spent by learners on active online tasks and peer collaboration is one way to deal with the massification of higher education, allowing for greater personalization of learning and increased motivation, while at the same time controlling the workload of the teacher. These tools allow work to be shifted from the teacher to the learner. Learners can spend more time on task, interacting both with digital content and with fellow students. However, for this approach to succeed, radical changes to the standard mode of teaching are needed.

Managing, administering and organizing the institution.

Universities and colleges are organized around the benefits and constraints of a physical campus. However, information and communications technologies enable the institution to be managed, administered and organized quite differently. There are increasing moves to student self-service, through online admission, course registration, fee payment, and ordering and delivery of learning materials, not just to save money, but to provide more flexible and better service. Student, faculty and staff digital identities allow for single log-in and secure access to appropriate programs, services, and resources. New business intelligence tools allow for the distribution of information to faculty, staff and managers at all levels to better inform decision-making (Katz, 2008). Many universities and colleges are making moves in these directions, but they are more often piecemeal and uncoordinated, and are not driven by any new vision of the academy and how it should provide services.

The need for experimentation, innovation and vision

The challenge then is to square three competing factors: increasing access, increasing quality or improving outcomes, and reducing costs. Can technology provide the fourth side of the square?

Many universities and colleges will argue that they are experimenting, innovating and have vision with regard to the use of technology for teaching and administration, but what they are mainly doing is accommodating technology to the traditional model. Many professors and instructors are incorporating technology into their on-campus classroom teaching, and enrolments in fully online courses are growing rapidly. Nevertheless, both of these are a perpetuation of older models of teaching and learning.

Tierney and Hentschke (2007, pp. 13-14) argue that:

> *'innovation in higher education has remained within a socially constructed framework where the innovators have tended to accept the parameters of traditional higher education and have worked within them…..As with all social constructions, deviations from these norms are relatively minor, in large part because those who participate in the construction have difficulties imagining ways much beyond the status quo….'*

They argue that traditional universities and colleges seek ways to integrate new technology within the parameters of the traditional model, and look for changes at the margins, in a slow and incremental manner, that sustain the existing goals and values of the organization. Thus technology is being 'accommodated' to the prevailing model, not changing it.

What is lacking is a systematic, pedagogically-based approach that attempts to fit the design and delivery of courses and programs to the needs of an increasingly large and diverse student population. For instance, older, part-time workers are increasingly making up a large proportion of students, and this trend will increase further over the next ten years (see Hussar and Bailey, 2009). Many will not want to come on campus at all. But many professors see distance or adult students as 'extra' to normal teaching load. They already feel they have too many students to teach, and adding lifelong learners just makes matters worse.

I need not go into the argument made recently by Margaret Wente, a columnist in Canada's Globe and Mail newspaper, that professors have too light a teaching load (averaging around six hours a week). I happen to believe that the majority of university and college instructors (tenured or contracted) work very hard at teaching, when course and lesson preparation, student assessment, hiring and supervising adjunct faculty, and counselling students are all included. In research universities, teaching is supposed to count for no more than 40 per cent of their activities, and there are strong arguments to be made that good teaching and research reinforce each other in higher education. Time must be found for both. Thus professors are caught in a vicious cycle, and it is time to break out of that cycle. They do not need to work harder at teaching, but they do need to work smarter.

However, this cannot be done without major changes, without experimentation on a much larger scale than we have seen up to now – in other words, it cannot be done without disruption. Furthermore, these changes are needed, whether or not technology is the answer. So technology alone cannot improve cost-effectiveness; it needs to be linked to new visions for the university, to leadership, and to change management.

Identifying the problem with higher education in the 21st is the easy part. Much more difficult is finding solutions to the problem.

Open universities as an alternative model

John Daniel (1998) has argued that the very large open universities have managed to increase access, lower costs per student, and change the teaching and organizational models, while maintaining quality. Open universities have done this mainly by using mass media, such as print and broadcasting, which enable economies of scale.

However, the issue here is quality – the large economies of scale are achieved mainly through reducing the interaction between teacher and student. Without strong learner support, drop-out rates from open universities are massive – often over 90% (Belawati, 1998). To provide adequate learner support, local face-to-face study centres, or online discussion forums, need to be introduced, but these mean more instructors or tutors are needed and costs go back up.

Nevertheless the change of teaching model and the use of technology has enabled open universities, with good quality learner support, to operate somewhat more cost-effectively than traditional universities, even on the basis of cost per graduate, while maintaining a good degree of quality (the O.K. Open University for instance usually ranks highly in specialist league tables looking at research, teaching quality, and student satisfaction.)

However, open universities are specialist distance teaching universities serving a somewhat different profile of learners from campus-based universities, although in recent years differences in mandate and student profile between traditional and open universities have become increasingly blurred. In any case, the open university model itself is now 40 years old, and was designed for an era when access to traditional universities was much more restricted, and was based on technologies that did not include computers, the Internet, or mobile phones.

As with traditional universities, open universities have adapted to the new technologies, but they are not a comfortable fit – for instance, most of the undergraduate programs at the U.K. Open

University, Athabasca University, the FernUniversität, UNISA, and many other open universities are still primarily print-based. The few open Universities that are now fully online, such as the Open University of Catalonia in Spain and Universidade Aberta in Portugal, have found that they need a completely different course design model from the older print-based model.

No, what is needed is a new model for the university that takes lessons from both traditional and open universities, that fully exploit new technologies, and which assures quality as well as access at an economical cost.

Mission

I am not arguing for major changes to the traditional mission of a university, which I would define as the preservation, creation and dissemination of knowledge, manifested through research, teaching, and public service. However, the balance between these activities may vary depending on the goals and mandate of particular institutions – as it does now.

Some, indeed, would challenge the traditional mission of the university as an anachronism. Knowledge is now created through networks and the Internet, through argument and discussion. However, I believe that this is a dangerous argument. Although the Internet can speed up immensely the dissemination of information, and open networks can add value to what we know, much of what gets into the public domain as grist for discussion is often initially generated by research and analysis conducted in the universities.

Indeed, the validation and assessment of 'general' knowledge, the scientific conduct of research, and critical analysis of popular thinking, will become even more important functions for the university in the age of the Internet. Thus one might add a fourth pillar to the current mission: 'knowledge referee', in the sense of challenging arguments that are not based on or are contrary to established facts, or ignore inconvenient data, or misrepresent or ignore minority views, etc.

Building visions for a modern university

I deliberately use the word visions in the plural. Although there is variety in the focus of different higher education institutions, for example between large research universities, small liberal arts colleges, polytechnics, two year community colleges, they all follow a somewhat similar model of teaching and institutional organization.

I believe we need much more variety in institutional structures and models of educational delivery than we have at the current time. We need in other words more innovation and experimentation if the challenge of greater access, greater quality and lower cost is to be met. Only through experimentation, trial and error and a certain amount of risk-taking are we likely to find new models that 'work' in that they achieve the three goals stated: more access, better quality, less cost.

This means we need lots of different visions of what a university could be. We also need those visions from the perspectives of different stakeholders – government, research scientists, dedicated teachers, employers, students, and, increasingly, professional staff such as registrars, librarians, instructional designers, web designers, and IT managers.

We have heard calls for changes, from different stakeholders (mainly external to the university) but where are the visions for the future? Unless we try to identify what we want, how can we possibly achieve it? Certainly, in my vision for the future there will be a greater variety of models for the university and especially for how we deliver teaching and learning.

What should universities look like in twenty years?

What is my vision for the university of the future, one that addresses the challenges of increased access, better quality and lower cost? My view is that technology is a useful tool for creating a new kind of university, but much more important are structural and cultural changes in which technology will play a supporting role. Without these cultural and structural changes, technology cannot change the university on its own.

Visions can be described at different levels of generality and specificity, and from different stakeholder perspectives. So I will start with a somewhat general vision from a learner's perspective:

> *My university will be my guide and facilitator for higher education throughout my life. It will not only provide me with knowledge, courses, programs and qualifications itself, but will also help me access the learning opportunities I need from other quality providers.*

How might this work out in practice? Well, let's follow the life of this learner.

Pre-university

> *In my last two years at high school, one of my teachers advised me on possible programs and courses, based on my interests and abilities. Before I made a decision about a college program, I was able to enroll online as a guest student in three courses from three different universities I was interested in. Two courses, math and biology, I was studying for high school completion, and were offered by my local university in Cape Breton. The third course, on marine biology from the University of Vancouver, was new to me, but I really enjoyed it, and I also liked the teaching, because I could go to my local beach, and video and photograph material for a project in the course, which counted towards my high school completion. I therefore enrolled online for the University of Vancouver. This was a big move for me, because I had to leave home in Cape Breton and travel across the country.*

First year

> *The best part though about enrolling at the University of Vancouver was that even in the first year, I could do about half of the program from home. I decided to start all my courses in January. I stayed with a friend when in Vancouver, and went to campus about twice a week, for the first six months of the year, mainly for the practical work in the labs, so I got a small part-time job in Vancouver that helped cover some of my expenses. For the last six months, I was able to take the rest of my courses from home in Cape Breton, which worked really well for the biology course, as I was able to collect and record specimens from the local shoreline that were different from many of the specimens from other students. Since my mother is not very well, I felt really good about this arrangement, as I could look after her, although I did go back to Vancouver for the last couple of weeks of the course, just before the Christmas break.*
>
> *The courses were interesting. In my group of 20 students in marine biology, there was one, like me the year before, from a local high school, eight other first year students, four second year students, two third year students, two fourth year students, a graduate student, and three people who were working. These three already had degrees but had not done this course, which focused on the impact of waste management on coastal waters. The working students were great, giving me lots of help with stuff I didn't know. We had to do a research project, and the graduate student was our main guide on this. I didn't see much of the professor on campus after the first couple of weeks, but she occasionally jumped into our online discussion forums and once or twice really helped me out with my research design. However, there were about fifteen other groups that she*

had to look after, as well, but the grad student usually got us through, because the course was really well organised. Most of our reading in fact was done online, accessing materials on waste management and marine biology from all over the world. Our professor and the grad student had found a lot of it for us, but towards the end we were finding lots of new stuff for ourselves that related to our specific research projects. There were only three actual lectures on this course, all from the professor, and they were terrific. I missed the middle one because I was in Cape Breton, but it was recorded like the others so I just downloaded it. The prof had also made lots of short videos, showing stuff she was doing for her research, then giving us links to notes about the videos, related research articles and her own web site. I found this really useful when I came to do my own research design. The hardest part was writing up my research report for the end of course assessment. I had too much stuff – photos, videos, data, and real stuff, too, like oil-stained feathers, and had to leave a lot out – but I was able to get it all online in the end. The grad student did the first run at the assessment, but because I got a really good grade, the prof also reviewed it, so I can now concentrate on marine biology for the rest of my degree. However, I need a bit of money, so will take a break then re-enroll in the April second year cohort. (I just find it too hard to work and study at the same time).

Masters program

Well, I made it through my undergraduate program. The last year was really hard work, as my group had a really big research project to manage, and I spent quite a bit of time helping out some of the other students. Vancouver didn't have quite the graduate program I wanted. I'm pretty clear now what I want to do, but a couple of the courses I want are from San Diego State University and some others are from Florida State University. I'm going do the research data collection mainly in Cape Breton, but I really wanted my prof at University of Vancouver as the supervisor for my dissertation. Fortunately the University of Vancouver has an agreement that allows me to take the courses from San Diego and Florida, mainly but not entirely online, and transfer them in, so I can keep my supervisor. (I think she wants me to do a Ph.D., but I'm not so sure about doing that.) As I really need to bring some money in now that my mother's died, I'm going to spread the masters over two years, and even better my supervisor's arranged for me to work part-time as a consultant for a local waste management company, so even when I'm working it will all feed into my dissertation. I'll also get a little bit of money for teaching part-time in the undergraduate program, which I will really enjoy – you learn so much from the other students' projects.

Out to work

Well, in the end it took me three years to finish my masters, mainly because I was offered a really good full-time job with the waste management company at the end of the first year. I'm now responsible for waste water environmental control. My prof was really disappointed that I didn't go for the Ph.D., but the work is really fascinating, and one day I will probably do a Ph.D. because there's lots of stuff we still don't know in this area. In fact, I'm now taking a management program online from Athabasca University, which takes about all of my spare time. Again, though, I'm able to do the face-to-face group work on change management on campus at the University of Vancouver, over four weekends, as the group work is also a part of the Vancouver MBA program. My prof put me on to this and helped me work it out between the two universities. I'm also still teaching online in one of the university's graduate marine biology courses – technically, I'm classified as a mentor – but I don't do it for the money, which barely covers my expenses. I just keep learning so much from the students' projects and I like helping them out.

Implications for the university

The next step is to move from the vision to the practical implications. So here are some of the implications from my vision.

1. Abolition of the semester system. In my vision, students can start – and finish – courses at different times of the year, although I would limit them to three or four start and end times, to enable groups to cohere during the course. Some courses would stretch over a year, and would be worth 12 credits; others – especially foundation or prior knowledge modules – would be shorter, some as short as a week.
2. Since course materials or content are constantly changing – many sources will be off-campus – courses will be built around learning outcomes, such as research design, critical analysis, knowledge management, within broad topic areas.
3. Courses would be designed to accommodate a range of students, from those still in high school to those already graduated. There would be a strong emphasis on collaborative learning, group work, and student mentoring. The professor will define very carefully the roles and expectations for different kinds of students/mentors in each group.
4. The teaching will focus on getting students to do the work: finding material, organizing it, reporting it, evaluating it, using digital technology to create portfolios of work, and participating in peer assessment. Students would be assessed on their progress through the course, as displayed by their work.
5. Large undergraduate courses (over 250) will have one or two full professors, supported by graduate students and off-campus mentors (graduates of the program now in the workforce), an instructional designer and digital technology support staff. The course will be designed and delivered as a team. The professor(s) will be academically responsible for the course, setting learning outcomes, determining the scope of content coverage, and managing the assessment of students. This will entail setting criteria and rubrics for the measurement of learning outcomes, and ensuring standardization in marking between the graduate students and mentors. Most assessment will be done by the graduate students and mentors in undergraduate classes, monitored by the professor(s), and with some peer assessment by students.
6. Large classes will be broken down into small groups of 20-30 students, each led by a graduate student or mentor. The professor(s) will move between the groups (both in face-to-face and online contexts), monitoring the work of the mentors, and occasionally participating in the discussions. Professors will also create learning materials that relate specifically to their research that links to the course topics. All such material created for teaching will be open content. Generally for undergraduate teaching one professor will be responsible for a maximum of 250 students or 10-15 groups. However, the concept of a 'class' will become blurrier, since students will be able to opt in and out more (see (7) below), depending on their needs.
7. Assessment methods will vary, but it many cases it will be through 'proof of learning', either in the form of mainly authenticated electronic portfolios of work, or by challenge. In the latter case, students may opt to take an examination when they feel they are ready. They may not follow the set curriculum, but can opt to meet the published assessment requirements through a supervised or proctored examination, or through a submission of an authenticated portfolio of work. Portfolio work will be

authenticated by graduate students or mentors who have been accredited to work with students.

8. All Ph.D. students will receive up to six months training in teaching and learning, as well as research techniques, as a pre-requisite for tenure. Students taking masters courses who wish to act as mentors, as well as those who have graduated and are in the work force who wish to be mentors, will receive up to three months training in teaching, embedded within their studies.
9. Most universities will belong to consortia, which allow for automatic credit transfer of courses or modules/credits from other consortium members into their programs. There will be many different consortia reflecting the growing diversity of higher education institutions. Many of these will be international consortia.
10. Costs will be driven down in several ways: professors focusing on overall program design, supervision of assessment, and supporting adjuncts, graduate students and mentors in their teaching; students working within a managed learning environment, with more experienced students helping the less experienced; use of low-paid mentors from the workforce, who benefit from the contact with the research in the university; use of graduate students, who spend as much time mentoring and teaching as researching; use of technology to improve communication, and ensure that everyone (professor, graduate students, mentors, students) is aware of what is happening in teaching and learning within a program.

You probably don't like this vision – great, think up your own! Visioning is best done as a group activity, involving different stakeholders, and not giving too much attention to current reality and constraints. We need lots of different visions, because so much is now possible.

Barriers to change

Satisfaction with the basic traditional university model

Despite lots of usually justified grumbling by faculty about overwork, too large classes, and increasing amounts of time spent on bureaucratic form-filling for accountability exercises, the basic model of teaching through classrooms on campuses with fixed schedules and timetables is generally accepted as the 'best' one. All that is needed are more resources for more professors and smaller classes. However, for most post-secondary institutions in even the most economically advanced countries, we have seen that this is not going to happen.

The status of Ivy league universities

The closest to the ideal model for the majority of academics, students and the public are the traditional Ivy League universities: Harvard, Yale, Oxford, Cambridge, etc. There is no denying that these offer, in the main, first class university education. Students have relatively close contact with the 'best minds', have small classes and excellent facilities. More importantly, access to these universities opens doors to top quality jobs and influential social and cultural networks. It would be madness for these institutions to change radically. They have a largely unassailable competitive advantage. They are well funded, have enormous student demand for places, and great prestige with governments and the public alike.

The problem though is that too many other institutions wish to aspire to this model. The importance paid to university rankings and mission statements such as 'to be one of the 100 top universities in the world' are symptoms of this aspiration. The Ivy League institutions are by definition elite institutions. It is not a model that can be economically reproduced in very large numbers, and certainly is not a model that can be reproduced with the kind of resources most public institutions are likely to access. It is with these less well-funded public institutions where

the real problem lies. They cannot serve large numbers well by using a watered down version of traditional teaching. As a result, many students are getting a poor deal.

The solution then is not to abolish the still valuable if elite and socially divisive Ivy League universities, but to find models that better serve the vast majority of university and college students. This, though, is a challenge if such institutions try to ape – and ape badly – the Ivy League institutions.

Governance

When it comes to using information and communications technologies to improve the cost-effectiveness, the governance system of universities militates against major change. For good reasons, in most economically advanced countries, universities are relatively independent of government. Basically the attitude of universities to government is 'Throw the money over the wall and go away.' Governments in some countries have responded to this by demanding greater accountability (e.g. the Spellings Commission in the USA, the Quality Assurance Agency in the UK, and Degree Quality Assurance committees in Canada.) However, these agencies or commissions do not have the mandate to challenge the basic model – they just want to be sure that the existing model is running as well as possible.

Also, in the last 10-20 years, governments have by and large retreated from creating alternative models such as the open universities established in the 1970s and 80s. Where they have attempted to establish new models – such as the UK's e-University – they have often been disasters. The policy in recent years, especially with regard to ICTs, is to hope that the integration of ICTs will lead to change within existing institutions. As we have seen, by and large, this hope for major structural changes has largely been disappointed.

But the real hope for change has to come from within the more traditional, state-funded public universities, simply because that's where the majority of university students are, and where the pressures in terms of increased numbers and less funding are found. Here again, internal governance is a major barrier to systemic change. Sangra (2008) found in an in-depth study of the governance of ICTs in five European universities that in general, the universities had weak governance structures for decision-making and implementation, and in particular lacked well-defined strategic directions or rationales with regard to using ICTs for teaching.

One reason for this is that decision-making is deliberately dispersed in universities. The autonomy of the individual faculty member, and the view that senior academic administrators are there to serve the needs as much of the faculty as the students, means that it is difficult to make decisions for radical change. The demand has to come from the professors themselves, and we have seen that what they want is the traditional, elite model.

There are then no real incentives for change, either internally or externally, and few power levers to bring about such change.

What can be done?

The success of open universities in the 1970s and 80s does suggest that governments acting with wisdom and determination can bring about significant change in the higher education system, and it is probably time to see some more experimentation with new ICT-based models at least sponsored or encouraged by government (although calling them 'virtual' universities is probably not going to be helpful). What is really needed are some models deliberately designed around hybrid learning, to cater for lifelong learners, up-grading of workers in vocational, health and other knowledge based industries, and minority groups not well served by the existing system (such as First Nations in Canada), possibly on a private/public partnership funding model with respect to lifelong learners who have already benefited from a state-subsidised first degree.

Governments do provide guidance and some incentives for change, mainly through increased funding to enable student numbers to increase, and on rare occasions, will direct that money be spent on innovation and change. One example was the government of British Columbia, which between 1994 and 1995, withheld a total of 3.5% of operating budgets over two years, which the institutions then had to bid for through projects that supported innovation and change. One outcome of this policy was the development of WebCT (later bought by Blackboard) at UBC. This development was directly funded from the innovation fund, and had a major impact on the uptake of online learning worldwide. Another example is the Open University of Portugal, which was given clear instructions by the Portuguese Minister of Education in 2006 to modernise or close down. As a result, after training all faculty members in technology and in a constructivist pedagogical approach, it moved all print-based correspondence courses online within 18 months.

Also, it should be recognised that the for-profit sector in the USA and Malaysia especially has been successful in developing online universities, such as Wawasa Open University in Malaysia and Kaplan University, University of Phoenix Online, and Full Sail University in the USA.

But the challenge is whether traditional, public universities can make radical changes internally. Without strong incentives, and more clearly defined governance structures, change is likely to be slow and piece-meal. The danger is that change never reaches a critical mass, and the system is locked into an inefficient traditional model of public mass higher education for ever, or at least until the public gives up, and turns it over to the private sector.

Conclusion

I believe that the cost-effectiveness of the system must be improved. This is because the changing needs of a rapidly growing knowledge-based economy has required (or resulted in) a massive expansion of post-secondary education systems in economically advanced countries. Consequently, the conflicting pressures for increased access, higher quality, and controlling costs require us to consider radical changes to the way post-secondary education is provided.

The increased use of technology offers one possibility to improve cost-effectiveness, but not on its own. It must be accompanied by major structural changes in both the design and delivery of teaching, and the re-organization of the institution.

However, we are failing to use e-learning to improve the cost-effectiveness of the system. Currently we are merely adding cost to the system, without any clear, measurable benefits. We have not seen in higher education major breakthroughs in organization and management, vastly improved service, or major learning gains as a result of the investment in technology. To use the analogy of the banks, the cash dispenser is still the clerk behind the counter - we haven't moved the ATM outside yet. This is because there are deeply embedded structural barriers, and a complete lack of incentives, for improving the cost-effectiveness of higher education. So it is not so much that e-learning has failed higher education, but more that higher education has failed to maximise the potential of e-learning.

I believe that it will be possible for some state-funded public universities to innovate and radically change their structures and teaching methods, and become more efficient and effective, through the use of ICTs. This will happen though only if there are strong incentives, both externally, and internally. This will require strong leadership committed to fundamental change. Above all, for universities to use technology more efficiently and effectively, an overhaul of traditional governance structures will be required, to ensure faculty engage and buy into the need for change, and to provide the means for ensuring implementation and maintenance of change.

References

Allen, I. E. and Seaman, J. (2008) Staying the Course: Online Education in the United States, 2008 Needham MA: Sloan Consortium.

Belawati, T. (1998) 'Increasing student persistence in Indonesian post-secondary education' Distance Education, Vol. 19, No. 1, pp. 81-108.

Bowen, G., McPherson, M., and Chingos, M. (2009) Crossing the Finish Line: Completing College at America's Public Universities Princeton: Princeton University Press.

Canadian Council on Learning (2009) The State of e-Learning in Canada, Ottawa: Canadian Council on Learning.

Daniel, J. (1998) Mega-Universities and Knowledge Media: Technology Strategies for Higher Education. London: Kogan Page.

Gilbert, J. (2005) Catching the Knowledge Wave: the Knowledge Society and the Future of Education Wellington, NZ: New Zealand Council for Educational Research.

Hussar, W. and Bailey, T. (2009) Projections of education statistics to 2018 US Department of Education National Center for Educational Statistics: Washington DC.

Instructional Technology Council (2008) Tracking the Impact of e-Learning at Community Colleges Washington, DC: Instructional Technology Council.

Johnson, N. (2009) What Does a College Degree Cost? Washington DC: Delta Cost Project.

Katz, R. et al. (2008) The Tower and the Cloud: Higher Education in the Age of Cloud Computing Boulder CO: EDUCAUSE.

Lee, M. & McLoughlin, C. (eds) (in press). Web 2.0-based e-learning: applying social informatics for tertiary teaching. Hershey, PA: IGI Global.

Organisation for Economic Co-operation and Development, Education at a Glance: OECD Indicators 2008 (Paris: 2008).

Perry, W. (1976) Open University Milton Keynes, UK: The Open University Press.

Sangra, A. (2008) The Integration of Information and Communication Technologies in the University: Models, Problems and Challenges (La Integració de les TICs a la Universitat: Models, Problemes i Reptes) Unpublished Ph.D., Universitat Rovira i Virgili, Tarragona, Spain.

Spellings, M. (2006) A Test of Leadership: Charting the Future of U.S. Higher Education Washington DC: US Department of Education.

Tierney, W. and Hentschke, G. (2007) New Players, Different Game: Understanding the Rise of For-Profit Colleges and Universities Baltimore: Johns Hopkins University Press, 215 pp.

Wellman, J. et al. (2009) Trends in College Spending Washington DC: Delta Project on Postsecondary Education Costs, Productivity and Accountability

White, D. (2008) Innovative Learning for Europe, EDEN Annual Conference, Lisbon.

World Economic Forum (2008) Report of the Global Advisory Committee on Technology and Education Dubai: World Economic Forum.

About the Author

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His hobbies include golf, skiing and flying a small plane. He is married, with two sons, three grandsons and a grand-daughter.

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Editor's Note: Wikis do much more than solve the logistics of collaborative publication; they provide a powerful tool for collaborative knowledge building. Ms. Kok shows how Wikis relate to and expand upon Piaget's theories and their application in knowledge acquisition.

Understanding the Wiki Technology from the Systems Perspective

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Abstract

Clearly delineating the border between the social system (the wiki) and the cognitive systems (the users) is crucial for understanding how collaborative knowledge building works. What is happening when people work mutually on one common artefact, thereby introducing their knowledge to the community and building new knowledge collaboratively?

In this paper, two processes are proposed as the basis for the crossing of the border between the social and the cognitive system: we refer to these processes as externalization and internalization respectively.

Definition

Wiki is the most representative tool that enables the new Web 2.0 philosophy that is defined by user participation, openness and network effects. Derived from the Hawaiian word of "wiki wiki" which means quick this social software is an enabler of social interaction, collaboration and information sharing, promoting the growth of communities as user groups. In order to clarify what wiki publishing is a synoptic table of comparison has been provided (Klobas, J., 2006)

Table 1

As Quick as a Wiki:

Comparison of steps needed for creation of a Wiki page and Web Page

(Klobas, J. 2006)

	Wiki Page	Web Page
1	Go to the page on web browser	Search your Web editor preferred (Dreamweaver, Frontpage…)
2	Click on Edit	Open locally the web page (off-line)
3	Make changes in page	Open the source file
4	Save the page	Make modifications
5		Save the file
6		Transfer the file on the web-server (FTP)
7		Open the browser
8		Check the edited page on the browser

The application of the wiki in the academic partnership projects can be object of a taxonomy following four dimensions:

- Support to effectiveness: This refers to the access of information such as phone numbers or suppliers address. Wiki can be useful to collect and self-update the users' index or other descriptive section.
- Knowledge and collaborative support: This refers to the collaboration inside and among teams and the related knowledge management issues. Wikis are used in this sense for many applications, from the creation and the implementation of the common knowledge base to the several applications that requires the matching of many experiences (e.g: co-creation of procedures, handbooks, planning activities, sharing presentation materials…etc.)
- Communication and socialization: This refers to the development of a networked internal communication as well as institutional and intrapersonal. Users are connected using Wiki in order to join the owner of a particular competence or knowledge or real time collaboration with other related parties.

As McMullin (2005) and other social constructivist theorists assert; because of their flexible functionality, wikis afford the opportunity to offer collaborative, constructive learning more extensively by shaping knowledge through discussion with peers and through reflection. Due to the collaborative nature of wikis knowledge is enacted with a focus on the community rather than on the individual learner (McMullin, B., 2005).

Similarly, according to the theory of the community of practice, learning is an inherently social activity, situated in a social and cultural context (Lave, J. &Wenger, E., 1991). So, in order for learning to occur, there must be a negotiation between an individual's unique experience and the knowledge of the group. The community provides a ground for interaction and so that learners can collaboratively construct shared knowledge (Palloff, R.M. & Pratt, K., 2005).

Wikis are web sites that allow users not only to have access to their content but also to change the content online. As Scardamalia & Bereiter (2003) emphasized wikis are tools for knowledge-building which is important for knowledge-creating competencies in a knowledge society. Wikis don't require software, are easily accessible, and are simple for everybody to use. Their special feature is that hyperlinks can be created and texts can be added, deleted or changed so that groups of like-minded people can work collaboratively on one and the same text about a certain topic. Wikis' potential for collaborative learning lies in their ability to facilitate shaping of knowledge (Chong & Yamamoto, 2006). Wikis can be regarded as media that support learning due to their ability to facilitate collaboration, to allow for design-based learning, to enhance inventiveness, to support inquiry learning and the co-construction of learning (Chong & Yamamoto, 2006). In general, wikis can be considered to support social constructivist learning.

To examine the question of what makes wikis supportive of knowledge building, the researcher's consideration will be based on fundamental perspectives on learning and knowledge building. As Scardamalia & Bereiter (2003) assert a person's individual knowledge can serve as a resource for other peoples' learning. Moreover, Norman (1991) stated that people make use of each others' knowledge through collaborative knowledge building with artifacts and that the learner's active participation should be emphasized.

Collaborative Knowledge Building with Wikis

According to Luhmann's sociological systems theory, social systems can be distinguished from cognitive systems. This paper will first outline the functionality of a social system, and then address the functionality of cognitive systems. After that, the processes responsible for transitions

between the social system and people's cognitive systems will be described. In this context, the process of externalisation will be distinguished from the process of internalization.

Systems are dynamic as they develop over time and consist of operations. A system ceases where its mode of operation ceases. Such operations are defined as the production of elements. This definition implies that systems are autopoietic and self-referential. They produce their own elements. According to Luhmann (1984), systems continuously develop and recreate themselves so that the system's permanent continuance can be guaranteed. In other words, the systems exist due to operations that are followed by further operations of the same kind and so on. Subsequent operations always build on the results of the preceding operations.

Luhmann (1984) distinguishes three different kinds of systems: Biological systems operate by means of biological processes. They are autopoetic in the sense that cells create other cells. Psychological or cognitive systems operate via processes of consciousness and cognitive processes, such as retrieval of knowledge from long-term memory, elaboration of knowledge, process of externalization and internalization of knowledge. They are also autopoietic as cognitions develop further cognitions. Finally, social systems operate by means of communication. In this context, communication is not intended to be a result of people' activities but a product of social systems.

From a system's perspective, the environment is contingent. This means that the system cannot anticipate what will happen in the environment, and thus, the environment can irritate the system. So, for each system its environment is more complex than the system itself. After being irritated, a system may be able to select a limited amount of information available outside its borders. By operating on this information, it reduces external complexity, establishes new relations and increases its internal complexity.

Social systems depend on cognitive systems as there would be no communication without cognitions. Luhman (1984) points out that systems are operationally closed, yet they can influence each other. In order to solve the problem of systems that are open and closed at the same time, Luhmann (1984) applies the concept of structural coupling. Social systems are structurally coupled with cognitive systems via language. Since systems are sensitive to irritations from their environment, and since irritations can be incorporated into system-immanent operations different systems can make use of other systems' complexity. So, a cognitive system can take on the social system's elements and the social system can take on the cognitive system's elements if they irritate each other. So, structural coupling allows for co-evolution of both systems. Both systems, the cognitive and the social system can become more complex over time.

Clearly delineating the border between the social system (the wiki) and the cognitive systems (the users) is crucial for understanding how collaborative knowledge building works. What is happening when people work mutually on one common artefact, thereby introducing their knowledge to the community and building new knowledge collaboratively?

In this paper, two processes are proposed as the basis for the crossing of the border between the social and the cognitive system: we refer to these processes as externalization and internalization respectively.

Externalization

For contributing to the development of a wiki, people first have to externalize their knowledge. They do this by introducing information that reflects their own knowledge (Cress & Kimmerle, 2007). For that purpose, a person's own knowledge has to be conveyed into a wiki article in a form that maps the person's knowledge.

The wiki artefact exists independently from the people who created it and it develops in a way that is determined by people's knowledge. The information in the wiki relates to the contributor's

individual knowledge; therefore the person's cognitive processes are represented by and reflected in the wiki (Cress & Kimmerle, 2007). A user is only able to contribute something to a wiki if she or he has corresponding knowledge about that topic. Of course, the information in the wiki and the knowledge in a person's mind are not identical, but they are equivalent to a certain degree (Cress & Kimmerle, 2007). After the process of externalization, the wiki exists independently from the person's knowledge.

Contributing to the wiki not only allows the creation of an artefact, it can also lead to individual learning processes in the contributors. The mental effort necessary for the externalization of knowledge can extend people's individual knowledge, because externalization requires deeper processing and clarification (Cress & Kimmerle, 2007). Normally, people who contribute to a wiki can't externalize their own knowledge without some changes in their individual knowledge. Through the externalization process, people often deepen their knowledge and clarify their understanding. So, externalization can lead to individual learning processes and people who contribute to a wiki article can expand their own individual knowledge (Cress & Kimmerle, 2007).

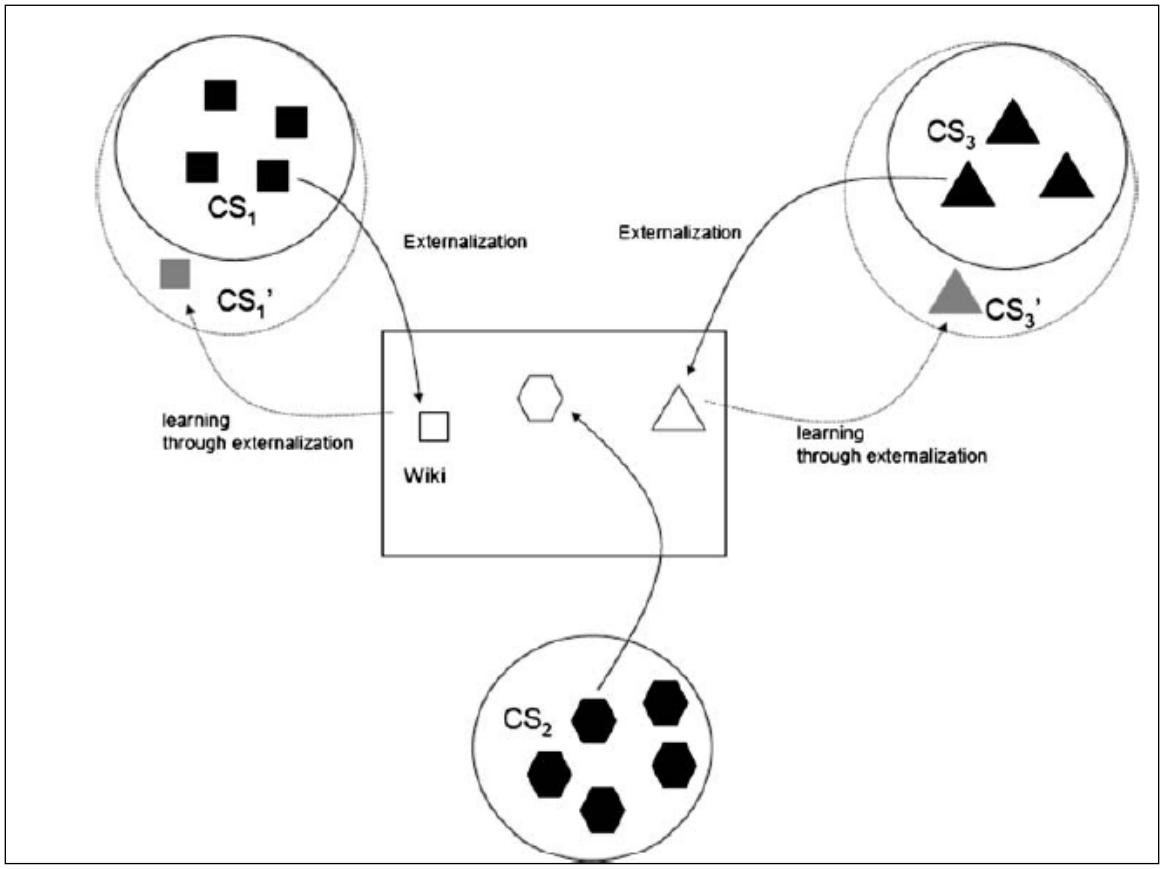

Fig. 1.0 The Process of Externalization

Once a person has contributed to a wiki, then each individual group member can have access to the wiki's information. This process of externalization does not require the interaction with other people in a narrow sense. People can externalize their knowledge without necessarily addressing other people in the first place (Cress & Kimmerle, 2007). These processes are also tentatively presented in Figure 1.0 in the form of the three cognitive systems (CS1 to CS3) and the social system wiki. The grey symbols represent novel aspects of knowledge as a result of learning through externalization.

Internalization

Inter-individual knowledge transfer and collaborative knowledge building take place when people have the opportunity to work with a wiki and to internalize the information available in the wiki. So, people have to process the information and integrate it into their individual knowledge (Cress & Kimmele, 2007). New knowledge may be developed in this way. Besides, an additional knowledge-creating process can occur. If people internalize information from the wiki, knowledge can develop which was formerly neither part of their personal knowledge nor part of the wiki (Cress & Kimmele, 2007). This can occur if new knowledge internalized from the wiki interacts with the prior individual knowledge in a way that enables people to create new knowledge. In other words, new knowledge is inferred to out of the knowledge internalized through the work with the wiki and the prior knowledge (Cress & Kimmele, 2007). This knowledge can be described as emergent knowledge (Cress & Kimmele, 2007). This is a result of the collaboration and as such represents collaborative knowledge building which is more than mere knowledge sharing. Something qualitatively new has developed (Cress & Kimmele, 2007). The process of internalization has been depicted in Figure 2.0 in which the cognitive system 3 has developed such emergent knowledge.

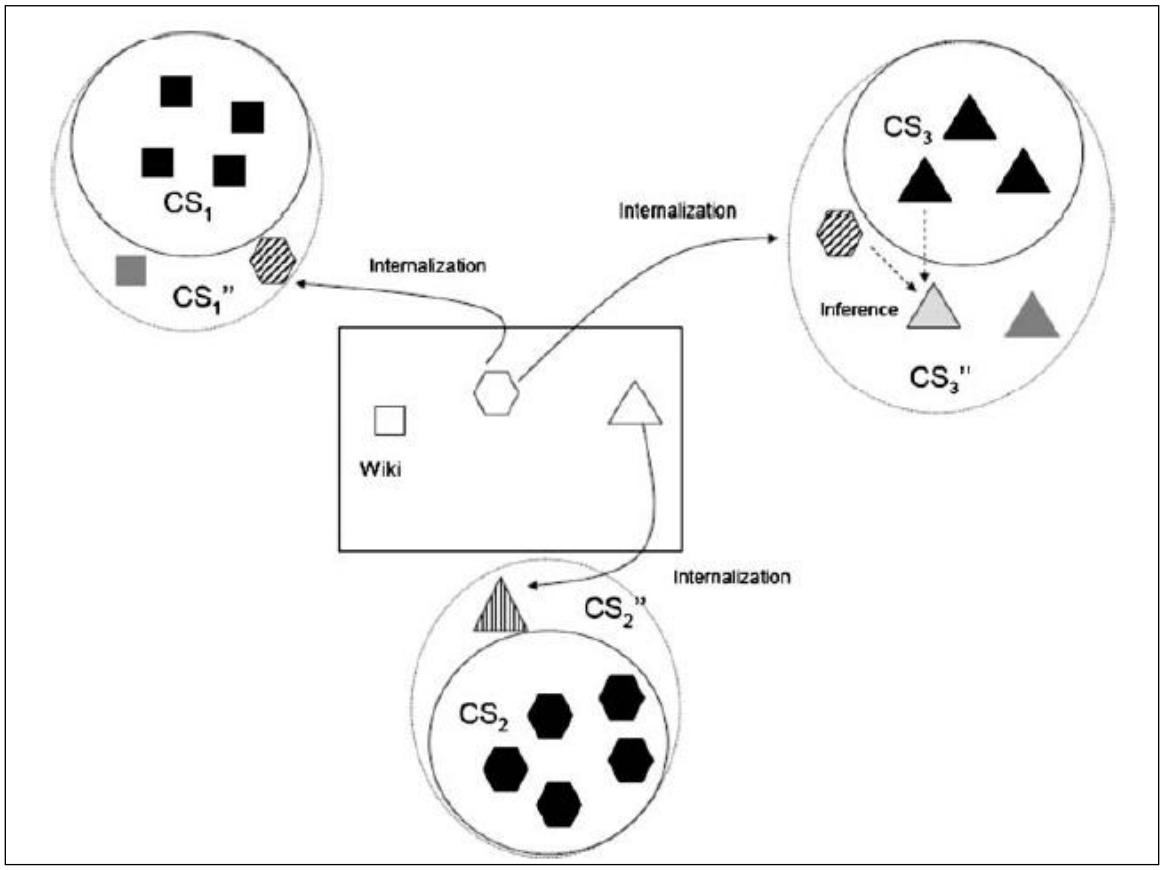

Fig. 2.0 The Process of Internalization

Four processes of learning and knowledge building

To explain the co-evolution of the users' knowledge and the wiki's content, one should also refer to the theories that describe cognitive processes of individual learning (Piaget, 1970). A prominent approach that describes how people deal with new information is Piaget's model of

equilibration (Piaget, 1970). This model explains how people take in new information from their environment, how they perceive and encode it from outside and integrate it into their own knowledge (Piaget, 1970). The equilibrium theory describes the way people try to maintain a balance between the environmental information on the one hand and their prior knowledge on the other (Piaget, 1970). If information is new and not in line with existing knowledge this incongruity causes a cognitive conflict (Piaget, 1970). When information cannot be promptly decoded and integrated into existing knowledge people have to adapt to the new environment. Piaget points out that such cognitive conflicts can lead to new knowledge. There are two possibilities to solve a cognitive conflict: by assimilating the new information or accommodating the knowledge to make it compatible with new information (Piaget, 1970). Assimilation refers to the process where an individual understands new information on the basis of existing knowledge and integrates it into prior knowledge. Assimilation describes the quantitative aspect of individual learning as only additional pieces of information that fit into existing knowledge are added (Piaget, 1970).

The other process of adaptation is the process of accommodation where people interact with new information in a way that changes their knowledge. They don't simply assimilate new information into existing knowledge, but actually change knowledge in order to better understand the environment and its information. This creation of new knowledge refers to the qualitative manner of learning.

Within this context, when interacting with the wiki, people can learn as a result of externalization or internalization. Learning can take place by assimilation or accommodation. Accomodation and assimilation don't necessarily take place internally (in people's cognitive systems), but also externally (in the social system wiki). If information is contributed to the wiki without being linked to previously existing information, the wiki is only extended by the addition of some information. If information is contributed in this way, the wiki assimilates the new information and its organization remains the same. On the other hand, accommodation happens when new information is not only attached to the existing information, but the information in the wiki is organized in a new way.

Cognitive conflict can be described as irritation. When people work with a wiki they have to see if their own individual knowledge matches with the information the wiki provides. If people feel that the wiki's information is congruent to their individual knowledge then there is no need for external or internal accommodation or assimilation (Cress & Kimmele, 2007). In contrast, if people feel that the wiki's information differs from their own knowledge there is a need for internal or external assimilation or accommodation (Cress & Kimmele, 2007).

If people realize that important aspects of their knowledge are missing in the wiki they may perhaps externalize these and add them to the wiki (external assimilation) (Cress & Kimmele, 2007). If people find that their knowledge and the wiki's information are incongruent, they will accommodate their knowledge (internal accommodation) or revise the wiki article (external accommodation) (Cress & Kimmele, 2007). So, if a user's knowledge corresponds to the information in the wiki the user will neither learn anything nor will she or he revise the wiki. If the incongruity is very large, the information in the wiki and the individual's knowledge will hardly be perceived as describing one and the same topic. This situation will reduce the need for making both congruent (Cress & Kimmele, 2007). Only a medium –level incongruity causes a cognitive conflict which motivates people to engage in one of the equilibration processes described above (Cress & Kimmele, 2007).

Conclusion

In collaborative knowledge building with wikis, four different forms of learning and knowledge building can be distinguished: internal assimilation (quantitative individual learning), internal accommodation (qualitative individual learning), external assimilation (quantitative knowledge building) and external accommodation (qualitative knowledge building) (Cress & Kimmele, 2007). What is essential is that cognitive and social systems develop mutually. This co-evolution of systems constitutes the foundation of collaborative knowledge building. While through external assimilation the wiki consists of increasingly more information, through external accommodation processes it enables new understandings, allows for new emergent knowledge and facilitates collaborative knowledge building.

This paper intends to propose just a personal and not yet validated manner to assure a right adoption of Wiki. A scientific validation here proposed may further be contributed via further studies and structured empirical researches in this direction.

One of the main points agreed in this study is that the use of Wiki permits not only a knowledge stocking or the sum of prior information, but a true creation and circulation of new knowledge. Wiki is not just a technology, but a true philosophical way of intending work.

References

Barlett-Bragg, A. (2006) Reflections on Pedagogy: Reframing Practice to Foster Informal Learning With Social Software [Internet] University of Technology, Sydney. Available from: http://www.dream.sdu.dk/uploads/files/Anne%20Bartlett-Bragg.pdf [Accessed January 20, 2009]

Bereiter, C. & Scardamalia, M., (2003) Knowledge Building. In J. W. Guthrie (Ed.), Encyclopedia of Education. New York: Macmillan, pp. 1370–1373.

Chong, N. S. T., & Yamamoto, M. (2006) Collaborative learning using Wiki and flexnetdiscuss: A pilot study. Proceedings of the Fifth IASTED International Conference on Web-based Education , 2006, pp. 150–154.

Cress, U., & Kimmerle, J. (2007) Guidelines and feedback in information exchange: Behavioural anchors and descriptive norms in a social dilemma. Group Dynamics: Theory, Research, and Practice, vol. 11, (2) pp. 42–53.

Creswell, J. W. (2007): *Qualitative inquiry and research design: choosing among five traditions*. 2nd ed., Thousand Oaks, Calif.: Sage Publications.

Denzin, N.K. & Lincoln, Y.S. (2003) Introduction: the discipline and practice and qualitative research. In N.K. Denzin & Y.S. Lincoln (Eds.) *Strategies of qualitative inquiry.* Thousand Oaks: Sage, pp. 1-45.

Ellis, C. & Bochner, A. P. (2000) Autoethnography, personal narrative, reflexivity: researcher as subject. In N.K. Denzin & Y.S. Lincoln (Eds.) *Handbook of qualitative research.* Thousand Oaks: Sage, pp. 733-768.

Goodwin, L., & Goodwin, H. (1984) '*Are Reliability and Validity "Relevant" in Qualitative Evaluation Research?'* Evaluation and the Health Professions 7: 413–26.

Henrichsen, L., (1997). TAMING THE RESEARCH BEAST, [Online]. Brigham Young University. Available from: http://linguistics.byu.edu/faculty/henrichsenl/ResearchMethods/RM_2_05.html [accessed 12 Jan 2009].

Klobas, J. (2006) Wikis: Tools for Information Work and Collaboration, Oxford, Chandos Publishing, It. transl. (2007) Oltre Wikipedia. I wiki per la collaborazione e l'informazione), Milano: Sperling & Kupfer Editori.

Lave, J., & Wenger, E. (1991) *"Situated Learning.Legitimate Peripheral Participation"*, Cambridge: Cambridge University Press.

Libert, B. & Spector, J. (2008) "*We Are Smarter Than Me*". Wharton School Publishing, New Jersey 2008.

Loan-Clarke, J., & Preston, D. (2002). *Tensions and benefits in collaborative research involving a university and another organization*, Studies in Higher Education, 27(2), 169-185.

Luhmann, N. (1984) *Soziale Systeme. Grundriss einer allgemeinen Theorie*. Frankfurt am Main: Suhrkamp.

McMullin, B. (2005) Putting the learning back into learning technology. In S. Moore, G. O'Neill, & B. McMullin (Eds.), *Emerging issues in the practice of university learning and teaching* (pp. 67-76). Dublin: [Electronic] AISHE. Available from http://www.aishe.org/readings/2005-1/mcmullin-D01-M10-2004.pdf [Accessed January 24, 2009]

Miles, M. B. & Huberman, A. M. (1994). *Qualititative Data Analysis*. Thousand Oaks, CA: Sage Publications.

Norman, D. A. (1991) Cognitive artifacts. In J. M. Carroll (Ed.), Designing Interaction: Psychology at the Human–Computer Interface. Cambridge: University Press, pp. 17-38.

Palloff, R. M. & Pratt, K. (2005) "Collaborating online: Learning together in community" (San Francisco, Jossey-Bass)

Piaget, J. (1970) Piaget's theory. In P. H. Mussen (Ed.), Carmichael's manual of child psychology. New York: Wiley, pp. 703-732.

Tapscott D. & Williams A.D (2006). *Wikinomics: How Mass Collaboration Changes Everything*. New York (N.Y.): Portfolio.

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Editor's Note: This is a simple and effective example of social engineering. Intrinsic motivation is used to focus the goal, and external feedback is provided my real and symbolic measures.

How Does a Visual Monitoring System Foster Sustainable Behavior?

Melissa Haeffner, Federico Casalegno
USA

Abstract

Americans spend upwards of 90% of each day in buildings that account for two-thirds of electricity usage. Because the supply of smart buildings will take time to catch up with demand, efforts are sought to develop informed and educated people to live and work in these "dumb" buildings. Additionally, energy efficiency alone may be inadequate to achieve major reduction in carbon emissions (Darby, 2006). Finding ways to intentionally change the lifestyle behavior in a household should have significant implications in reducing environmental impacts as fossil energy use in resident homes is directly related to the exploitation of natural resources and a leading cause of air pollution and global warming (Poortinga, p 71). This paper attempts to understand how visual monitoring systems can be used by communities to assist in identifying and modifying collective and individual behaviors that result in reduced energy use. Specifically, the paper is a case study of a community of undergraduates on a Midwestern US college campus who have experience with three types of equipment that monitor and display information regarding energy use. Understanding user experience within the Campus Resource Monitoring system at Oberlin College in Ohio, this study explores intentional lifestyle modification for sustainable behavior through the use of technology, complemented by competition and educational programming. The findings are threefold. First, the prime motivating factor for participation in the contest was not a prize, as might be expected, but maintaining social networks. Second, the technology prompted the students to be more concerned about their direct personal impact rather than their aggregate energy use. Third, several students replied that the technology influenced them to self-reflect, and in so doing, they changed their ideas about what it means to be an environmentalist.

Keywords: environmental sustainability, learning, learning communities, ethnography, qualitative communities

Research Background

The goal of the research is to study communities that have strong relationships. This study uses ethnographic research to assess the role of a real-time feedback mechanism in the learning of environmental sustainability. Users of the product are important actors in this study and to explore this concept, we looked into studies in human-computer interaction (HCI). Several studies demonstrate that technology can positively influence human behavior in regards to more environmentally sustainable behavior. (Buys, 2005; Egan 2008; Foth, 2008). Mackay, et al. simply define users as "boundary label to delineate developers from others." From a list of Mackay's typology of users, this paper will focus on 'end users,' or operatives, as opposed to 'clients,' who are the universe of all for whom the system is intended and designed. The reason for this is because the system has simply not evolved to the full involvement of clients. Dobbyn and Thomas (2005) put it clearly:

> "Energy and power are not terms within the natural language of mainstream householders. Gas and electricity operate at the level of the subconscious within the home É. Whilst there does seem to be some latent cultural guilt about the notion of

> waste É, there appeared to be virtually no sense of being able to actively and significantly reduce energy consumption in the household."

Finding the "right user" who can not only provide an account of experiencing the product but also a knowledgeable critique about its shortcomings is a project discussed in user-centered design literature. Mackay and others call for a much more fluid definition of the notion of user in relation to designers and address the limitations of user involvement. Users are sought who can be reflective and critical.

Several types of feedback mechanisms, from billing to household devices to ambient orbs, have been studied to understand their effects on lifestyle modification. (Clark, 2003; Dourish, 2008; Fischer, 2004; Lysecky, 2006; Nawyn, 2006). Sarah Darby gives an excellent synopsis of worldwide experiences in energy use feedback mechanisms since they first appeared in the early 1970s. One common theme she finds is that there was a general consensus that feedback does in fact have measurable effects worth pursuing. "Overall, the literature demonstrates that clear feedback is a necessary element in learning how to control fuel use more effectively over a long period of time and that instantaneous direct feedback in combination with frequent, accurate billing (a form of indirect feedback) is needed as a basis for sustained demand reduction. Thus feedback is useful on its own as a self-teaching tool. It is also clear that it improves the effectiveness of other information and advice in achieving better understanding and control of energy use." (Darby, 2006: 3) In her analysis of systems used throughout the world that use direct (i.e., displays) and indirect (i.e., billing) feedback, direct feedback typically contributes 5-15% savings while indirect feedback has been shown to account for 0-15% savings. However, she cautions against saying that any type of feedback, regardless of the social context, will always produce positive results. (Darby, 2006: 7). What the social context might contribute to variability in results has yet to be explored, and is a gap that the current research seeks to explain.

Research Method

Due to reasons described above, and the dynamic nature they bring to the continued development of this innovation, advanced users are sought as a small convenience sample. Although they occur infrequently, advanced users are preferable because they are conceptually significant in that they are unusual in population but we can expect the same behavior from any other group with similar dynamics and constraints. This paper is an attempt to understand the structure of the common identity that lies beneath individual response. Efforts will be made to ensure that the sample contains adequate range on critically important dimensions.

This study specifically looks at a monitoring system that incorporates three different types of feedback mechanisms to motivate users to consume less energy. It has already been demonstrated that the system has in fact produced measurable results but the social context has yet to be explored (Peterson, et al 2005 and 2007). In 2005, Oberlin College installed "Dashboard," a real-time feedback monitoring system developed by Lucid Design Group in San Francisco, CA. (www.oberlin.edu/dormenergy/). The system is linked to public displays that feature touch screen interactivity as well as a website that displays energy use by dorm and by the college as a whole. Each spring, the college organizes a competition between dorms to promote the concept of using the technology and to learn about the energy footprint of their behaviors. Ambient displays, known as orbs, have also been installed in some resident halls that glow green if their dorm's energy usage decreased in relation to the same time in the previous week, yellow if it is the same, red if it is has increased.

Students were recruited using a snowball sample through the use of informants. Contacts were made with Lucid Design (the designers) and with an Environmental Science professor at Oberlin

College who identified advanced users. Oberlin offers an Environmental Science course which leads the Dorm Energy competition. Students were recruited from that class as well as those employed as student workers who operate and maintain the equipment. Those students were asked to recruit others. Students were chosen based on their level of experience with the equipment, the competition and educational programming. Eligibility criteria included: the student must have lived in a dorm during a competition, must have visited the website at least once and/or has used the public display and must have participated in an educational programming activity (enrollment in an Environmental Science course, participation with the Light Bulb Exchange, work as a Resident Assistant, etc.).

Figure 1. MIT Mobile Lab.

Oberlin College's enrollment for 2008 consists of 2800 students, 2200 in the Arts and Sciences, 600 in the Conservatory of Music, and 200 enrolled in the double degree option. Advanced users are likely to be enrolled in the Arts and Sciences or double degree programs, so efforts will be made to focus on these groups. Geographically, Oberlin students come from 9% in-state and 85% out of state, while 7% are from abroad. 54% of Oberlin students are female while 46% are male. (http://new.oberlin.edu/arts-and-sciences/at-a-glance.dot).

This case is appropriate because it is the only community in the U.S. who has had this system installed, working and linked to competition and educational programming for more than one year. While other college campuses have purchased some Lucid Design equipment, only two other colleges have enough equipment to attempt community involvement activities like competitions (Hamilton College, fall 2008 and University of Colorado Boulder, spring 2009). Harvard University, for example, has purchased one Lucid Design monitor for one of their graduate dorms.

Data Collection and Analysis

The semi-structured interview consisted of questions that attempted to assess how the subject understands the technology, his or her frequency and extent of use, her or his perceptions of its impact on their behavior and his or her perceptions of other factors that influence her or his behavior, especially focused on social networks and environmental education. The analysis used issued-focused coding and sorting in the following categories: attitudes towards community, individual behavior change, shares responsibility for environmental impact, lifecycle process of environmental awareness, technology, educational programs, perceived influence over other people's behavior change, attempted influence over other people's behavior change, coordination and competition.

The nine students interviewed at Oberlin range from freshman to senior - four females, five males, all American citizens. Several students were able to compare differences between dorms and

between on-campus and off-campus use. For example, one student has had experience with living in three separate dorms plus an on-campus co-op where there is an orb that displays performance. Between the three dorms, she noticed that the freshman seemed to be the most involved in the competition. Another student lived in the dorms, but now rents off campus. He reports that his experience with the system gave him the foundational knowledge so that when he moved out he could save money on gas and electricity. Students generally live in on-campus housing for much of their undergraduate career, but change dorms year-to-year.

Results

The findings of this study are threefold:

1. The prime motivating factor for participation in the contest was not a prize, as might be expected, but maintaining social networks.
2. The technology prompted the students to be more concerned about their direct personal impact rather than their aggregate energy use.
3. Several students replied that the technology influenced them to self-reflect, and in so doing, they changed their ideas about what it means to be an environmentalist.

Motivation

Oberlin conducts a competition each spring to reward the dorm that shows the biggest percent reduction of energy use. The interviewees were involved in the competition although they couldn't remember what the prize was and didn't remember hearing who won. A junior explains: "I think there was a prize for whatever dorm won, but I don't remember what it was. I think there was an ice cream party for whatever dorm won. But I don't think it was widely known. I think whatever dorm ended up winning, they all knew because they had an ice cream party or their RA sent them an email. I'm motivated to turn off the lights anyway. The competition doesn't affect me that much." One student said "I think we ended up winning, I'm not sure." Another said, "It wasn't that big of a deal who won." This finding suggests that the traditional motivator of a tangible incentive was an insignificant. Social networks are important and all of the students interviewed spoke about their influence on others. Many mention that they have used their knowledge to educate their parents about recycling, composting and gardening. A female sophomore mentions: "My mom, we also started saving rinse water from our washing machine and bailing it back into the next wash and we actually did see a very concrete result, the bills went down." Many talk to their friends about turning off the lights and turning down the thermostat. Some report resistance from others, some report acceptance and even appreciation from others when sharing suggestions on lifestyle behaviors.

The subjects also appreciated the efforts of others and acknowledged how others acted as leaders in the competition. Almost all students reported that the buy-in of the Residence Assistants (RAs) was imperative to motivating their charges in changing their behavior. Many students suggested that the RAs who built community through dorm meetings were more successful than those who did not.

Consumption Patterns

Students seem to develop a hierarchy of actions that they employ. For instance, at the top of their list might be that they turn off the lights when they leave the room even when there are no tangible incentives (prizes or financial savings) while other behaviors at the bottom of the list are only employed when there is an incentive to do so. "Living in [a freshman dorm], we had a very close atmosphere and it was more a let's do it and try to win the energy competition so that was more like people were turning out all the lights in the hallways which I mean was great except

that you couldn't see and you walked into other people." Other dorms unplugged the vending machines to win the competition; some students save water by going to other dorms to do laundry. One student reported that his roommates put a picture of John Edwards in the shower to discourage people from staying the shower too long.

Most of the behavior changes in this category on their hierarchy occur during the competition and taper off afterwards. This hierarchy is both personal and informed by social factors. For instance, students who lived in a particular residence that were selected through an application process based on their environmental awareness, the hierarchy included everyday actions such as collecting gray water from sinks and laundry that was more extensive that others who lived in mixed residencies. The monitoring data shows that energy use is reduced in the competing dorms through the end of the semester and only returns to baseline when students return the following year.

Retro-effect

Self-perception changes and matures as students are exposed to environmental information. Students report that their involvement in the competition and their use of the Campus Resource Monitoring system is heavily influenced by an evolution of awareness of environmental issues. When asked if they thought they were environmentalists, many students nodded in affirmation, with hesitation. When asked if they thought they were environmentalists before the competition, several students explained that they thought they were environmentalists in high school, but as they learned more about their impact on the earth, they realized that their actions were not so environmentally friendly. Socialization as a child to connect with nature, environmentally focused courses at Oberlin, and the liberal atmosphere of the college were mentioned by students as factors that lead them to use the technology to its fullest extent. "Even though I grew up being energy conscious, my environmental awareness increased as I was on campus longer. I paid more attention to this type of thing in later years than, say freshman and sophomore year." They see the real-time feedback mechanism as a feature that expands their knowledge of their personal impact on the environment that could helps others in the same way.

Conclusion

In all, students are positive about the system. They like the fact that the large monitor is easy to use and reminds them to go to the website. Students report that they are slightly emotionally involved with the results. For example, seeing an orb glowing green made one student feel "proud" and "satisfied." The publicity about the competition and RAs as social leaders is very important in reminding students to change their behavior. The students would like even more direct feedback - the system today only gives floor by floor or dorm by dorm analysis but not room by room. They say they do not know the direct impact of their action, but they perceive that it makes a difference so they continue doing it. One senior says: "A lot of people talking about the lack of control which was related to heating. In some of the large dorms you have absolutely no control and then sometimes in the older buildings you got too hot and you open your window in the middle of winter. But most of the heat is generated by burning coal and creating steam and it's like it's not where our heat comes in is not set up particularly well for individual adjustments." Another Oberlin senior explains, "I think the competition and the orbs are a step in the right direction. But the more specific things are the more personal the better, I think people will respond." If the system is improved to provide even more immediate and concrete results, they say that this could have positive implications in motivating people to reduce their energy and water use.

This paper seeks to inform models of lifestyle change through advanced technology, using real-time feedback on energy use. The literature suggests that end users modify their behavior

when exposed to such information. The analysis suggests that real-time feedback one factor of many in modifying behavior for advanced, well-informed users but may be more important in reminding users to continue habits. This study shows that a visual monitoring system can support sustainable behavior if the users are motivated through social networks and if the technology is tailored to individuals so they better self-reflect and experiment with their behavior.

References

Buys, Laurie, Karen Barnett, Evonne Miller, and Chanel Bailey. "Smart Housing and Social Sustainability: Learning from the Residents of Queensland's Research House." Australian Journal of Emerging Technologies and Society Vol 3 (2005): 43-57.

Clark, C. F., Matthew J. Kotchen, and Michael R. Moore. "Internal and External Influences on Pro-Environmental Behavior: Participation in a Green Electricity Program." Journal of Environmental Psychology 23 (2003): 237-46.

Darby, Sarah. The Effectiveness of Feedback on Energy Consumption: A Review for DEFRA of the Literature on Metering, Billingand Direct Displays. Rep.No. Environmental Change Institute, University of Oxford. Oxford, UK, 2006.

Dourish, Paul. Points of Persuasion: Strategic Essentialism and Environmental Sustainability. Rep.No. Donald Bren School of Information and Computer Sciences, University of California, Irvine. Irvine, CA. University of California, Irvine. 4 Dec. 2008 http://www.ics.uci.edu/~jpd.

Egan, Christine, Willett Kempton, and Anita Eide. How Customers Interpret and Use Comparative Graphics and Their Energy Use. Rep.No. 8. Center for Energy and Environmental Policy, # E.O. Lawrence Berkeley National Laboratory # University of California # U.S. Department of Energy. 39-45. Environmental Energy Technology Division. University of California. 4 Dec. 2008 http://eetd.lbl.gov/payne/publications/howcustomersuseandinterpret.pdf.

Fischer, Corinna. Who Uses Innovative Energy Technologies, When, and Why?: The Case of Fuel Cell MicroCHP. PublicationNo. Freie Universitat Berlin, Transformation and Innovation in Power Systems. Berlin, 2004.

Foth, Marcus, Christine Satchell, Eric Paulos, Tom Igoe, and Carlo Ratti, comps. Queensland University of Technology, Australia, Workshop on Pervasive Technology and Environmental Sustainability, 2008, Queensland, Australia. 4 Dec. 2008 http://www.urbaninformatics.net/green.

Lysecky, Susan, and Frank Vahid. "Automated Generation of Basic Custom Sensor-Based Embedded Computing Systems Guided by End-User Optimization Criteria." Ed. P. Dourish and A. Friday. Ubicomp LNCS 4206 (2006): 69-86.

Mackay, Hugh, Chris Carne, Paul Beynon-Davies, and Doug Tudhope. "Reconfiguring the User: Using Rapid Application Development." Social Studies of Science 30 (2000): 737-57.

Nawyn, Jason, Stephen S. Intille, and Kent Larson. "Embedding Behavior Modification Strategies into a Consumer Electronic Device: A Case Study." Ubicomp (2006): 297-314.

Peterson, John E., Vladislav Shunturov, Kathryn Jande, Gavin Platt, and Kate Weinberger. Does Providing Dormitory Residents with Feedback on Energy and Water Use Lead to Reduced Competition? Proceedings from Greening the Campus IV Ball State

University. Tech.No. Lewis Center for Environmental Studies, Oberlin College. Muncie, IN, 2005.

Peterson, John E., Vladislav Shunturov, Kathryn Jande, Gavin Platt, and Kate Weinberger. "Dormitory Residents Reduce Electricity When Exposed to Real-time Visual Feedback and Incentives." International Journal of Sustainability in Higher Education 8 (2007): 16-33.

Poortinga, Wouter, Linda Steg, and Charles Vlek. "Values, Environmental Concern and Environmental Behavior: A Study into Household Energy Use." Environment and Behavior 36 (2004): 70-93.

Appendix - Interview Questions

1. In your own words, can you describe what the Campus Resource Monitoring is? What is involved?
2. When was the last time you used the monitor? website? Did you live in a dorm with an orb? Did you feel your actions had an impact on the data that was being monitored? If so, how did you know that?
3. What are some actions that you had to do in order to win the competition? Do you still do those things now that the competition is over? Why or why not?
4. Did you have a "eureka moment" when you figured out what do you had to do to win the competition or reduce your energy/water consumption? If so, can you explain what happened?
5. What are some factors that influenced you to change your behavior?
6. What are some factors about the website/monitoring system that influenced you to change your behavior (i.e., icons, mouse clicks, etc.)?
7. Before this project, did you consider yourself to be an environmentally friendly person in relation to your friends/peer group? Do you now?
8. Do you talk about this project with others (friends, family)? Why or why not? How do they react?

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Editor's Note: There is a long and productive history of distance learning support for students in the military. The tremendous size of this effort dates back to World War II. This article provides insights on effective use of technology to overcome a series of constraints in deliverfing programs to navy ships in different parts of the world.

On the Front Lines of Distance Learning: Teaching Warrior Students

Patricia B. Strait
USA

Abstract

This paper offers a detailed account of the challenges encountered during the implementation of a unique distance learning program which provides graduate courses to active duty military students serving onboard combative ships. The paper begins by providing an overview of the distance learning technology which makes it possible to provide live classes simultaneously to students who are on board ships located in multiple time zones up to thirteen hours away from the professor teaching the class. Despite the advancements in this distance learning method, there remain several challenges for both the students and the professor participating in this distinctive program. To that end, five specific challenges are explored. These challenges include: classroom conditions onboard the ship, conflicting priorities, security restrictions, multi-time zone scheduling, and student isolation. Lastly, commentary is provided which contemplates the future of distance learning programs to "warrior students" on the open seas.

Keywords: distance learning, implementation, military, technology, challenges, ships, students, education, programs

Introduction

The navy, like all branches of the military is deeply concerned about retaining qualified employees especially now during the global war against terrorism. To aid retention and foster continuing education efforts, the navy offers several distance learning opportunities to personnel at sea. This article provides an instructor's observations regarding one of the most innovative distance learning initiatives called, "Ships at Sea". First, an overview of the program and the technology it uses will be provided followed by an analysis of five specific challenges an instructor can expect to encounter when teaching active duty military students via this unique distance learning program.

The Ships at Sea Program delivers live televised courses to navy ships at sea via a joint military/civilian satellite connection for students pursuing a Master's Degree in Business Administration. The Ships at Sea Program not only allows these sea-based warrior students to receive a live lecture from a professor located several time zones away, but also provides the professor with a live view of the students who are operating in such distant seas as the Persian Gulf, the Mediterranean Sea, and the Sea of Japan.

Program Overview and Implementing the Civilian-Military Technology Link

The Ships at Sea program is provided by Old Dominion University. ODU's distance learning network is one the largest interactive distance learning networks of its kind in the United States. A public doctoral research institution, ODU is located in Norfolk, Virginia which also happens to be the home of the world's largest naval base. The proximity and shared interests of these two institutions has resulted in a unique partnership. TELETECHNET, as the distance learning system is called, delivers graduate

and undergraduate courses to students who are unable to attend traditional campus classes. The ODU distance learning system includes a large modern facility which contains approximately fifteen studio classrooms equipped with cameras, tracking devices, instructor control panels, computers, monitors, and digital white boards. The audio system allows the professor to choose between a traditional microphone that is clipped to one's jacket or a sensor-mike that tracks the professor via a remote controlled camera as the professor moves about in the studio classroom. By selecting among the options available in the control panel, the professor is able to provide the students with a video presentation, internet access, a PowerPoint presentation, overhead projection, or digital white board notations. An integration of these options allows the instructor to broadcast a sophisticated and interactive presentation to students at extremely distant locations. In addition to the training needed to operate the technology, each professor must also adapt his or her course and presentation style to the live televised format. Consideration must be given to camera angles, lighting, and movement. Thought must also be given to patterns and colors of clothing worn by the professor as particular colors tend to "bleed" on television and certain patterns can cause visual distortions for the viewer.

To accomplish the satellite connection, university technicians work with military technicians to link the civilian and military satellite systems. The navy provides the primary means of communication for the Ships at Sea program by allowing the university to access the military satellite system known as Challenge Athena. Simply stated, the university's satellite system sends the live feed to the Challenge Athena satellite via a connection of naval communications centers. From there, the ship links directly with Challenge Athena and downloads the live signal. The latest advances in this technology have made it possible to link with multiple ships simultaneously thereby allowing students located in different time zones to participate in the same class together. All classrooms aboard the ships are equipped with cameras and audio systems and students are able to view their classmates located on other ships. When a student activates the microphone at his desk, the camera abandons the wide angle default position and zooms in for a close-up on the student keying the microphone. When the student is done speaking, the camera resumes its default position which provides the professor with a panoramic view of each ship's classroom. If a professor is broadcasting to more than one ship, the monitors in the instructor's studio provide the professor with a thirteen second scan of each ship's classroom. From the students' perspective, they are provided with a close-up of their professor throughout the class or the alternative view the professor has selected such as a PowerPoint presentation or whiteboard illustration.

The Five Challenges of Teaching of Warrior Students

Teaching is never accomplished in a vacuum. Even in a conventional classroom environment, the world intrudes from time to time via local or national events or even simple things such as power failures, or fire drills. The conditions encountered when teaching students onboard combatant ships via live television, however, are particularly challenging. Below is an analysis of five unique challenges an instructor faces when teaching warrior students at sea via a live satellite connection.

Challenge Number One: The Classroom Environment

The location of a ship's classroom is critically important to the learning environment. While some ships have dedicated classrooms reserved specifically for education and training, most ships must use rooms that serve a variety of purposes. Examples of classrooms that serve more than one purpose include classroom spaces which are also used as the ship's chapel or the ship's library or the ship's theater. Some floating classrooms can be rather noisy depending on where they are located on the ship. For instance, on aircraft carriers it is not unusual for the ship's classroom to be located under the catapult which launches the aircraft from the flight deck. When a jet is launched, the classroom flexes with the force and weight of the catapult. The sound of the jets engines can often be heard by the professor back in the studio in the United States. Both the students and the professor must learn to concentrate through these considerable distractions. Classrooms can also be unbearably hot or extremely cold according to the location and/or operating conditions of the ship. When ships are located in warm waters such as the Persian Gulf, students can be seen sweating and squirming in their seats or bundled in warm coats if the ship is operating in the North Sea. Seldom is the warrior student treated to a comfortable and quiet classroom environment.

Challenge Number Two: Warrior Student Priorities

The priority of every warrior student is the military mission. A professor who teaches warrior students must accept that his or her class has and always will have a lower priority. In addition, the warrior student's attention is seldom focused entirely on what is happening in class when he is in class. Many students carry emergency beepers, walkie-talkies, or cell phones which ring or vibrate in class. There are times when special alerts are sounded and every student must immediately leave the classroom and report to assigned battle stations. The professor in the studio has no way of knowing when or if the students will be returning. The flight surgeons in the class (physicians who specialize in treating pilots) must respond to medical emergencies. The pilots in the class must leave to fly their assigned missions. The engineers in the class must respond to equipment failures, and the chaplains in the class must respond to a wide variety of crises. Students must also react to aircraft accidents on the flight deck, and fires that occur throughout the ship. This is only a small sample of the things that can happen during classroom time. Lastly, an instructor must learn to accept unusual excuses for late assignments such as; "I was out bombing Afghanistan" despite the nature of his or her political beliefs. Faculty members who to teach warrior students must accept these priorities.

Challenge Number Three: Communication Restrictions and Security Issues

To borrow the words of playwright Tennessee Williams, educational programs delivered via satellite connection must "rely upon the kindness of strangers". In this case, the broadcasting university must rely on the bandwidth available in the navy's communication's system. The availability of bandwidth rises and falls according to the intensity of the military operations. As the intensity of operations increases, the available bandwidth for education purposes decreases. Although there has been a general decrease in bandwidth since the events of September 11th, 2001, it has not been enough to cause serious disruption in classroom connections. During times in which bandwidth does become scarce, more frequent interruptions in the signal will be experienced by both students and professor. In addition to bandwidth issues, professors are not allowed to know where their students are located or where the ship is headed except for in the most general terms. Ship movements are confidential, and any leeway that might have existed in this regard was eliminated after the United States was attacked in 2001.

Challenge Number Four: Scheduling

The student's classroom is sailing in vast expanses of open water. As it does, the ship moves from time zone to time zone, and from country to country. The ship operates 24 hours a day seven days a week. Typically, classes convene in the evenings according to the ship's time zone location. Most ships prefer that the classes be offered during the weekend since this timeframe offers the fewest potential interruptions for the students. The start time remains the same from the student's perspective, which means that the professor must adjust his or her starting time each week according to where the ship is located in the world. This requirement creates constantly changing work hours for the instructor. Each week the professor must wait for a start time message from the lead ship. The message will contain general information regarding the time zone in which the ship is operating, and will inform the professor as to the time that class must begin the following weekend. The start time messages are sent via e mail in Greenwich Mean Time or what military personnel refer to as Zulu time. The professor then converts the Zulu time to his local time zone. The ships participating in the Ships at Sea program are typically located between six to thirteen time zones away from the east coast of the United States. This being the case, classes will typically start between midnight and six in the morning Eastern Standard Time.

Challenge Number Five: Stress and Isolation

The typical student who enrolls in the Ships at Sea Program has an undergraduate degree from a very selective university. Many students are graduates of the Naval Academy or other top universities. Several students will already have advanced degrees. Nearly all of the students have significant work experience. Their academic histories typically include course work in quantitative analysis, business, and engineering. In addition, many students hold positions of great responsibility supervising large numbers of personnel. Nearly all of the warrior students are technologically savvy from both a civilian and military perspective. The typical age range for MBA students in the Ships at Sea Program is between the ages of 28-48 years. The students include both enlisted and officer as well as male and female students. Long deployments away from loved ones are particularly trying on the warrior student. Navy ships are typically deployed for a minimum of six months and are often extended beyond six months. These long separations are stressful to military personnel and their families. The stress impacts not only their professional lives, but their personal lives as well. Professors who teach via television are often the only live connection that naval personnel have with the home front. This personal connection forms a unique bond between the professor and student and can serve as an important support system as the student progresses in his or her education.

Teaching Warrior Students in the Future

The military continues to place a high value on education. This is not expected to change in the near future. The way educational programs are delivered to the military, however, must change. The biggest challenges to military distance learning remain accessibility and flexibility. Live televised education, while providing a rich interactive experience for the student, draws heavily upon military and civilian resources. The fixed time frame of a live televised class can create problems for many military students who are unable to get away from their duties at a specified period of time each week. Televised classes are also prone to signal disruptions as well as classroom availability problems. Students need to be able to access their courses from a variety of locations on the ship, not just a single classroom which may be needed for other purposes such as Sunday worship. Warrior students must also be able to start and stop a course according to his or her military duties. These disruptions may last thirty minutes or more than thirty days if the student is sent on temporary assignment to another location. It may appear that the answer to

these problems is to deliver classes via an asynchronous format. There remains, however, one significant problem with this method for warrior students; internet bandwidth for tasks other than the military mission itself remains very limited on most combatant ships. In addition, the internet access that is available is not evenly distributed among all crew members. Typically, senior military personnel or personnel serving in sensitive positions have better access to internet resources than other personnel. Security firewalls create yet another challenge. Sites such as MySpace, YouTube, and Twitter are also restricted due to the tendency of these sites to expose military computer systems to viruses. Many naval ships restrict access to anything other than one's military e mail address. Until these problems are resolved, the viability of asynchronous courses on naval ships for educational purposes remains limited.

In conclusion, warrior students will never be like other college students. Their schedules are often interrupted and their assignments are often late for strange reasons; but they also hungrier to learn than the traditional student and more grateful for the attention that is given to them. Most professors who have taught in this rather unique program agree that military students are deserving of the extra effort and the attention they require. After all, some warrior students never come home.

About the Author

Patricia B. Strait Ph.D. is a faculty member at the University of Richmond. She is currently chair of the Department of Human Resource Management and Leadership Studies. She has over ten years of experience teaching in the distance learning including the program described in this article.

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Editor's Note: This is an excellent example of social media in support of language development. Graphics assist learning, add meaning, build associations, and stimulate memorization. There were also benefits from keyboarding because of the complex penmanship required to write using traditional Chinese characters.

Design and Implementation of a Model for Using Blogs in a Writing Class for Schoolchildren

Hsueh-Hua Chuang and Chia- Lin Shih
Taiwan

Abstract

In this study, we presented a model for the integrative level of weblog use in teaching writing to schoolchildren and a case of the use of weblogs under a Weblog Text-image Transmission Model (WTTM) in a Taiwan third grade class. A detailed description of the WTTM was provided to illustrate the theoretical framework guiding the design and implementation of using blogs in a writing class for schoolchildren. Findings from the study revealed themes that illustrated the characteristics of the use of weblogs under WTTM framework. Those themes included association activation, the pros and cons of word processing, copy-revise phenomenon and collective wisdom.

Keywords: weblog, writing process, weblog and writing, writing and schoolchildren, language and writing, instructional technology, technology integration, blog, dual coding theory, cognitive theory.

Introduction

In Taiwan formal teaching of writing begins in the third grade. The main teaching principle at this stage of writing is to cultivate the writing interests of students through expression of their experience and feelings (Ministry of education, 2003). Therefore, the process rather than the product of writing is emphasized at this particular stage. Writing is a complex process, some aspects of which often cause particular difficulties for children (Flower, 1989; Hays & Flower, 1986). Englert and Raphael (1988) identified idea generation, planning, and text organization as common problem areas for poor and novice writers. Children may also lack awareness of appropriate strategies or have difficulty exercising control over their implementation and monitoring. For schoolchildren, writing is also often a solitary activity, lacking interaction and dialogue with others, factors that a social interaction theorist such as Vygoysky (1978) consider crucial for learning. As children make the transition from spoken language to written language they may suffer owing to a lack of external feedback (Bereiter & Scardamalia, 1987). Advice to schools with respect to the teaching of writing to schoolchildren often recommends arrangements to include peer interaction. Hayes and Flower (1980; 1986) emphasized the complexity of the writing process and the multiple and simultaneous information-processing demands it makes on the writer. Their writing model is comprised of three main components: planning, translating, and reviewing. Writers can recursively activate all three of these components during the process of writing. Hayes (2000) proposed a new framework for grouping cognition, affect, and memory together as individual aspects, and to depict the combined social and physical environments as the task environment. This model tended to provide a more accurate and comprehensive description than the old model.

A wave of weblogs has swept across the whole world in recent years, making a large impact on teaching and learning. Specifically, we have seen the phenomenon of weblog writing exploding on the Internet. Features of blogs such as self-publishing of text and graphics, easy access and maintenance, and immediate feedback or comments encourage social interaction. The process of expression through weblog writing and journaling supports both individual and collaborative

work and nurtures interconnection of ideas between participants. Weblogs have been used in writing classes and language arts curriculum activities at schools at all levels to increase motivation toward writing and scaffolding efforts have been used to increase knowledge ownership, knowledge management skills, and reflective practice(Kajder, Bull & Van, 2004; Baggetun & Wasson, 2006). Specifically, one blog feature with easy text and graphic publishing, has paved the way for convenient presentations of both verbal (text) and pictorial/graphic (non-verbal) media. According to dual-coding theory, use of both verbal and imagery codes improve learners' recall and retention (Sadoski, Piavio, and Goetz, 1991). This type of cognitive theory can not only be used to improve memory and recall but can also reduce the cognitive load on the learner and thereby increase motivation and interaction.

We have thus developed a model for using blogs in writing for novice writers or schoolchildren based on the framework of writing proposed by Flower and Hayes (1981;1986;2000) and Dual Coding Theory (DCT) by Sadoski and Paivio (2001) through Vygotsky's social-cultural perspective. Based on this model, we designed four writing units at the third grade level (On the Sports Day, before and after the Monthly Exam, During the Recess Time, and My PE Teacher) and then implemented this design for one semester in a class of 35 third graders.

Theoretical Framework

We proposed a model, adapted for third graders, called the Weblog Text-image Transmission Model (WTTM) of the writing process. The model is depicted in Figure 1.

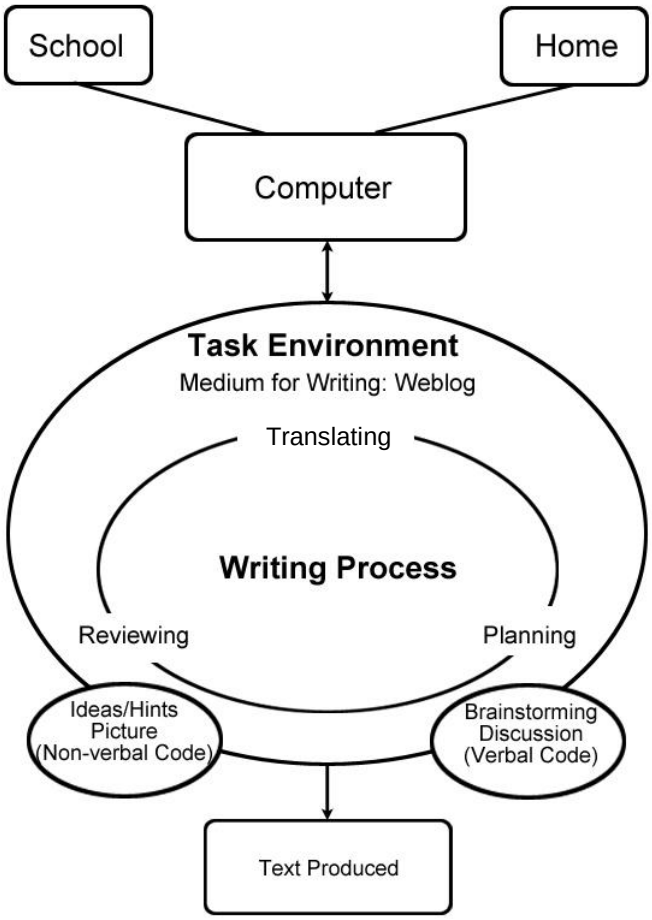

Figure 1. Weblog Text-image Transmission Model of Writing Process

There are inner and outer circles in this model, with the inner circle representing the process of writing and the outer circle representing the task environment. The task environment includes both the social and physical environment. Weblogs and pictures constitute the physical environment. The discussion and publishing records between peer pupils constitute the social environment. There is interaction between both these environments and the writer's cognitive process.

We have focused on guiding the participants through a series of photos and guiding questions to facilitate their writing of events and descriptions of familiar personnel through use of interactive weblog features. This kind of easy text and graphic publishing has paved the way for convenient presentation of both verbal (text) and pictorial/graphic (non-verbal) media for participants to use in writing activities.

We used the constant comparative method on the data collected to elicit key issues related to the use of the Weblog Text-image Text Transmission Model (WTTM) in writing for third grade students in Taiwan.

Emerging Themes

Association Activation

Our findings revealed that the presence of both verbal and nonverbal codes activate associations that inspire an increase in ideas. Dual Coding Theory implies that the more elaborated and connected the complementary systems of language-based and imagistic world knowledge, the more potential there is for meaning (Sadoski and Paivio, 2001). We have found several obvious incidents of representational connections during the writing process. The participants referred to both the photos and the discussion and then retrieved related knowledge and experiences to include in the content of narrative text for writing. Both verbal and nonverbal connections provided content clues and a vocabulary inventory to choose from. Nonverbal clues such as photos were reminders of the scene at some specific moments, while verbal connections activated a wider spectrum of words and idioms. Photos promote more vivid and detailed descriptions.

There were also inferential association incidents, specifically in the use of Chinese idioms that are usually taught through oral explanation only and then memorized by pupils, accompanied with drill practice. However, we found several students used such idioms activated by photos in the discussion forum and subsequently used the idiom in the final writing product.

The Pros and Cons of Word processing

Using the Chinese keyboard system, students save time for penmanship, a very demanding task, particularly for traditional Chinese characters. Cochran-Smith (1991) found that keyboarding skills alleviated the physical constraints and thus allowed the writing process to be accelerated. Participants expressed relief from elimination of Chinese penmanship. In addition, Flower and Hayes(1981) found that, during the composition stage of the writing process, the composer was required to make a series of choices and decisions and, should the composer become distracted by mechanical demands, the task of planning would be disrupted and the actual translation work from planning to words would be impaired. We have found that 90% of the participants could meet the deadline of turning in their writing assignments, this figure representing an increase by 20% compared to traditional paper and pencil writing assignments. The Chinese keyboarding and typing system provides words in a list with the same phonological symbols so the students could select the correct character rather than composing it from scratch. This keyboarding system is especially beneficial for children who can recognize more words than they can actually produce and thus accelerates the writing process.

However, we have also found a higher percentage of typographical errors. Through interviews and observations, the typographical incidents usually would result from the system's automatic

generation of word combinations, since participating students tended to rely on the system without carefully examining the words chosen.

Copy-Revise Phenomenon

We have observed a copy-revise phenomenon in the writing process for most participants. They copied the paragraphs in the photo discussion forum or they used the discussion content as the outline and then revised the text to what they believed should be the final product.

In revision, Hayes and Flower (1983) began to use the term "review" to refer to "the act of evaluating either what has been written or what has been planned" (p. 209) and emphasized the pattern of writing process in which writers can recursively activate all three components (plan, translate, and review), leading to a working model of revision (Flower, Hayes, Carey, Schriver, and Stratman, 1986). We have also observed that most changes were related to the choices of words and some syntactic aspects of transforming the colloquial form of speech into what they believe to be acceptable written text. Therefore, the quality of their final product depends on how well they can identify the discrepancies between colloquial speech form and good writing. This revision process actually may be blocked when presentation-related goals are in conflict with content-related goals. To resolve this conflict, we provided a discourse level of knowledge through idiom prompts and writing samples in the third and forth thematic units.

Collective Wisdom

Meanwhile, the discussion forums served to provide collective wisdom that has been identified one of the benefits of communicating through CMC (Gunawardena et al., 2004). During the writing process, participants referred to the contents from the blog discussion forum to retrieve needed information or materials to help them compose the text either at the word- and sentence-level or in broader text features such as organization of paragraphs. We have also observed that less-skilled writers in our study seemed to benefit more from the WTTM model. We have identified three students who have made obvious progress, both in quantity and quality, in the actual writing product under WTTM environments compared with their tradition paper-and-pencil writing samples. They expressed the view that they have an inventory of context to refer to, providing them content on which to elaborate. In other words, they gained essential help in the planning stage of the writing process from the inventory of photo discussion forums. In the review stage, they chose material they think appropriate (review) to include in the final writing product. These are students who often lack knowledge about what to say. The WTTM environment helps them develop content-related goals. Another student mentioned that the photos helped him to recall knowledge that he needed to write.

Conclusion

While writing in cyberspace has raised some provocative issues, such as the presence of electronic orality in writing, children of the digital generation continue to become significant users of information technology, conveying their thoughts and opinions through CMC. The WTTM (Weblog Text-image Transition Model) sees the weblog as a space in which the mediation of technology introduces technologically-related demands on writers such as the incorporation of new interactive techniques and the management of information. Thus, the development of the (WTTM) Weblog Text-image Transition Model is an attempt to frame weblog experiences applied in a schoolchildren writing class under theoretical guidance. Its initial and pilot implementation revealed several insights with respect to third graders' writing processes by way of WTTM. Based on the findings from this pilot study, we will continue activities and designs to incorporate facilitation of peer editing and review of the final writing products. Also, in the second stage of this project, we will continue to explore the design of empirical studies to identify the effect of WTTM on learners of different writing ability levels.

References

Baggetun, R. & Wasson, B. (2006). Self-Regulated Learning and Open Writing. *European Journal of Education*. 41(3-4), 453-472.

Bereiter, C. & Scardamalia, M. (1987). *The psychology of written composition*. Hillsdale, N.J.: L. Erlbaum Associates.

Chen, Po-chang(2005). *The politics of educational reform in Taiwan*. Paper presented at the 2005 Annual Meeting of the Comparative and International Education Society.

Cochran-Smith, M. (1991). Word processing and writing in elementary classrooms: A critical review of related literature. *Review of Educational Research, 61,* 107-155.

Daiute, C. (2000). Writing and communication technologies. In R. Indrisano & J. R. Squire (Eds.). *Perspectives on writing: research, theory, and practice, (pp.251-276).* Newark, Dela: International Reading Association.

Englert, C. S., & Raphael, T., E. (1988). Constructing Well-Formed Prose: Process, Structure, and Metacognitive Knowledge. *Exceptional Children, 54*(6), 513-520.

Flower, L. and J. R. Hayes (1981). A Cognitive Process Theory of Writing. *College Composition and Communication*, 32(4), 365-387.

Flower, L., J. R. Hayes, et al. (1986). Detection, Diagnosis, and the Strategies of Revision. *College Composition and Communication,* 37(1), 16-55.

Flower, L.(1989).Rhetorical problem solving : Cognition and professional writing. In M. Kogen (Ed.), *Writing in the business professions* (pp. 3-36). Urbana , IL: National Council of Teachers of English and the Association for Business Communication.

Gunawardena, C. N., Jennings, B., Ortegano-Layne, L. C., Frechette, C., Carabajal, K., Lindemann, K., et al. (2004). Building an online wisdom community: A transformational design model. *Journal of Computing in Higher Education, 15*(2), 40-62.

Hayes, J. R. & Flower, L. (1980a). Identifying the organization of writing processes. In L. W. Gregg & E. R. Steinberg (Eds.), *Cognitive processes in writing* (pp. 3–30). Hillsdale, NJ: Lawrence Erlbaum.

Hayes, J. R. & Flower, L. (1980b). Writing as problem solving. *Visible Language, 14*(a), 388–399.

Hayes, J. R. & Flower, L. (1983). *A Cognitive Model of the Writing Process in Adults*. National Inst. of Education (ED), Washington, DC.

Hayes, J. R. & Flower, L. (1986). Writing Research and the Writer. *American Psychologist*, 41 (10), p1106-13.

Hayes, J. R. (2000). A new framework for understanding cognition and affect in writing. In R. Indrisano & J. R. Squire (Eds.). *Perspectives on writing: research, theory, and practice, (pp.6-44)*. Newark, Dela. : International Reading Association.

Kajder, S., Bull, G. & Van,N. E. (2004). A Space for "Writing without Writing" Blogs In The Language Arts Classroom. Mining the Internet. *Learning and Leading with Technology*, 31 (6),32-35.

Lankshear, C. & Knobel, M. (2003). *Do-It- Yourself Broadcasting: Writing Weblogs in a Knowledge Society.* Paper Presented at the Annual Meeting of the American Educational Research Association (Chicago, IL, April pp. 21-25, 2003), (ERIC Document Reproduction Service No. ED478120).

Martin, L. E., Segraves, R., Thacker, S., & Young, L. (2005). The writing process three first grade teachers and their students reflect on what was learned. *Reading Psychology, 26*: 235-249.

Ministry of education (2003). The national "Grade 1-9 Curriculum Guidelines". Republic of China, Taiwan.

Paivio, A. (1986). *Mental representation: a dual coding approach.* N.Y.: Oxford University Press.

Paivio, A. & Sadoski, M. (2001). *Imagery and text: a dual coding theory of reading and writing.* New Jersey, N.Y.: L. Erlbaum associates.

Sadoski, Mark; Paivio, Allan & Goetz, Ernest T. (1991). Commentary: a critique of schema theory in reading and a dual coding alternative. *Reading Research Quarterly*, *26*, 463-484.

Shen, P. W. (2004). On the problems in experimenting with curricular transformation. *Bulletin of Educational Research, 50*(1), 1-32.

Vanderburg, R. M.(2006). Reviewing Research on Teaching Writing Based on Vygotsky's Theories: What We Can Learn. *Reading & Writing Quarterly*, 22 (4), 375-393.

Vygotsky, L. S. (1978). *Mind in society: the development of higher psychological process.* Cambridge, MA: Harvard University Press.

Wood, D. J., & Middleton, D. (1975). A study of assisted problem solving. *British Journal of Psychology, 66*(2), 181-191.

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