

Practitioner Experiences with Technology Enhanced Teaching

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Abstract

This paper describes a research project, which seeks to showcase the experience of educators with technology-enhanced teaching and learning. A particular focus of this investigation is on how the use of information and communications technology is influencing teaching practices and students' approaches to learning at the University of Melbourne. As such it comprises a naturalistic inquiry into the experience base of practitioners who have been engaged in technology-enhanced teaching and learning. Our goal is to look beyond objective data and examine closely how information and communications technology is fundamentally influencing the nature of the teaching and learning transactions. As such we are interested in the "untold" stories of practitioners and participants in this work. Data that is collected is archived on a website, and used in a variety of ways for faculty development.

Aims and Outcomes

Educational institutions all around the world are beginning to pay greater attention to the improvement of their teaching and learning practices with the innovative use of information and communications technology (ICT). Although a great deal of work has gone on in the investigation of the effects of computer-based learning, there is a lack of reliable knowledge about *what* works, *why* and in *what ways*? This paper describes a research project that is trying to seek for some answers to the foregoing questions from the perspective of practitioner experiences. The goal of this investigation is to look beyond survey data derived from questionnaires into the experiences of practitioners, to ascertain how ICT is fundamentally influencing the nature of the teaching and learning processes in various subject matter domains. As such the aim is to tell the "untold" stories of practitioners and participants. The stories we are collecting, and the profiles of practice that we are developing will comprise the data for the development of conceptual models of best practice. These models may then form the subject of empirical study in the future.

The outcomes of this research are expected to be a deeper level understanding of how the use of ICT is influencing teaching and learning in fundamental ways. In that regard, this is "exploratory" research as it seeks to compile stories of the experiences of teachers and students with technology-enhanced teaching and learning. As an immediate output, these "stories" or "vignettes" of practitioners will be used to build a "gallery of stories" on technology-enhanced teaching and learning that will be accessible on a website for the benefit of all, but most importantly, for novices. Furthermore, models of behavior and practice derived from this research will provide the context for more empirical studies in the future, such as the study of any correlation between innovative teaching and learning designs and specific learning outcomes, and/or approaches to learning and teaching.

Context and Scope

The application of ICT in teaching and learning has the potential to change educational practices in significant ways (Ben-Jacob, Levin, & Ben-Jacob, 2000; Rogers, 2000). For example, the integration of e-mail and computer conferencing with multimedia databases and electronic libraries has enabled the emergence of a whole new kind of educational activity, namely eLearning. Information and communications technology is also enabling established campus-based providers to rethink and re-engineer the nature of their teaching and learning practices. The University of Melbourne, like many other educational institutions, is currently involved in just such a process as part of a strategy to position the University as a global player in higher education. As a direct result of this and along with the adoption of ICT, innovative approaches to teaching and learning such as problem-based learning and collaborative learning are being encouraged. These initiatives have led to the rise of new roles for teachers such as "facilitators of learning" as opposed to "deliverers of content" (Evensen & Hmelo, 2000; de Verneil & Berge, 2000; Salmon, 2000). They have also exposed students to new models and approaches to learning such as "computer supported collaborative learning" (Dillenbourg, 1999; Koschmann, 1996; O'Malley, 1995), and "computer supported problem based learning" (Bernard, Rojo de Rubalcava, & St-Pierre, 2000; Koschmann, Kelson, Feltovich, & Barrows, 1996).

While interest is growing in the integration of technology in learning and teaching, there is still very little known about how the use of ICT is changing teachers approaches to teaching, and students' approaches to learning (Rumble, 2000). The need to investigate what is happening with technology-enhanced teaching and learning is now imperative. This includes, among other things, understanding how approaches to teaching are being impacted, how teacher-thought about teaching and learning is being modified, how students' approaches to learning are changing, and how student support is changing with the use of ICT?

Methodology

The research described in this paper set out to seek some answers to the foregoing questions from the practitioners' perspective. It comprises a naturalistic inquiry into the *modus operandi* of educators (Lincoln & Guba, 1985). Naturalistic inquiry is particularly suited to questions and settings such as this where the context is heavily implicated on meaning. Such a contextual inquiry *demand*s the use of human instruments for gathering data, as humans have the capacity to use their tacit knowledge with qualitative data gathering tools such as *interviews, direct observations, self-reporting and think-aloud, and document analysis*. Once in the field, the inquiry takes the form of successive iterations of these elements: *purposive sampling, inductive analysis of the data, development of grounded theory* based on the inductive analysis, and *projection of next steps* in a constantly emergent design (Lincoln & Guba, 1985; p. 187). Throughout the inquiry, and especially at the end, the data and interpretations are continuously checked with respondents, and differences of opinion are negotiated until the outcomes are agreed upon or differences of opinion are understood and reflected as such. This information is then used to develop a case report or profile, which is tested for "credibility" and "confirmability" (Lincoln & Guba, 1985; p. 189). This testing begins early in the study and continues throughout, culminating in a final representation of what was observed.

Data Gathering

Interviews are being used as the principal instrument for data gathering in the first instance. The initial sample comprises practitioners who are known for spearheading the use of ICT into teaching and learning at The University of Melbourne. This sample will grow to include other practitioners at the University of Melbourne. There is a possibility that this may grow even further to include practitioners from other organizations including tertiary educational institutions, and also commercial enterprises. In the spirit of naturalistic inquiry, interviews are being conducted on location. An interview protocol has been developed which sets out the goals of the interview and trigger questions to guide the interview (see boxed text below).

Teaching and Learning Experiences with Educational Technology

We are interested in *your story* and *your experience* with technology-enhanced teaching and learning. We would therefore like you to reflect on your experience with technology-enhanced teaching in terms of the following:

Planning

- What are your goals and motivations?
- What aspects of your teaching and learning are you trying to influence (*e.g., approaches to subject matter content representation, activation of learning, assessment, socialization, or provision of feedback*)?
- Why are they important, to whom and to what?
- Describe your approach to learning and teaching?
- What is unique or innovative about this approach?
- What limitations of theoretical perspective have you encountered?
- What unique challenges have you faced in planning your approach?
- How did you know if you were on the right track?

What you are doing?

- How did you go about choosing the tools and technologies?
- What influenced your choice of these tools and technologies?
- What challenges did you face in selecting these tools and technologies?
- What limitations did you experience; financial, technical or organizational?

What happened?

- What worked and what didn't work?
- What criteria did you use for evaluating the effectiveness of your progress?
- How did you make use of the data that was gathered?

What you learned?

- How did this innovation influence your view of teaching and learning?
- How did it influence your students' approaches to studying and learning?
- Did it impact your understanding of your students' studying and learning?
- What are your successes, failures, serendipitous findings, lessons learned?
- What would you do differently next time?

Interviews routinely begin with a discussion of this interview protocol and the trigger questions. This is to ensure that interviewees understand the questions, and are comfortable with their motives. With the permission of the interviewees interviews are audio taped and subsequently transcribed. These transcripts comprise the raw data for the development of profiles of practice. The interview protocol follows the action research methodology, which comprises *planning, doing/taking action, observing and reflecting*.

Developing Profiles of Practice

Excerpts derived from the interview transcripts comprise the raw data. Researchers sift through these transcripts to develop individual profiles of practice along the lines of the interview protocol. These are then presented to each interviewee to allow the filling of gaps in the profiles, verification of existing materials and addition of any other thoughts on the matters raised during the interview. This in itself is an iterative process and involves further consultations with interviewees. The profiles are entered onto the database only when complete agreement has been reached between the interviewee and the researchers on the content of the profiles.

Development of the Database

The database is used to generate profiles of practice for a website that is available to all University of Melbourne academics. Data is entered using a simple web-based form to populate the following fields:

<i>Planning</i>	<i>Doing</i>	<i>Observing</i>	<i>Reflecting</i>
Summary	Summary	Summary	Summary
Goals & motivations	Choice of tools	What worked	Impacts on your view of teaching & learning
Approach to learning	Influences on choice of tools	What did not work	Impacts on your student's approach to studying
Limitations of the approach	Challenges in selecting tools	What criteria for success were used	What did you learn
Challenges	Limitations experienced	How those criteria were measured	What you would do differently next time

Data is also included for standard project details such as the names and affiliations of faculty and project leaders, date of implementation, and project type. Each profile also contains a brief summary of the project and current issues in the discipline. There is no requirement that all fields contain data.

Where appropriate, data can be provided in formats other than text. The database is used to generate a showcase of academic practice. Users of the site can customize the display of stories by focusing on a particular action research process, group of trigger questions, faculty or the complete profile of a particular project.

Display options include a choice of predefined categories, as well as browseable lists and individually constructed searches. Browseable lists allow the display of projects by faculty and department, as well as by action research process, including approaching the data from varying perspectives. Search functions provide for user-constructed views of the data that enable investigation based on specific interests. Keyword searching is also available across all fields of the database. Each story segment is displayed with fully linked metadata for the

corresponding project. This provides a link to departmental databases containing other project information, and also to academics involved with the project. Links are provided to live course content where possible.

Sample Profile (Abbreviated)

Project Leader: Tim Van Gelder

Faculty/Department: Arts/Philosophy

Summary of Project

Reason!Able is a stand-alone PC package designed to assist students at all levels, including those with no explicit training in logic or argument, to acquire general informal reasoning skills. We looked at research about critical thinking courses and it showed that they just weren't having the effect that they were claiming to have had, and were perhaps actually hurting students' critical thinking.

Planning: Summary Comment

We wanted to help students to learn to acquire general and fundamental skills of reasoning and argument. We teach general skills that can be applied in any domain whatsoever e.g. in students' other academic subjects and in their chosen profession.

Planning – Goals and motivations

We wanted the students to go through a certain fairly standard, straightforward routine. We had initially used a HyperCard stack, but wanted to come up with a dynamic forming type of software tool, that would simultaneously teach the students all the concepts and procedures that they needed to know.

Planning – Approach to learning

I was fundamentally concerned with the problem that the students did not learn. They were trying to learn, but not succeeding, and not reflecting on the fact that they weren't succeeding. If you want to acquire skills, you've got to practice. It's true for cognitive skills just as much as practical ones. But it's not just any old practice; it's got to be the right kind of appropriately guided, scaffolded, and motivating practice.

Planning – challenges

The idea that targeted practice will lead to an improvement in skills is the one thing that has been absolutely constant. What we were trying to create with the *Reason!Able* software is what I have come to call an 'environment tool' for quality practice in reasoning.

Doing – Summary Comment

Teaching is still a cottage industry where a whole lot of people are just assumed to be able to do it and they go by unquestioned. There hasn't been the pressure to force change.

Doing – Choice of tools

We thought that maybe there were more ways of representing complex structures of reasoning, which take advantage of representational resources, which for practical reasons couldn't be used very effectively. In *Reason!Able* you'll see an almost complete switch from a HyperCard approach to an all-in-one workspace. All the information is at all times is available on the screen.

Doing: Challenges in selecting tools

Despite difficulties, it was the first time ever that somebody had built a way of handling argumentation that made it visual, manipulable, and graphical. It's a real turning point.

Doing - Limitations experienced

In a certain sense, we failed in our first attempts, because we found out that the task was a lot more difficult and challenging. I don't think it was a success from the point of what we said we would do at the beginning and what we delivered at the end. Although, I think that we've succeeded at the end of three attempts.

Observing - Summary Comment

We are dealing with a huge spectrum of intuitiveness and familiarity. It is very interesting, that many university students are having difficulty with critical thinking skills and yet, elementary school students are coping with it.

Observing - What did and did not work

Students have been more successful in learning how to think critically because of these visual elements. It is the visual element that is having the most impacts.

Observing - What criteria for success were used?

So far, our students gain three to four times as much as any other students in the world, in terms of critical thinking skills. The studies showed that this technology helps people learn critical thinking skills.

Observing - How those criteria were measured

Last semester, we did a number of studies, comparing the results from the University of Melbourne, with that from Monash University in Melbourne and McMaster University in Canada. Their results were only half as good as ours. There was something about our approach, which was working much better.

Reflecting - Summary Comment

It has changed me a lot, there's no question about that. We don't think hard enough about effectiveness and quality. We inherit a framework of practices and assumptions and we work within that so that what everybody else accepts is deemed fair and reasonable practice is what obviously I would accept as reasonable practice.

Reflecting - Impact on your view of teaching and learning

The software is tapping into a much larger set of brain resources than the typical ways of presenting arguments. We are getting students to use more of their brain. The software is partly visual, partly manipulable and that helps them and it makes life easier for them. It reduces the cognitive burden.

Reflecting - Impact on your students' studying and learning

The students are being affected far more than they realize. At a deeper level, they are being exposed for the first time to what it is to be critical and what it is to have a rational opinion. They're getting an understanding of what it takes, how complex the world is, what the issues are and how much work is involved in actually thinking through an issue.

Reflecting - What you learnt

If the primary role of this course is to improve students' critical thinking skills, then yes, I think I have become better at it. I am using better methods, better tools, and getting better results. I have also learned that if you're engaged in a challenging project, you have got to expect that it may not pan out the way you think it will. You have got to be prepared to change your direction, re-conceive the project, and keep pushing the boundaries.

Concluding Remarks

The work that is described and discussed in this paper grew out of a growing call for "evidence of the impacts" of information and communications technology in tertiary teaching and learning. While this is a question that has been asked many times before, answers to it have not been conclusive one way or the other. There is a lot of evidence to suggest that the use of information and communications technology in tertiary teaching and learning has many advantages. There are also suggestions that these benefits do not justify the cost, time and effort that this kind of work entails. Many of these findings are however, problematic as they are based on neither reliable nor valid research techniques. The work that is reported in this paper incorporates investigation techniques that depart from the commonly used approaches to the quantification of user perceptions with questionnaires and surveys of sorts.

Our goal in this work is to capture the experience base of practitioners with the use of a range of data gathering techniques that are grounded in the principles of naturalist inquiry. We realize that data derived from these kinds of approaches are not easily "generalizable" to other contexts. Among other things, generalizability is a function of sampling and we expect that over time, we will have in this gallery, the amount of information and data that is necessary to make meaningful generalizations from it to similar situations and contexts. We anticipate that this gallery will grow into an extremely rich resource of the experience base of not only many of our pioneering efforts but some of the most innovative work that is being undertaken in this regard at the University of Melbourne and elsewhere. A larger collection of profiles in the database would enable the examination of patterns and models of behavior among practitioners that could become the subject of study further down the road. Questions that might seem relevant would include: the reasons for particular approaches to teaching, and prominent approaches to student study behavior. We are hopeful that these questions would make interesting study towards explaining how the use of technology is impacting teaching and learning.

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