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Designing learning activities for a *Technologically Integrated Curriculum* (TIC)

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Information and Communication Technologies (ICT) now play a significant part in many classrooms. New and sophisticated technologies are introduced to the education market regularly. But no matter how good the tools, unless teachers are convinced and willing to design, develop, and implement appropriate pedagogies that use the new technologies; the new gizmos are unlikely to succeed in classrooms. In many schools across the globe, teachers have blended new technologies in an array of innovative ways. This paper describes such an initiative which is currently underway at a high school in Queensland, Australia. A group of year eight students (first year in high school) and their teachers in the *Technologically Integrated Curriculum* (TIC) Program use ICT and related technologies in all their subjects. Purpose-built rooms accommodate the students to do their work at school. They also use *Blackboard* to access learning materials after school hours. Qualitative data were gathered from teachers (N =10) through structured and unstructured interviews to ascertain their perceptions of the new initiative. Teachers in this program had between 5-30 years of teaching experience. This investigation identified challenges faced by teachers and identifies the factors and the key questions associated with designing learning activities in a technology rich learning environment.

Introduction

Personal computers began appearing in schools more than 25 years ago. Commodore 64's was one of the first computers which offered educational possibilities in terms of word processing and creating spreadsheets. More recently *Information and Communication Technologies* (ICT) have become more efficient and affordable with an array of possibilities for educational purposes. As a consequence it has become a tool which is becoming very common in classrooms.

There were at least three important questions – vocational, pedagogical and societal have dominated the use of ICT in education (Wellington, 2005). One pedagogical question is the effect that ICT has on the role of the teacher. With new and smarter technologies, the role of the teacher is progressively changing as the “sage on stage” to the “guide on side”. As teachers turn more towards Information and Communication Technologies (ICT) for facilitating teaching and learning, their role as the “sage on stage” is quickly transformed to “a guide on the side”. McKenzie (1998) argued that a good teacher knew “when to act as sage on the stage and when to act as guide on the side” (para. 10). According to Papert (1999), digital technologies create new opportunities for students to explore the wider world. However, these tools are useless unless teachers can effectively blend these tools into learning activities.

There are a number of frameworks which propose how teachers embrace new technologies. Newhouse, Trinidad and Clarkson (2002) for instance proposed five stages which describes how teachers engage with technologies. The first three stages – “inaction”, “investigation” and “application” describe a progressive enhancement in teachers’ abilities to use the technologies in the classroom. The transition from “application” to “integration” is significant because teachers go past a threshold which Newhouse, Trinidad and Clarkson describe as the “critical use border”. By the time the teacher reaches the “transformation” stage, he or she can take leadership roles and demonstrate attributes of a leading teacher in ICT.

The ACOT (Apple Computers of Tomorrow) research project (1985 – 1995) mirrors some of the stages highlighted by Newhouse, Trinidad and Clarkson (2002). The ACOT project (ACOT, 1995) describes five iterative processes – “entry”, “adoption”, “adaptation”, “appropriation” and “invention”. Learning to use the new technologies is an iterative process and even those who have reached either the “invention” or “transformation” stages have to learn and unlearn about teaching with new technologies.

This paper presents some of the findings of a year long study where ICT was blended at a high school in two year eight classes across most of the subjects. Teachers in the *Technologically Integrated Curriculum* (TIC) Program volunteered to teach in their respective subject areas. All teachers in the study were at least in the “adaptation” stage (ACOT, 1995) of ICT implementation. This qualitative study focuses specifically on the issues and challenges which teachers faced as they planned and prepared for the new program.

Research Methodology

Context

The TIC program was designed and implemented in year eight classes (first year of high school) at a state school in Queensland, Australia. Two out of eleven classes (55 students - 36 males and 19 females) were taught using computers. Lessons in English, Mathematics, Science, Studies of Society and the Environment (SOSE), Languages Other Than English (LOTE) and Health and Physical Education (HPE) were created using ICT. Two custom built rooms catered for the needs of the students. One of them was student focussed with a computer for each student while the other was teacher centred but also created numerous opportunities for collaborative tasks. Each room had a data projector and the computers were equipped with a wide range of up-to-date educational and industry standard software. Digital cameras were available for student use and the teacher centred room had an electronic whiteboard.

The TIC program was developed with the following objectives:

- a) Actively engage students in learning
- b) Improve literacy and numeracy through the use of technology
- c) Enhance Information Technology skills

- d) Increase students motivation to learn
- e) Provide greater access to learning resources
- f) Provide greater flexibility to address the needs on individual learners
- g) Provide access to learning materials outside school hours and increase the involvement of parents.

On average students participated in learning activities in the rooms for at least 75% of the day. They also had access to learning activities after school through Education Queensland' *Blackboard* site. Students joined the program through an application process. However, the selections were not made on the basis of academic or ICT ability. These selections were based on the data provided by their primary on their abilities to work independently. Students also had to pay a relatively small fee to enrol in the program.

Planning and preparation for the course began almost a year before the program was implemented. This investigation focussed specifically on the design phase (prior to the implantation of the program) as teachers planned and prepared to implement the new program.

Participants

Twelve teachers were directly involved in this project. Of the twelve, ten agreed to participate in this investigation. The teachers taught English, Mathematics, Science Studies of Society and the Environment (SOSE), Languages Other Than English (LOTE) and Health and Physical Education (HPE).

Data collection and analysis

The major data collecting strategy employed in this part of the study was in-depth interviewing. Teachers were interviewed at pre-determined locations. Interviews and conversations were recorded and transcribed. They were asked to reflect on the design phase (before the program was implemented) as they answered the following questions:

1. How did you go about designing lessons for the TIC program?
2. What were some of the challenges and problems you faced? How did you address them?

Results and Discussion

The implementation of each new program in a school environment brings on new challenges for teachers. Some of these challenges are anticipated and factored in the design process program which others emerge (sometimes unexpectedly) as implementation starts. For this reason understanding the issues and how they are addressed by teachers in the design phase is important. In this study teachers were asked to identify some of the issues which were most significant to the as they planned learning activities for the TIC program.

All teachers acknowledged that they had to rethink the teaching learning process. For some teachers the TIC program was viewed as an opportunity to initiate a curriculum renewal process. It gave them an incentive to revisit what they were teaching and how they were teaching it.

TIC gave us an opportunity to reevaluate courses. For instance, our program was revamped and the learning activities were centred on the new textbook because all students had to purchase one.

We had a new syllabus we had to make changes anyway and looking at how we could enhance what we were already doing in cyberspace and incorporating it into the existing work.

The school took a conservative approach to the implementation of the new program – only one variable of the teaching-learning cycle was predominantly changed to keep the new challenge manageable. As one of the teachers pointed out – the challenge *was to have a course built from the old course*. TIC and non-TIC classes were essentially addressing the same learning outcomes, covering the same content and finally doing either similar or the same assessment. However, one significant difference was in the pedagogies that teachers used to present their lessons – this was the only variable within the teaching-learning cycle which was changed significantly. Designing learning activities in a technology rich learning environment was a challenge especially in the absence any suitable models which paralleled this context.

It was also difficult because no other schools were trying this and there are no models to go by

The teachers addressed the challenge in different ways. In one of the subjects, the approach was to keep the new textbook as the focus for developing the learning activities and use some of the resources in the accompanying CD. In another subject, the approach was to audit what was there already and then decide what new initiatives could be undertaken.

The course design and the content was kept the same for all students but varied the assessment tasks to suit TIC and non-TIC students. The CD accompanying the textbook had internet sites to support the lessons together with some good little quizzes and flashcards for definitions.

We did a review of what was available...we looked at the program as it was and explored ways to keep the program similar and areas where we could slot the [technology based] exercises in...

In Mathematics, the school had already decided to purchase a software package that would be used by TIC classes. However, teachers did not have access to the program at

the time learning activities for the TIC program were designed and as a consequence spent their time on semester planning.

The Mathematics Department had already decided to use this new software and as a consequence the teachers did not have to think too much in terms what the relevant software they have to use. The software was also packaged with other applications e.g. drawing graphs. In terms of planning ...we didn't have the program so most of the time was spent selecting what topics we wanted to do...and work on semester plan

While in Mathematics, software was not an issue, in other subjects not knowing enough about which packages were available was problematic. Teachers knew of some resources that could be used for parts of the course, but not knowing enough about what ICT based resources were available on specific topics was an issue.

One of the greatest challenges was designing appropriate assessment...the hardest part was coming up with the assessment items using a range of technologies, because we didn't know what most of it was...We knew there was PowerPoint...we couldn't have every assessment piece based on PowerPoint.

Yeah not knowing...for the first term....I have been able to use what is already out there... but next term there are more specific topics and there isn't a lot out there in terms of online resources.

Given that this program was new, teachers understandably had other issues in terms of what was expected of them and more importantly predicting how successful some of their lessons would be when these resources were used in TIC classrooms. There was a certain degree of uncertainty in terms of how it would pan out. Limited access to computer rooms also prevented teachers from trialling certain ideas before they were implemented in the TIC classes.

It wasn't easy. I didn't know what was available or what was expected of me... and coming up with ideas. I really wanted the first year to be just manageable. To get it done so it wasn't a big flop. I have been looking at technology and games for my classes but because of limited access to computers I haven't be able to use it. I have looked at a lot of packages and websites that were already out there; but the planning was still very hard...

Whether we had the technology here to do the work and locating the work you wanted to do and then looking to see if we had the ability to achieve this goal....

I felt really anxious about what was expected of me.

The school had a number of highly skilled technology staff; however there were no local experts (eg. e-learning specialist) who could specifically support and advice teachers in terms of how to blend the technologies in their respective subject areas. The program had a TIC coordinator who had other teaching responsibilities and supported the teachers in the best ways possible. Teachers were highly appreciative of the support they were getting from the coordinator and other technology staff.

Time allocated for designing and planning activities was also an issue. Some teachers felt that more time should have been allocated to enable them to plan and search for appropriate software packages and resources that were available online. *There are some good links to websites* – but they needed time to structure their search, explore the content, and establish its credibility and suitability for developing learning activities. Teachers also needed time to discuss with other TIC teachers to establish what they were doing. They did not want to unknowingly step on other teachers toes *by using their ideas*.

With regards to hardware and software issues... the time needed to review the program not in an ad hoc way but sit down and look at it. Talking with other teachers in other subject areas helps and you get ideas...

Most of the teachers engaged in this program would either be in the “application” or “integration” stages of technology users in their classrooms (Newhouse, Trinidad & Clarkson, 2002). However, some were at the “transformation” stage where they knew exactly how to design lessons and had their own innovative ideas.

We have a booklet which is like a textbook. I did PowerPoint presentations and have a subscription to a website now. I can get language games...I provide the raw data and the site converts it into a java game and the kids have access to it with a password. It's an American site and it cost us about 50 USD.

Implications for teachers

While teachers entered this program with varying abilities and beliefs about a technologically integrated curriculum, they all seemed to appreciate the experience. There was an overwhelming belief amongst the teachers that despite some of the challenges and issues highlighted here they all believed that it was a worthwhile experience. They all understood what they were trying to achieve.

...we wanted to use technology to enhance learning and not learn technology...Make it [Lessons] interesting and engage students but keep the academic rigour

This investigation focussed on the challenges faced by teachers when they design learning activities in a technology rich learning environment. It identified some of the issues in the initial stages - prior to the implementation of the program (Table 1).

Table 1. Factors and key questions associated with designing learning activities in a technology rich learning environment

Factors	Key questions for teachers
Curriculum renewal	How can we do the learning activities differently?
Textbook	How can we blend this resource in the new environment?
Course audit	What resources do we have already?
Resources	How and where do we find new resources?
Models	Has a similar approach been trialled elsewhere?
Time	How do we plan as a team and find resources?
Trailing ideas	Can we trial ideas before we implement them?
Teacher support	Who do we ask when we have a problem?

Table 1 highlights the key factors and the key questions that are relevant when learning activities using technologies are designed. Teachers have different levels of expertise in the use of technologies and as a consequence the extent to which the factors impact on them could vary. The TIC program can serve as an effective model for teachers as they design learning activities for a technology rich learning environment. Further research on this project is underway.

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