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RETHINKING CURRICULUM: ACHIEVING QUALITATIVELY DIFFERENT OUTCOMES USING INFORMATION TECHNOLOGIES

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Education has been slow to capitalize on the significant potential benefits to learning of the increased use of information technologies because teachers have, by and large, used them to automate existing classroom practices. A recent innovative Australian project sought to scale up the use of e-learning by giving students and teachers more equity in the development of projects. Students determined the questions that were of interest to them, and were then supported by teachers in designing an e-learning environment to support learning about those questions, in researching the questions, and then providing content for the final e-learning project using a range of information technologies. This approach to e-learning development has been successfully scaled-up to other topic areas within the participating schools.

Keywords: e-learning; information and communication technologies; scale-up; curriculum; innovation; dissemination; change.

The major question posed in the article by Halverson and Collins relates to the degree to which new technologies might fundamentally alter traditional learning and teaching practices. On the one hand, this would not seem to be a new idea. For decades, predictions have been made about the ways in which new technologies might change the way we teach and learn. The lesson of history has been however, that the more the technologies (or tools) change, the more the predications stay the same. Individualized learning opportunities, personalized feedback, and removal of the "drudgery" of teaching are just some of the benefits that have been extolled as the inevitable outcomes of the use of Computer-Based Training in the 50s, 60s and 70s, of Interactive Multimedia in the 80s, and of Web-based learning in the 90s. And now we have e-learning.

On the other hand, one might ask what it would take for education to take advantage of new technologies in order to enhance teaching and learning? Halverson and Collins seem to suggest that new opportunities for learning in terms of new contexts (home schooling, distance education, internet cafes and so on) might force

just such a change. But for me the big question is not which technologies we use and where we use them, but *how* we use them.

There is now significant evidence that despite the large financial investment in information technologies in education, the much-heralded promises have yet to materialize. Zemsky & Massy (2004) for example, report three "troubled assumptions of e-learning," one of which is that "e-learning will force a change in the way we teach." "Not by a long shot" is their response, with the major use of new technologies reported as being the simplification of tasks rather than "... by fundamentally changing the way the subject is taught" (p. 52). The authors report examples of task simplification such as the extensive use of lecture notes translated into Powerpoint presentations, and the widespread use of Course Management Systems to distribute such materials, both of which reflect more of a change of distribution mechanism than a fundamental change in the way we teach.

Similarly, a longitudinal study of seven Australian schools posed a number of questions about the ways in which information and communication technologies were integrated into classroom practices, and whether information and communication technologies were mediating new learning experiences. The study (Hayes *et al.*, 2005; p. 52) reported that:

> "teachers most commonly integrated information and communication technologies (ICT) in ways that allowed students to practice using ICT. In these cases, the purpose for choosing and using ICT was often a secondary consideration. We occasionally observed ICT being integrated in ways that engaged students in new forms of learning ... "

While there were pockets of changed teaching and learning practices, they were in the minority.

So how might educators take advantage of new technologies to enhance teaching and learning? The degree to which the appearance of new contexts for learning might act as a catalyst for change as noted in Halverson and Collins' article is questionable, because the contexts of themselves will not change the way we teach. They are as equally suited to supporting transmission models of teaching as they are to more innovative approaches. Given that most teachers have so far simply used the new tools to automate what they already do in classrooms (give lectures, supplemented by notes and textbooks, and set questions) there is no reason to believe that these practices would suddenly change. What is clearly needed, in addition to these new contexts, is a fundamental re-think about the ways in which we understand learning, and about how we use this understanding to design our approaches to teaching and hence to our use of new technologies.

One such example of a qualitatively different approach to learning and teaching, using new technologies is a design-based research project initiated by an Australian university, funded by the Australian Research Council. This project sought to address the very issue of the lack of "scale-up" (after Coburn, 2003) of

e-learning at the same time as enhancing the quality of learning. The researchers[a] in the Genesis[b] project wanted to understand what might happen when students have an opportunity to conceive, design and, as far as possible, build an e-learning environment in which they and other students can explore questions they are passionately curious about. Secondly, they wanted to know whether new technologies might be more effectively used in education if students designed the software environments themselves.

Over the three-year life of the project approximately 300 students, aged between 7 and 15 years, from three Sydney schools participated. They generated a range of possible questions for further exploration including the sample below:

- Why is DNA shaped in a spiral shape?
- How come space never ends? Does it keep on going?
- Why does the world spin around?
- If it wasn't for gravity, how would we live?
- If not one cockroach was touched (killed), how long would it take for cockroaches to double the human race?
- What are the differences in tongues of people who like different foods?

Finally, they selected the questions "why do we think and how do we think?" and "how come we're not born with the knowledge we know now?" for detailed investigation.

The students then designed an e-learning environment in which they and other students might pursue these questions. This environment was one in which students would take on the role of explorers, traveling on different pathways, encountering the ideas of others, contributing their own ideas, watching experiments that might prove or disprove current theories, taking the opportunity to replicate those experiments and report on them, and posting questions they still have.

A professional multimedia team built the e-learning environment to the students' specifications. Meanwhile, the students continued their investigations, gathering the information with which they could populate the environment once it was ready. Students planned and then recorded interviews with professionals such as psychologists and psychiatrists. They designed and recorded experiments using digital video, conducted surveys and used the Internet to gather information about their topic, and they maintained a list of relevant sites for others to visit. The carrying out and recording of these investigations were only made possible because of the range of technological tools available to them, at the appropriate location, but it was the investigations themselves that were the main focus of the project, with the technological tools playing a peripheral but enabling role.

[a]Lynette Schaverien, Shirley Alexander, Robin Hall, Nerida McCredie (University of Technology Sydney), Norman Nicholson (Killara Primary School), Karen Cuthbert (St Ives North Primary School), Cathy Hill, John Tomkins (St Pauls Grammar School).
[b]http://www.iml.uts.edu.au/genesis/

The environment was completed and introduced to the classrooms in the three schools. Schaverien *et al.* (2005) describe the project and the students' reactions to this research project in more detail, but the following excerpt exemplifies that reaction:

> "It's good being able to continue something for a while because you get really engrossed instead of just taking the surface information — you go deeper — there are many more things that you can learn about it — and so — if you do something more than just once you can really get involved."

When asked about the ways in which the e-Learning environment might have been different had adults designed it, another student commented:

> "I think one of the main differences would probably be, there would be more teaching at you than to you kind of thing because it's also hard for teachers and adults to know what a child is thinking, to know what interests them and stuff, but if you make something by kids for kids it's a lot easier to connect."

The project described above exemplifies the words of Halverson and Collins when they say, "Information technologies are reshaping and extending our capacity to communicate." However, we need to do more than rely on the mere presence of the tools to reshape our practices because no technology or tool, of itself, can guarantee learning. We need to design, to carry out and to test a range of ways of making fundamental changes to the learning experiences we provide.

But what might those approaches to designing learning include? The project cited above has much in common with the opening stories of Halverson and Collins' article. There is a common thread relating to the central role played by students in determining what it is they want or need to learn or do, and the high level of engagement with the tasks that results when they have such an opportunity.

Our major challenge in fact is finding ways of helping teachers to recognize the important role that students could play in determining what it is they want or need to learn. This, of course, requires a major shift in thinking about the role of teachers as they become important guides and coaches. And, it requires a change in thinking about the most effective way of spending learning and development funding which, in my experience, is primarily spent on teaching the teachers to use the technological tools necessary to build e-Learning products, rather than a more effective approach of helping teachers to continue to build on their knowledge about the ways in which their students learn.

If we are able to change this system, we will more likely see greater scale-up of e-Learning using the dimensions described by Coburn:

- the innovation results in deep changes in classroom practice;
- the innovation is sustained over time;

- the innovation spreads not only to a greater number of schools, but also involves the spread of the ideas underpinning the innovation (such as new views of learning that underpin the innovation); and
- over time, the "ownership" of the innovation moves away from the innovator to the "authority for the reform."

In conclusion, I agree with the assertion in Halverson and Collins' article that there are significant benefits to be realized for education through the use of new technologies. But, these will only be realized when we as educators better understand what we need to do to support learners in what it is that we know they want to be able to do — to pursue the questions that interest them. We need to be able to work alongside students as they pose questions, refine them, clarify positions, make connections, design and conduct research, report findings, critique what they have found, and communicate their findings. Only then will the days in which the primary role of teachers giving out information will come to an end.

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