Integrating ICT into the Learning Environment at Sevenoaks Senior College: How Teachers and Students use Technology in Teaching and Learning

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Abstract

This paper reports part of a larger, ongoing study of an innovative new school. Sevenoaks Senior College is committed to creating a highly outcomes-focused curriculum by integrating unique Information and Communication Technology (ICT) infrastructure into the delivery of educational programs, online curricula, and management systems for both teachers and students. The study used qualitative research methods to examine the ways in which students use ICT and their attitudes towards its use. The study also examined the types of support, training and environment that facilitate the effective integration of ICT in teaching and learning. The findings indicate that teachers are making substantial progress in their transition towards teaching in an ICT-rich environment. The results indicate that most students hold positive attitudes towards their experiences at Sevenoaks and feel that the ICT-rich environment being developed at the school encourages students to become more self-directed in their learning.
Introduction

In 2001 Sevenoaks Senior College broke new ground in Western Australian secondary education with a focus on industry and community partnerships and innovative approaches to learning in today’s information society. Situated in a low-socioeconomic area of Perth, where high unemployment rates and low university entry are common, this new-concept senior college attempts to provide a unique learning environment and comprehensive curriculum that addresses the needs, particularly the post-school aspirations, of the full range of students attending this school.

At Sevenoaks Senior College, traditional timetables have been replaced with a flexible timetable and an extended day. The traditional classroom has been replaced with a lecture theatre and ‘learning suites’ that enable Sevenoaks to change the way in which teaching and learning have traditionally taken place in upper school subjects. Students are able to access and work on their learning programs in a range of settings, including at school, during community-based activities, and during work placement (Wood & Trinidad, 2001).

Teachers use the advantages of a wholly-integrated ICT system at Sevenoaks Senior College. Such a system allows teachers to enrol students, determine their starting levels and competencies, and manage each student’s learning program. There are three major elements to this system, including the RM Australasia School Management System, the use of WebCT, and an electronic resource store arranged by learning area/subject.

The curriculum development system comprises three distinct parts – the Document Publishing and Management Software (HarvestRoad DPMS), a HTML text editor (HarvestRoad Publisher) and WebCT, the web-based front end mode for the delivery of courses. Such a curriculum development system enables teacher to develop online curriculum materials with limited knowledge of WebCT or HTML writing.

Sevenoaks’ communications system involves an innovative ICT infrastructure that connects 200 desktop computers and provides a wireless network for laptops. There is a computer to student ratio of 1:2 and every staff member is provided with a laptop computer. The teacher librarian/webmaster is responsible for the library and web administration, as well as staff professional development and online curriculum development.

This present study is part of a larger ongoing study that examines and documents the integration of ICT into all facets of teaching and learning at Sevenoaks, especially how ICT can be used for improving student outcomes. The study is funded through a national ARC Strategic Partnership with Industry: Research and Training (SPIRT) grant. The research group involves an industry consortium comprising Sevenoaks Senior College, the Education Department of Western Australia and several ICT industry partners (RM Australasia Pty Ltd, CISCO Systems, Alphawest and ACER Computers) working with Curtin University of Technology researchers to investigate the impact of ICT on the learning environment during 2001-2003. Progress with this project can be followed through the school website at http://www.sevenoaks.wa.edu.au and conference papers (Aldridge, Fraser, Murray, Comb, Proctor & Knapton, 2002; Aldridge, Fraser & Fisher, 2002; Fisher, Aldridge & Fraser, 2001).

The part of the study reported in this paper involved all Year 11 students attending Sevenoaks Senior College in 2001. Qualitative research methods, including observations and interviews with students, teachers and the webmaster/teacher librarian, were used to examine the ways in which ICT has been used and integrated into the teaching and learning at the school during this important first year. The study examined the attitudes that students hold towards the use of ICT at Sevenoaks and identified factors that are likely to influence
these attitudes. Finally, the study examined the types of support, training and environment that are likely to make possible the integration of ICT into teaching and learning at the school.

**Aims**

The major research aims described in this paper are:

1. To investigate the ways in which teachers and students use ICT at Sevenoaks Senior College.
2. To examine students’ attitudes towards the use of ICT at Sevenoaks Senior College and to identify factors likely to influence attitudes.
3. To examine teachers’ implementation of ICT into the classroom/school, especially the types of support, training and environment that facilitate the integration of ICT into the teaching and learning at Sevenoaks.

**Background/Theoretical Framework**

*Information and Communication Technology (ICT) and Education*

Education and training are fundamental to achieving priorities for the Australian economy in the twenty-first century. All Australians need to be "enterprising, innovative, adaptable and socially responsible participants in the information economy" and "Australia will be at a serious disadvantage in the global knowledge economy if it fails to produce workers, professionals and managers with the skills to work in the online environment" (National Office of the Information Economy, 1999, p. 11). These national views also are reflected in the Western Australian Curriculum Framework (Curriculum Council, 1997).

To meet this challenge, the Western Australian government has invested approximately $100 million on information technology in schools. However, increased spending on ICT in schools does not necessarily guarantee improved teaching and learning environments and improved student outcomes (Centre for Research on Information Technology and Organisations, 1999; EdNA, 1999a; White, 1999). Although education has a poor history of successfully meeting the challenges of major shifts in information technology (Trinidad, 1998), there has been far too little research into the implementation and educational benefits of technology-rich school learning environments. Therefore, this research, as part of the larger study, investigated how teachers and students integrate ICT effectively into the learning environment, as well as the attitudes of students to using ICT for teaching and learning.

*Learning and Teaching Styles and ICT*

People have preferred styles of learning. For example, some people prefer to read or listen while others like a highly visual approach. Learning opportunities must be provided in a variety of ways so that no-one is disadvantaged by the approach. Research (Carbo, 1986; Campbell and Campbell, 1999) continues to show that, when learners are able to use their own particular style of learning and processing information, their motivation, initiative and results improve.

Teacher-centred learning approaches often favour passive reception of knowledge, whereas learner-centred approaches encourage a process of active inquiry. Learners are best
motivated to learn when they can take responsibility for their own learning as it is an active process.

Interactive technologies encourage active learning and, with the increased popularity of computers, today’s students are learning with technology, as opposed to learning about technology. As authors (Schweizer, 1999; Nelson, 2001) show, teachers can provide powerful learning opportunities through ICT when students are responsible for their own learning and are active learners defining their learning needs, finding information, assessing its value, building on their own knowledge base and communicating their discoveries. These online activities need to be carefully designed, giving thought to the different learning styles of students and the way in which students learn. In the information age, the implications of a move from teacher-centred to learner-centred education are that it is important for students to be able to analyse and synthesise enormous amounts of information, thus determining what should be learned, how it will be learned, and when it will be learned.

**Teachers’ Use of ICT and Levels of Implementation**

The rapid development of ICT, particularly electronic communications and easy access to information through the Internet and email, is now an undeniable fact of contemporary life and one that is inextricably linked with modern education. As students and teachers begin to use ICT in classrooms, its use has the potential to lead to changes in the role of the teacher and the school. The teacher’s role, as described by Scheffler and Logan (1999), should be to work in collaboration with students as knowledge is applied to authentic situations. Teaching no longer centres around the transfer of content from teacher to student. Instead, learning comes from student inquiry, critical thinking and problem solving based on information accessed from a variety of sources.

As Godfrey (2001) states, "to become confident, critical and creative users of ICT teachers must have access to professional development programs that enable them to have multiple skills, both, in the use of technology and in task design" (p. 16). Therefore teachers need, not only the ICT skills, but also the models of best practice and knowledge to support learning. They need to understand the rationale for integrating ICT into learning environments and interpreting curriculum documents to make decisions about designing, delivering, managing and evaluating instruction.

The present study examined teachers’ use of ICT at Sevenoaks Senior College and the level of implementation at which they appeared to be working. The identification of teachers’ levels makes possible the introduction of professional development which will help teachers to move on to the next stage.

**Research Methods**

According to Erickson (1998, p.1155), qualitative information is particularly appropriate when researchers require "detailed information about implementation … [or] to identify and understand change over time." The present study (which is part of a larger ongoing study) examined the implementation and use of ICT over a period of three years. It was considered appropriate, therefore, to collect qualitative data using a variety of sources.

It is widely agreed that multiple research methods are useful in achieving greater understanding (Denzin & Lincoln, 1994; Keeves & Adams, 1994; Tobin & Fraser, 1998). It was with this in mind that data collection for the present study involved different kinds of information (as recommended by Erickson, 1998), including field notes based on
observations, analysis of school documents, interview comments and discussions and tape recordings of interviews.

Observations were carried out in the classes of four teachers. The selection of classes included Tertiary Entrance Examination (TEE) subjects (physics, economics and English) and wholly school-assessed (senior English and small business) subjects, but was based largely on teachers’ willingness to be involved in the study.

For two of the classes, observations were carried out on an average of two lessons each a week for a term. For the remaining two classes, observations were carried out for two lessons a week over three weeks. Observations involved the monitoring and documenting of classroom discourse and pedagogy in the form of field notes.

After each observation, discussions were held with the teacher. These discussions sought the teachers' reasons for various actions and whether they had encountered any problems during the course of the lesson.

Data were also gathered during semi-structured interviews conducted with 34 Year 11 students, of whom 16 were enrolled in TEE subjects and 18 were enrolled in wholly school-assessed subjects. Students were asked to comment on their views of the ICT learning environment being developed at Sevenoaks Senior College and about the problems and advantages that they perceive to be associated with it.

Finally, an in-depth interview was conducted with the teacher librarian/webmaster responsible for staff professional development and online curriculum development at Sevenoaks Senior College.

The information collected from teachers and the teacher-librarian helped to identify the types of support, training and environment that makes possible the integration of ICT into the teaching and learning at Sevenoaks.

Findings

Ways in which ICT is Used in Classes at Sevenoaks Senior College

Sevenoaks Senior College has the capacity to deliver educational programs, online curricula and management systems for both students and teachers through a purpose-built learning environment supported by an extensive ICT infrastructure. Interviews and observations indicate that the students at Sevenoaks Senior College use computers in most classes. According to students whom were interviewed, computers are used mainly for researching information on the Internet, typing up assignments and accessing course information from WebCT during class time. These results reflect previous research, which has reported that Australian school students spend more time using word-processing software than any other software, and that they use the Internet primarily for email, research and entertainment (EdNA, 1999a; White, 1999).

Interviews indicate that the email facilities were popular amongst students at the school, a finding that reflects past research with students (Oliver & Towers, 2000). Most students (90%) used email to contact or reply to friends during class time. Generally, the students interviewed were not concerned with the amount of time spent on the email as they felt that the flexibility provided with online work allowed them to catch up outside of class time. Interviews indicated that students enrolled in Tertiary Entrance Examination (TEE) subjects tended to be more disciplined with their use of email than were students enrolled in wholly
school-assessed subjects. One student enrolled in TEE subjects estimated that she spent "50% of … [class] time emailing friends and 50% doing work. I can do both" (IDS4:2001).

Another student discussed how one of his teachers encouraged students to stay off the email by telling the class that, if students stayed on task, they could have the last ten minutes of the lesson to either check their email or leave early. "This keeps the kids on task." (IDJ7:2001)

Students whom were interviewed indicated that one of the main uses of ICT at Sevenoaks was access to WebCT for course information, both in and out of class. WebCT provides students with the means to access the course outlines, objectives, information about assessment, and notes for each subject. Each student enrolled at the school has a personal site containing a tailored course profile with direct links to the subjects that apply to them.

Students are able to access lesson notes and content for each of the subjects. Interview data indicated that students were most enthusiastic about the advantages that WebCT provides. For many subjects, students felt that WebCT offered them flexibility, allowing them to work at their own pace (albeit to a deadline). The objectives were made clear and the content to be covered was explicit. Students felt that, if they missed a class, they were in a position to catch up more easily than in a traditional classroom and there was also the option to move ahead if they wished to do so. Some students felt that WebCT reduced the amount of paperwork that needed to be carried from lesson to lesson and, therefore, the likelihood of losing papers and notes was also reduced. Finally, WebCT was used by a number of students to communicate with teachers and to email assignments.

Two of the online courses have been specifically developed and trailed in 2001 at Sevenoaks, one in English (related to the analysis of television drama) and the other in Physics (related to nuclear physics) using a constructivist framework (Feynman, 1963; Kuhn, 1962; Vygotsky, 1962) to support students’ construction of knowledge rather than the transmission of knowledge. In doing so, these two courses attempt to build connections between prior knowledge to form more integrated understandings, support inquiry activities and emphasise the collaborative construction of knowledge and will become models for further course development in 2002.

Both courses are structured to enable students to work online during lesson time or outside of class time. Students who used these online course materials generally enjoyed the courses and felt that they learned a lot. Many of the advantages of WebCT also applied to these online courses, with one of the biggest advantages being the ability for students to work at their own pace.

**Students’ Attitudes to the Use of ICT at Sevenoaks Senior College**

Most students whom were interviewed felt that the ICT facilities available at Sevenoaks Senior College made coming to school more enjoyable, particularly with respect to the Internet and email access. When asked whether they felt that the ICT facilities had helped them to achieve better grades, students generally felt that ICT was not directly responsible. One boy was quite explicit about the role of computers and his own role in his learning stating: "Not really, it depends on me not the computers!" (IDS13:2001)

Overall, students whom were interviewed were of the opinion that the ICT environment allowed them to achieve improved grades through better presentation of assignment work. These students agreed that the ability to type work, search the Internet for information, create power point presentations and use spell checks all had contributed to improving their grades. One student stated that:
The technology doesn’t get you better grades; it just makes it easier to do the work. It might help you get better grades because of the way that you do it. For example you can put pictures into your work that will make the presentation better. It might also be better to get [information] off the Internet rather than from books. (IDJ6:2001)

All of the students whom were interviewed held very positive attitudes towards WebCT and the use of online courses. When asked about the benefits of online learning, students responded with such comments as: "You know exactly what to do and there are no excuses for not doing assignments" (IDS12:2001) and "[We are able to] look up more information, which is better than books and gives a wider range to look at" (IDS2:2001).

Interviews with students indicated that positive student attitudes could also be attributed to the fact that WebCT made students more responsible. By being provided with clear objectives and overviews, the ability to communicate electronically with both teachers and students, and the ability to find out the content that needed to be covered, students felt that they were made more responsible for getting work done on time. Those students who used the online courses generally held very positive attitudes towards this mode of teaching.

In most cases, however, the students whom were interviewed felt that the importance of the teacher should not be underestimated. The success of the courses, in their opinion, was due to the presence of the teachers, who in both cases made a point of being present and available for questions at all times. Despite positive attitudes towards the online courses, many of the students felt a need for more structure and directives from the teacher. Some of the students whom were interviewed also felt that they lacked the time management skills required.

Encapsulating the positive attitudes of students at Sevenoaks towards the ICT-rich environment, one girl commented: "I don’t think I could go back to a normal school now because I would be too used to having a computer in front of me" (IDS9:2001)

Less than positive attitudes would appear to stem from factors such as a mismatch in learning style. There was a small number of students whom were interviewed whose learning style did not appear to match the use of computers. One student commented:

I prefer to work out of books. They [computers] can be most frustrating when I cannot find information. I would prefer teachers to explain things to me rather than to find out off the web. Teachers can use different words and ways of explaining to make it clear, whereas online course instructions only have written stuff. (IDJ8:2001)

It is important that teachers are aware of different learning styles among their students and cater for them by providing verbal instructions to accompany on-screen instructions and making hard copies of the screen version of text available.

Another factor that influenced students’ attitudes towards ICT was the skill level at which they were operating. Most of the students interviewed were very comfortable with computers and have a high level of computer literacy. There was however a small number of students whom were interviewed (about 10%) who lacked the skills to use the computers effectively. The interviews indicated that those skills that were most likely to influence students’ attitudes were Internet search skills and typing skills. Other skills, related more to the effective use of the ICT than to computer literacy, were time management skills and effective use of the WebCT. One female student, enrolled in wholly school-assessed subjects, was having difficulty with her an assignment because she lacked skills in searching for information:
In [this subject] it is all to do with computers and the Internet. So I find it difficult to do … I hate the Internet. It’s really annoying and I have trouble doing the computer research assignment because we have to use the Internet. (IDS8:2001)

Interviews with students also revealed that not all students (about 20%) had access to computers at home, and that other students had a computer at home but were not connected to the Internet. These students who did have a computer at home that was connected to the Internet tended to hold more positive attitudes about the ICT facilities at Sevenoaks than those who did not. These students felt that they were at an advantage because they were able to email unfinished work home and were able to search the Internet for information. These students felt that they were less likely to forget homework as they could email it directly to the teacher.

On the whole, students who did not have a computer at home felt that, whilst it might be less convenient, it was not an issue because there was adequate access to computers at the school. One student, who lived far from the school, felt that not having a computer at home was a disadvantage. Another two students had to print out unfinished work to complete at home and felt that they were disadvantaged financially.

**Teachers’ Use of ICT at Sevenoaks Senior College**

The teachers employed at Sevenoaks have been selected on merit and, therefore, have a positive attitude to the vision and aims of Sevenoaks Senior College. These teachers were selected on the basis of their teaching skills in their particular subject rather than for their knowledge of ICT. The teachers each came to Sevenoaks with different levels of ICT literacy and, in many cases, their implementation of ICT into their teaching and learning reflect this.

The different courses at Sevenoaks appeared to fall into three main categories of online course development: **high-developed courses**, which have links and extensive resources and which use a range of features available in WEBCT; **medium-developed courses**, which have fewer links and resources, but teachers often build on these and increase the number of links over time; and **basic-developed courses**, which involve an online version of a paper version that would have been used in a traditional class.

To date, the teachers of Sevenoaks have developed 32 courses in WebCT. For the courses developed at Sevenoaks, there would appear to be a fairly even distribution between the three levels of development. Around one-third of the courses can be considered high-developed courses with extensive resources and links to sites both inside and outside of the school. About one-third can be considered medium-developed courses and one-third basic-developed courses (paper version online). To have such a high percentage of high- and medium-developed courses at the end of the first year of operation at the school can be considered a significant success for the teachers at the school. The challenge presented to staff at Sevenoaks will be to move from the development of medium- and basic-developed courses to the next stage. Whilst not within the scope of this paper, this is considered an important goal of the teaching and administrative staff of Sevenoaks.

According to Moersch (1995, 2001), the implementation of ICT could be related to a teacher’s self-efficacy. Self-efficacy theory, as proposed by Bandura (1977, 1997), suggests that individuals with a low level of self-efficacy will often choose a level of innovation that they believe they can handle, which might not be the best or most effective option. Conversely, those individuals with high levels of self-efficacy are most inclined to accept change and choose the best option. Olivier and Shapiro (1993) identified self-efficacy as a major predictor of adoption of innovation (Rogers, 1995). Adoption of information technology has been shown to be highly dependent on access, training and mentoring and a major
barrier to adoption is more an ‘aversion to risk’ than an aversion to information technology (Albaugh & Knight, 1996).

To have such a high percentage of courses developed in WebCT by the end of the first year of operation is a great achievement for Sevenoaks. Observations and interviews would suggest that this achievement is due to a number of factors.

The relative success is due, in part, to the role of the teacher librarian/webmaster of the school, who is located in a central position at the school and accessible to staff at any time. At the beginning of the year, the teacher librarian provided a number of workshops to help teachers use the ICT environment. Also the teacher librarian has been available for as many one-on-one tutorials as the teachers require. The teacher librarian is willing to sit with teachers, teaching and helping them to set up, design and provide links in their online courses. Usually a teacher needs to make use of this expertise for at least one or two three-hour sessions before becoming confident enough to begin developing courses.

Lengthy discussions with the teacher librarian/webmaster revealed the delicate balance between encouraging teachers and the need to not put undue pressure on staff. She stated that her vital role was to “get staff on board [helping them develop their courses online] without putting them under too much pressure”.

A further factor in the success of developing a high percentage of middle- and high-level online courses is the level of collaboration between staff. The unique set-up of Sevenoaks Senior College has enabled an unusual degree of collaboration between staff members, not just in their own departments but also across departments. The single staffroom seats all staff members in a single room which has been invaluable for the sharing of ideas and knowledge.

Discussion and Conclusion

The use of ICT enables individualised instruction and collaborative learning. Using any of these strategies effectively requires changes in teaching practices. Use of ICT should be driven by the desired learning outcomes. But, once the decision to infuse information technology into the instruction/learning process is made, teaching practices need to be changed to allow its effective use.

This research involved gathering qualitative data about how teachers are integrating ICT into the unique learning environment being developed at Sevenoaks. This environment has the potential to provide teachers with the means to manage efficiently the diverse educational provisions needed to optimise each individual student’s learning outcomes.

At the end of the first year at Sevenoaks Senior College, teachers have progressed significantly in their development, integration and use of the ICT in their teaching. In the coming year, it will be important to consider ways in which teachers can be helped to use the ICT environment in more innovative ways in their classroom and to move towards a higher level of course development. There is a need to support teachers in their second year and to provide suitable professional development to help them to move towards:

• completing more online curriculum modules using WebCT.
• developing courses that use innovative models established previously and setting up steps to help to develop such courses.
• integrating information technology into the curriculum at a higher level.
• planning the integration of information technology into their classes.
According to Coogan (2000), with the right investment in hardware/software and teacher professional development, teachers can be moved towards a higher stage of integration of information technology into their teaching and learning.

Interviews with students at Sevenoaks Senior College generally reflected positive attitudes towards the use of computers and the unique ICT environment being developed at Sevenoaks. Specifically, students felt that the ICT-rich environment developed at Sevenoaks made them more responsible for their own learning, an observation that has been made in past research (North Central Regional Educational Laboratory, 1995), and allowed them the flexibility to work at their own pace.

Students did not feel that the ICT environment was directly responsible for improved grades but that it did make school more enjoyable. This finding replicates a past study by Cox (1997) who found that the installation of a computer network at a secondary school increased enjoyment of learning in the school. The students interviewed at Sevenoaks also felt that, through the use of the ICT facilities, they were able to present their work at a higher standard. Cox (1997) also found that students tended to pay more attention to the presentation of the work and that presentation had improved since the installation of the computer network.

The ICT environment at Sevenoaks provides a wealth of opportunities in terms of individualising student programs and optimising each student’s potential. Already students at Sevenoaks are becoming more responsible as learners and are feeling the benefits of the unique learning environment. Research indicates that the widespread application of information technology to promote engaged learning yields exciting changes in the ways in which schools organise curricula and define teacher and student roles (North Central Regional Educational Laboratory, 1995). These changes, in turn, are likely to affect student achievement.

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References


Aldridge, J. M., Fraser, B. J., Murray, K., Combs, B., Proctor, D., & Knapton, P. (2002, March). Learning environment, teaching strategies and the implementation of
a Grade 11 online nuclear physics program. Paper presented at the annual meeting of the National Association for Research in Science Teaching, New Orleans, LA.


