

# OECD/CERI ICT PROGRAMME

## A Case Study of ICT and School Improvement at Shenley College

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## Contents

Page

### Introduction Overview

3  
4  
4

Description of School .....  
ICT in the School .....  
The Reform .....

5  
5  
6

6

<b>The Past</b>	7
	8
History of the Reform .....	8
History of ICT .....	9
Barriers Which Were Overcome .....	11
	12
	12

## The Present

	13
Description of the Reform .....	14
Impacts of the Reform.....	15
Description of ICT in the School .....	17
Role of ICT in Academic Program.....	18
Use of ICT Across Subjects.....	
Monitoring and Maintenance.....	
Impacts of ICT.....	19
Expansions in ICT.....	
	21
	23

## Hypotheses

Hypothesis 1 .....	
Hypothesis 2 .....	
Hypothesis 3 .....	
Hypothesis 4 .....	
Hypothesis 5 .....	

## Projections to the Future

Sustainability .....	
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Appendix A.....	
Appendix B.....	

## Introduction

The following case study report is based on research carried out in Shenley College during January 2001. This research focuses on whole school reform and the role that Information and Communications Technologies (ICT) has played in that reform. Data was collected using the methodology outlined in the OECD/CERI workbook for case studies of organisational change, version 9b August 8<sup>th</sup>, 2000.

## Overview

### Description of the School

Shenley College is a Church of Ireland co-educational boarding and day school situated on the outskirts of a fairly large city. The school is situated on a large site and enjoys modern facilities. At present there are 780 students attending Shenley College and the intake is approximately 140 students per annum. Two thirds of the student population are boarders, evenly split between boys and girls, whilst the remaining third are day pupils. Shenley College caters mainly for members of the Church of Ireland community from the surrounding areas. As a boarding school some students travel quite a distance to attend this school and at present there are in excess of forty feeder schools. Students attending this school are mainly from rural backgrounds. Fees are payable by all students attending this school (approximately £1,600 for day pupils and £4,000 for boarders per annum). Grants subject to a means test are available to some students each year, as are a number of scholarships. Recent expansions have seen an increase in student numbers and this has been accompanied by an increase in the number of teachers in the school. There are currently over seventy teachers in the school, approximately twenty of whom are employed directly by the school. Many of the new teachers are recent graduates and there is a mix of young and older teachers on the teaching staff.

Reflecting its Church of Ireland ethos the school has a strong Christian and moral development focus. According to the school mission statement:

It is the constant concern of Shenley College to further the Christian and moral development of each pupil within an atmosphere that reflects its distinctive ethos and long tradition. The College has an aspiration to provide that all pupils, having developed and realised their own worth and potential, will leave the college equipped to make their contribution within the wider community.

The school also has a strong emphasis on sport, especially rugby and hockey. Pictures of past teams are displayed all around the school's corridors, as are the trophies won in competition by various school teams. Participation in inter-school sports is a strong element of school culture and ethos. School history is also remembered with pictures of both staff and students from the school's previous existence displayed prominently on the school walls. Previous school principals are also remembered in this way. There is an emphasis on school history and sporting achievement evident from the artefacts on display in the school.

## **ICT in the School**

The school is well equipped in terms of ICT resources. The majority of computers operate on the Mac platform and there is a good range of ICT peripherals available in the school. The main computer lab consists of twenty-six iMac machines. There are also two smaller computer labs. One consists of eleven iMac machines and is used mainly by the Business Studies department. The second is located in the Technology block and consists of eight machines (four iMac, four PC). Networked machines are located in a number of classroom/laboratories, including Science and Technical Graphics. Internet access is available on all networked machines. There is currently a student to computer ratio of approximately one PC to every fifteen students.

The main role of ICT in the academic program is currently in terms of a non-exam subject called Computer Studies which is taught mainly by the IT Specialist in the computer lab. ICT is also used in a number of subject areas including Technology, Technical Graphics, Science, Business Studies, Careers and Music. Based on the survey results approximately fifty percent of teachers in the school currently use ICT for administrative purposes, with ten percent utilising it for teaching and learning purposes. All students have the opportunity to use computers in the open access period every evening after school. This is supervised by the IT Specialist who is responsible for the day-to-day running and maintenance of the computer network in the school.

## The Reform

Recent reform and improvement in Shenley College is defined by interviewees in terms of the completion of phase two of a planned building programme, and on the introduction of a greater range of subjects to the school curriculum.

The recent building phase has seen the construction of two specialist blocks, one for business and one for technology. This has provided facilities for the teaching of Technology, Engineering, Woodwork, Technical Drawing, Home Economics, Art and languages. The computer lab has also been updated and computers are installed in all specialist areas and classrooms. A lecture theatre facility which includes DVD, video, satellite television and computer facilities has been introduced. A new library featuring a video conferencing facility has also been provided. A further development is the new senior boy's residence.

## The Past

Shenley College was founded in 1538. In 1981 the school moved from its then location in the city centre to its current location on the outskirts of the city. In 1985 the main school building consisting of classroom blocks, sports hall complex, playing fields and kitchen and dining hall were completed. Further extensions were completed in 1993, including the provision of a computer lab.

## History of the Reform

In 1999 a further building program was undertaken, with Business, Science and Technology blocks introduced to the school's campus. A senior boys' residence was also built at this time.

To accompany the building program there has also been an increase in the range of subjects and extra curricular activities provided by the school. The school now offers a total of 19 subjects at Leaving Certificate level and it is envisaged that students attending the school will be able to select the subjects most appropriate to their interests and their ability. According to the principal there was a perceived need by the teaching staff to increase the range of subjects, for the long term good of the school, and to cater for the demands of both parents and students. The introduction of new subjects has required the employment of new, generally younger teachers, who according to the principal have brought a new sense of enthusiasm to the school.

The development of these facilities was initiated under the leadership of the previous principal, who according to some of the teachers interviewed, provided the vision and planning (in terms of both finance and infrastructure) for the phased building program. This is now in its second stage of completion, with a third stage yet to be completed. Since taking over four years ago, the current principal has continued where his predecessor left off. These improvements have also been dependent on the approval of the College Council Committee and the school Board of Management, which consists of sixteen members. The College Council Committee is responsible for presenting proposals to the Board of Management which makes decisions as to whether or not these proposals will progress. As the school is owned by the Church it is accountable to the general church body, known as the Incorporated Society. The Board of Management is answerable to the Bishop of the United Diocese of Cashel, Ossery and Ferns.

## History of ICT

In 1993, the development in terms of computer resources was accompanied by the appointment of a full

time computer teacher and IT specialist on a contract basis by the school. This appointment is funded by the school itself rather than by the Department of Education. Aside from some teaching duties, this teacher is also responsible for the management and development of the computer room, for providing training and assistance to staff and for supervision of the computer lab in the evenings after school hours. This teacher has provided a number of informal evening courses aimed at improving the computer skills of teachers in the school. A computer clinic on scanning pictures was also provided by this teacher. This was attended by four teachers. The computer teacher/ IT specialist also keeps teachers informed of any ICT related courses being provided externally for teachers. To date approximately thirty percent of teachers in the school have undertaken professional development in ICT in some form.

Prior to 1993 there was no computer resources or use in the school. Initially the computer lab consisted of twenty-four Apple Classic machines, networked to a central file server but without Internet access. In 1996 these computers were upgraded and four more computers were introduced. This increased the number of computers in the lab to thirty. In 1999 the original Apple Classic computers were replaced by Apple iMac computers, networking was introduced, and computers were installed in some classrooms. The current lab consists of twenty-six machines.

## **Barriers Which Were Overcome**

Funding has been provided both by the Department of Education, and by the school itself. One and a half million pounds were provided by the school to fund the building of the new senior boys residence. This money was generated by the fees paid by all students attending the school. Funding for computer resources has also been granted due to the schools participation in the SIP project and also the Shenley Information Age Town project.

## **The Present**

### **Description of the Reform**

Recent reform and improvement in Shenley College has, as defined by the majority of interviewees' responses, centered on the completion of phase two of the planned building program, and on the introduction of a greater range of subjects to the school curriculum. The facilities available and the range of subjects offered has facilitated extensive extra curricular activities in the school. The recent building phase has seen the construction of two specialist blocks, one for business and one for technology. This has provided facilities for the teaching of Technology, Engineering, Woodwork, Technical Drawing, Home Economics, Art and languages. The computer lab has also been updated and computers are installed in all specialist areas and classrooms. A small computer lab containing eleven computers has been installed in the Business area, whilst a similar sized lab containing eight computers (four iMac, four PC) has been installed in the Technology area. A lecture theatre facility which includes DVD, video, satellite television and computer facilities has been introduced. A new library featuring a video conferencing facility has also been provided. A further development is the new senior boy's residence.

From the first building phase completed 1985 the school is equipped with five science laboratories, a sports hall complex and extensive playing fields. Four rugby pitches, an Astroturf and three all weather hockey pitches, a grass soccer pitch, tennis courts and a cross-country running course facilitate the provision of outdoor games. Indoor games are facilitated in the indoor sports complex. Here badminton, basketball, indoor soccer and hockey, rope climbing, weightlifting and table tennis are accommodated. Rugby and hockey are central to the day to day life of the school, with teams competing at all age levels. Matches are

normally scheduled for the Wednesday of each week. Soccer and equestrian sports are also played. Other non-sporting extra curricular activities evident in the school are music, where students are given the opportunity to learn their choice of instrument after formal school hours, school choir, debating and various school trips. The emphasis on sports and extra curricular activities was acknowledged by representatives of all sectors interviewed: teachers, students, parents and school principal.

The second element of school reform and improvement defined is that of the increased range of subjects offered by the school. However this was defined and identified to a lesser extent, and by fewer interviewees than the improvement in terms of new facilities.

The school principal and a number of the long serving teachers identified the greater range of subjects as a positive element of school improvement and reform.

The subjects now offered by the school are Irish, English, Maths, History, Geography, French, German, Science, Physical Education, Religious Education, Technical Graphics, Wood Technology, Business Studies, Metalwork, Home Economics, Art, Music and Technology to Junior Certificate Level. A transition year programme is compulsory for all fourth year students. At Leaving Certificate level all students study Irish, English, Maths, French or German and Religious Education. Students select addition subjects from the following: Physics, Geography, Home Economics, Chemistry, German, Building Construction, Economics, Agricultural Science, Biology, Art, Accountancy, Business Organisation, Technical Drawing, Applied Maths and Engineering. The business and technology based subjects have recently been introduced in line with the provision of facilities for these subjects.

### **Impacts of the Reform**

The twin reforms of new facilities and a greater range of subjects have had a number of impacts on the school. Firstly there is a greater number of options on offer to students in the school. It is the generally held view that these reforms have impacted equally on all students, as all students have equal opportunity to be involved. The new subjects have required the employment of young teachers who, according to the school principal, have brought a new sense of enthusiasm to the school. It is also believed that the new facilities have helped bring about a greater balance between academic and extra curricular activities, and that the dedicated study areas have sharpened the focus on academic activities and thereby helped improve the academic performance of students in the school. New pitches and additional funding for extra curricular activities has helped improve sports performance. One interviewee believes that the improved performance of the school rugby team has had a positive effect on morale and confidence in general, in the school.

The provision of a greater range of subjects has caused timetabling problems, and introduced the need for two timetables, which are run biweekly. The increase in student numbers has resulted in facilities becoming overcrowded and it is believed that there is need for further expansion to cater for the increased numbers. A number of the teachers interviewed believe that the bigger school, and increased student numbers, have resulted in the loss of the family atmosphere that was in existence in the school, and that it is now more difficult to know all students. A further problem identified is that of the 'division', which exists between boarding and day pupils. Currently there are separate dining facilities for boarding and day pupils and whilst day pupils generally leave the school premises at the end of the formal school day, boarding pupils remain to partake in a range of extra curricular activities. There is a recognised need to provide common facilities so that they can be integrated more positively. In the short term, the provision of a common canteen is planned to facilitate this.

### **Description of ICT in the School**

The development of ICT use in Shenley College stretches back over a period of eight years. In terms of facilities, the school is resourced by one main computer lab containing twenty-six iMac machines. Smaller labs are located in the areas of business, which has eleven iMac machines, and construction studies, which has eight machines (four iMac, four PC). Networked computers are also located in a number of classrooms/laboratories. Three of the five science labs are equipped with one computer whilst a fourth lab is equipped with two computers. The technical drawing room is equipped with four computers. Single computers are located in the music, art and engineering rooms. In addition each of the three careers advisors has their own computer. Three computers are located in the library and three in the staff workroom. Computers are also located in both the male and female residential teachers' offices (one in each office). Additional ICT resources include three printers, two of which are networked, two flatbed scanners, two digital cameras and one ceiling mounted data projector in the lab. There is also a ceiling mounted data projector in the business studies lab, and a third mobile data projector which was gained as a result of the schools' participation in a SIP project. A scanner and printer are located in the Art room. The music room is equipped with an adaptor, keyboard and inkjet printer, whilst the Engineering room is equipped with a CAD/CAM system. Inkjet printers are also located in the staff workroom, library and residential teachers' offices.

### **Role of ICT in Academic Program**

To date the role of ICT in the academic program has been mainly in terms of a non-exam subject called Computer Studies, which is taught mainly by the IT specialist, and takes place in the computer lab. However teachers of technology and business studies have also been involved in the teaching of computer skills to certain groups. Aside from this, the main use of ICT on a cross-curricular basis has been in the areas of technology, science, business and careers.

All first year students are timetabled for one class per week of Computer Studies, whilst second and third year students are timetabled for a five week module consisting of one class per week. In first year students are taught the basic of keyboarding and given a general introduction to the computer. This is followed up in second and third year with the teaching of word-processing, spreadsheets and databases. Students are also taught research and project skills in terms of using the Internet as an information source, and presenting the material found in the form of a report. The setting up of a Web based email account and the production of a project using the Hyperstudio software package are also included under the umbrella of Computer Studies.

In Senior Cycle, those students who are not studying French may take computer studies for four classes per week, and study towards the European Computer Driving Licence (ECDL) qualification. In Transition Year the Journalism module is taught in the computer lab and students involved in mini companies have regular access and use. A short course of five weeks duration, covering Internet, PowerPoint and email is run by the Business Studies teacher for Transition Year students. Teachers also take classes into the lab on an ad hoc basis, mainly to research projects on the Internet or CD-ROM encyclopaedias, and to write up reports.

All students have the opportunity to access the computer lab in the open access period from 3.30pm to 5.30pm each evening after school. These access times are supervised by the IT specialist. In the session observed by the research team, students main use during this time was for personal and recreational purposes, including searching the Web and sending email. The pictures below show students working in the computer lab.



## Use of ICT Across Subjects

In addition to the Computer Studies subject, ICT is used in a number of different ways in different subject areas. The three Technology teachers have scheduled classes in the lab. Classes for second and third year classes focus on the teaching of basic computer skills including word-processing, use of Paint program, Internet and email. Classes are also scheduled in the lab for senior classes. These classes focus more on software appropriate to the Technology/Engineering subject area, such as CAD/CAM and AutoCad. Other uses described by the head Technology teacher include simulations of engines, and use of email to communicate with students regarding Websites appropriate to specific project work. The mini lab situated in the Technology block (consisting of four iMacs and four PCs) is used mainly by students to produce project reports, as their teacher continues to teach in the room adjacent.

ICT is also used in the area of Technical Graphics/Drawing. Four iMac computers are situated in the Technical Drawing classroom. In this setting students take it in turns to use the computers whilst the 'normal' class is in progress simultaneously. Work assigned centres on the use of the AutoCad package. Students are required to use the various program commands to produce drawings of various objects. These computers are sometimes used for project work, and for finding information on the Internet.

In the Science area the main use is in terms of data logging software which has recently been purchased by the school. This consists of a set of interchangeable probes and a user interface, which can be used to conduct experiments and plot graphs in the areas of chemistry and physics. This facility is available in four of the five science labs and is currently being pioneered by one Science teacher. It is hoped that others will become involved in its use in the near future. Other use in the area of Science consists of teacher to class presentations on certain areas, and the use of the Internet and CD-Roms by students to resource information for project work. All use in the Science area is based in the science labs.

Most use in the area of Business Studies is situated in the mini-lab which contains eleven iMac computers. This use consists of both the teaching of syllabus related topics, such as spreadsheets and databases, and the use of the Internet as an information source. Other sample uses in the area of Business Studies are as follows:

- An activity whereby the teacher directs the students to the Website of a certain organisation, where they have to find and print out two useful pieces of information. These pieces of information form the basis for a class discussion in the next lesson.
- An activity whereby students, working in pairs, research material from their textbook on a certain topic, and use this information to prepare a PowerPoint presentation on the topic.

All three Careers teachers in the school have their own computers and are timetabled for classes in the computer lab. These classes are timetabled for third year and Senior Cycle students. The use of ICT in relation to careers centres on the use of software (Careersworld, Qualifax) which is designed to help students make career choices appropriate to them, and on the use of the Internet to access information on courses at third-level. Students also submit their CAO applications using the Internet. Other uses described by the head Careers teacher are in relation to the preparation of notices and handouts, and the use of PowerPoint to make presentations to classes.

The Music room is equipped with a Mac computer, an adaptor and keyboard plus an inkjet printer. This facility allows students to compose their own music and save it electronically. The main use of this facility is by students taking the applications of computer technology as an option that is worth twenty-five percent of the overall grade in the Higher Level Leaving Certificate Music examination. The computer in the Music room is also sometimes used for researching and preparing projects. There is also a computer, plus scanner and printer, located in the Art room. This is used mainly to visit galleries and art museums on the Internet.

Aside from the use of ICT in these subject areas, the other main uses currently are for a SIP project on digital video editing which involves the IT specialist and two of the Technology teachers, and a Cormenius German language project which involves a link with a German school. The emphasis of this project is on sport. The school has gained a budget to buy software as a result of its participation in this project.



The picture on the left shows the computer facility located in the Music room, whilst the picture on the right shows the Business Studies mini-lab.

### **Monitoring and Maintenance**

All computers in the school are connected to the AppleShare network and every student and teacher has an account that is generated from the school administration program Facility. This account uses the students' full name as on the school role and provides them with a password-protected folder of their work on the server. This arrangement allows the IT specialist to monitor all activity on the network. All Internet access is controlled by one computer which acts as a gateway. Filtering software is also used. This is regularly updated and the types of sites excluded by the software can be set internally. Rules for responsible computing are posted up in the computer lab and students are aware that it is an offence to search with inappropriate words. Inappropriate use is sometimes detected from the log information or by a scan of students' folders for jpeg or gif files. Access to inappropriate materials can also be detected from the history folder on students' Web browsers. Although no games are installed on the computers, students can play certain games on the Internet during the open access period.

On the ground first line maintenance is provided by the IT specialist. An external consultant who has a long-standing association with the school provides back up support, especially in relation to hardware

problems. This consultant has also been involved in advising the school in relation to hardware and networking specifications.

## **Impacts of ICT**

The introduction and increased emphasis on ICT has had varying degrees of impact on different personnel in the school. Firstly in terms of the IT Specialist, with the introduction of networking and with the spread of computers from the lab to classrooms and mini-labs, this has placed increased demands, especially in terms of maintenance and technical support. Although supported by an external consultant on a needs basis, the IT specialist believes there is need for a technician or to be assigned extra time to deal with these matters. The approach of trying to spread first line maintenance skills amongst teachers has also been adopted by the IT Specialist. The need to address this situation is also recognised by the school principal.

Some teachers have been impacted on more than others. Some have been impacted by becoming involved in the use of ICT, either in their subject area, or in relation to the teaching of skills, or by taking courses at different levels. Three teachers in the school are in the process of taking courses at Graduate Diploma/Masters level in relation to the uses of ICT in education. Two further teachers, including the IT specialist have already completed similar courses.

Evidence from the Teachers Questionnaire and in-school observations indicate that there is greater use by teachers for personal administration (planning, finding resources, email, compilation of tests) than for in-class teaching and learning purposes. The IT specialist speculates that approximately fifty percent of teachers use ICT for administration purposes, but only ten percent for teaching and learning purposes. At present approximately sixteen of the schools' seventy teachers are involved in either the direct teaching of some form of computer skills or in using ICT as part of their teaching. Currently twelve teachers in the school are taking a course, which aims to help second-level teachers integrate the use of ICT into their subject areas. Seven of these twelve are not currently involved in teaching computer skills or in using ICT as part of their teaching. All students have access in some form and to some extent, depending on their year, and their choice of subjects.

## **Expansions in ICT**

Aside from the need for a technician, some of the teachers interviewed believe that the existing facilities are not being used to their full potential and recognise that ICT is currently "a fringe thing" in terms of school activities, with greater priority placed on both academic and extra curricular activities. One teacher was critical of the service provided by the external consultant on the basis of the time span involved and the high cost incurred. Other issues raised by interviewees include the difficulty in gaining access to the computer lab, the slowness of the Internet with a high number of simultaneous users and the lack of subject appropriate software. A further issue raised by a number of teachers was that of the computer platform in operation in the school, with some teachers disliking this platform and expressing a preference for a PC network. Some of the reasons given include their personal lack of familiarity with the Mac platform, and the lack of subject appropriate software availability for this platform. These teachers believe that there is more software available for the PC platform and suggest that a second computer lab consisting of PCs be installed in the school. Another alternative suggested was that of laptops and wireless technology. The need for more data projectors to aid the use of ICT in teaching and learning was also mentioned by a number of teachers.

## **Hypotheses 1-5**

## Hypothesis 1

1. *Technology is a strong catalyst for educational innovation and improvement, especially when the World Wide Web is involved. The rival hypothesis is that where true school-wide improvement is found, technology served only as an additional resource and not as a catalyst, that the forces that drove the improvements also drove the application of technology to specific educational problems.*

### Evidence in support of Hypothesis 1:

The use of technology has facilitated a change in teaching style and approach for a number of teachers in some subject areas. Classes observed where this was in evidence were in the area of Business Studies where students formulated their own presentations from their course text, and in Science where students carried out experiments using data logging equipment. This is also in evidence in Music. Further to this, the use of the Web as an information source had facilitated innovation in the areas of Careers, Technology and Business. One activity described by the Business Studies teacher was whereby students are given the Website of a certain organisation where they must find and print out two useful pieces of information, which will form the basis for a class discussion in the next lesson.

The use of the Web in submitting CAO college application forms is one example where the use of technology, and the Web in particular, has served as a catalyst for educational innovation and improvement, although not directly for purposes of teaching and learning. In addition the Web has served as a strong catalyst for innovation in relation to career guidance in general, with both students and Career Guidance teachers now using the Web as their main information source.

### Evidence in support of the rival Hypothesis:

According to the majority of interviewees, the new buildings and facilities have been the main source of school-wide improvement in this school. This improvement has served to sharpen the academic focus in the school and has facilitated the introduction of a greater range of subjects and choices for students in the school. In addition, ICT is seen as currently a 'fringe thing' within the school: as an additional resource and contributing factor to general school improvement, rather than as a catalyst or main driving force behind school improvement and reform.

The use of ICT currently is limited to too few subject areas to be considered a true vehicle for school wide improvement. In addition a substantial degree of current use is in relation to specialist vocational use in the areas of Technology and Business. There is limited use in respect of teaching and learning in all areas, and there is no use of either description in many of the non-technology/business areas. This is especially true in the case of the arts and humanities based subjects.

The use of computers by students in the open-access period is mainly for recreational and personal purposes, rather than for use in respect of schoolwork. In addition sports and academic activities take precedent in the post-school evening period. The use of computers in this period is mainly by students who are not involved in sports or other activities. This illustrates the status of computers and ICT in terms of school-wide activities.

The main teacher use of computers and ICT is in respect of administration and planning rather than the direct use for the purposes of teaching and learning. In this respect the majority of teachers see ICT as another resource rather than as a direct means towards innovation and improvement. Both students and parents identified sports, and to a less extent academic activities, as the most positive aspects of the school

(rather than ICT).

The provision of ICT in the school has been driven by the Board of Management and the IT specialist acknowledges their commitment in this respect. The Board of Management was also the main driving force in respect of the provision of the new buildings and facilities. In this respect it may be said that the forces that drove the improvements in general also drove the installation of technology and ICT into the school. The application of this technology to specific educational problems, where occurring, has been driven by individual teachers and facilitated in terms of advice and support by the IT specialist.

On balance the rival hypothesis holds in this setting.

## Hypothesis 2

1. *The diffusion of the innovation/improvement (and therefore of ICT) followed the traditional diffusion pattern for innovations, as outlined by Rogers (1995). The rival hypothesis is that technology functions differently from traditional innovations and that therefore different diffusion patterns occur.*

### Evidence in support of Hypothesis 2:

Data from observations, surveys and teacher interviews indicates that there are varying levels of confidence and use of ICT by teachers in this school. Some teachers rate themselves as comfortable in carrying out a range of ICT related tasks whereas others rates themselves as less comfortable and others less comfortable still. In addition some teachers exhibit a substantial degree of ICT use for teaching and learning purposes whilst others exhibit none such use. The IT specialist speculates that approximately fifty percent of teachers use ICT for administration purposes, but only ten percent for teaching and learning purposes. These varying levels of use and confidence suggest the presence of the various adopter categories, as defined by Rogers, amongst the teaching staff in this school, from early adopters to laggards and others between these extremes.

As a relatively recent appointment the IT Specialist does not have sufficient status in the staff hierarchy to actively drive the adoption of the innovation by other staff members. The research team believes that this is a contributing factor in respect of the approach taken by the IT Specialist within the school i.e. to facilitate and foster ICT adoption rather than actively drive and push its implementation. This is consistent with Rogers' assertion that innovators normally have higher social standing and that this enables them to actively drive an innovation.

### Evidence in support of the rival Hypothesis:

The introduction of computers and ICT to this setting was driven by the commitment of the Board of Management and facilitated through the appointment of the IT Specialist. In this sense the impetus for this innovation did not come from one or more 'innovator' but from the school management body. The IT Specialist appointed by this body has facilitated the use of computers across the school setting but has not actively driven their application. As summed up by the IT Specialist, the diffusion of the innovation in this context has been a slow and organic process. Support for this innovation has been provided by the Board of Management through allocation of funding to support the installation of the computer facilities, and the provision of the IT Specialist. Some, including the Principal, believe the provision of an IT Specialist may have hindered diffusion amongst other teachers.

In summary there is support for both the hypothesis and rival hypothesis in Shenley College.

### **Hypothesis 3**

1. *Successful implementation of ICT depends mostly upon staff competence in the integration of ICT into instruction and learning. This hypothesis assumes that teachers mediate ICT applications when they are successful, and that ICT's academic value relates positively to teacher competence. The rival hypothesis is that the school technological infrastructure and student ICT competence rather than staff competence determine ICT implementation outcomes.*

#### **Evidence in support of Hypothesis 3:**

The implementation and day-to-day running of the network is dependent on the IT Specialist, who has a high level of technical knowledge and experience from working in industry, of being in charge of a computer network. In addition the IT specialist has undertaken a formal qualification in relation to the use of ICT in education. This knowledge and experience is not only crucial to the day-to-day implementation of computers in the school but has played a part in helping and advising other teachers to use it in their subject areas and in revising teaching methodologies to incorporate ICT.

The teachers in the subject areas where ICT is most used (Business/Technology/Science) have experience and familiarity of using computers from their own experiences at third level education. Thus teachers in these areas are more competent in using computers than teachers whose third-level background has not included any such experience. Hence there is a direct relationship between competence and experience of using ICT and use across subject areas. It is also noted that a high degree of use in these areas is of a vocational nature rather than for teaching and learning purposes.

There are five teachers in the school who are currently taking or have completed postgraduate courses in relation to the use of ICT in education. All five are heavily involved in the use of ICT in the school. One such teacher is the IT specialist, another such teacher is pioneering the use of data logging equipment in the Science department. Two teachers are involved in the use of ICT in career guidance whilst the fifth teacher is involved in the use of ICT in Business Studies. In the case of some teachers, there is a positive relationship between attendance at the internal courses provided by the IT specialist and a second course provided externally, and use in their subject areas. However not all teachers who have attended these courses currently use ICT in their subject area.

Evidence from the questionnaire indicates that, in general, teachers who do not use computers for teaching and learning purposes do not feel comfortable and competent in their use. Thus teacher competence is a prerequisite for implementation and use. Teachers who do not feel comfortable and competent are not inclined to attempt its use.

#### **Evidence in support of the rival Hypothesis:**

As a high percentage of students have computers at home, the general level of computer skills amongst students is high. There is an awareness amongst teachers that some students know more than them and that this should be utilised as an additional resource in the development of ICT in the school.

A substantial amount of student use is in relation to the compilation of reports and projects (word-processing of final product) and the use of the Internet to locate information for these reports. The main focus of these activities is often to improve presentation for the submission of the work as part of a State examination. As these activities are not directly supervised by teachers, student competence and availability of the required technology are the main influences in determining implementation outcomes. An

example is in the area of Technology where some students, during normal class time, may engage in such activities by working in a mini lab adjacent to the Technology room.

On balance all significant evidence in this setting supports the hypothesis.

## Hypothesis 4

1. *Gaps in academic performance between high and low poverty students will not increase when all students have equal access to ICT. The rival hypothesis is that equal access to ICT will lead to more advantaged students increasing the performance gap with disadvantaged (high poverty) students.*

### Evidence in support of Hypothesis 4:

There is little concrete evidence in relation to this hypothesis at this site. No data is available relating students' academic performance to socio-economic background and as the school is fee-paying none of the students attending may be categorised as 'high poverty'. As there is currently limited use of ICT in respect of teaching and learning it is impractical to link academic performance to ICT access. Further diffusion of the innovation is necessary before this is practical.

Most use is recreational in nature irrespective of the ability of the students. As a boarding school access is not dependent on students' background. The open access period allows all students to experiment and become familiar with computers. Students who are heavily involved in extra-curricular activities have less opportunity to access computers during this time. Approximately 70% of students have access at home. However the provision of an open access period has diminished the relative advantage these students may previously have enjoyed.

The IT Specialist believes that lower ability students will benefit the most from using ICT given that it is a more practical hands-on approach, and that for higher ability students traditional methods are more of a guarantee of success in terms of state exams. In project work those students with lower academic ability are focused more on presentation, whilst those with higher ability are focused more on content. It is acknowledged that one of the main benefits to lower ability students has been in respect of the presentation of reports and project work.

According to teachers interviewed lower ability students are especially well catered for in this school, and that every student is given the opportunity to maximise their achievement. It is felt that this 'balance' is reflected in all activities in the school, including sport and ICT.

### Evidence in support of the rival Hypothesis:

One teacher interviewed noted that more able students are more capable of finding relevant information on the World Wide Web and of carrying out Web searches more quickly. Students who are interested in computers and who are capable of navigating their way around the Web are also thought of as being at an advantage. This is one aspect in which more able students may increase the performance gap with respect to their less able peers.

It is difficult to reach judgement on this hypothesis in the case of Shenley College given the student profile and the lack of hard data on academic performance. However the scant evidence suggests that the hypothesis holds at this site.

## Hypothesis 5

1. *Successful implementation of ICT will lead to the same or higher academic standards in spite of the low quality of many ICT materials. Academic standards are a function of teacher and school expectations and not of the standards of textbooks, ICT materials, and the like. The alternative hypothesis is that ICT use will lead to a lowering of academic standards as students spend more time on marginally beneficial searches and in browsing poor quality Web and courseware content.*

### Evidence in support of Hypothesis 5:

The use of data logging in Science and open tools in Business Studies are examples where the use of ICT has the potential to lead to an increase in academic standards. It was observed that successful implementation in these cases was a function of teacher confidence and spirit of innovation rather than the quality of the resources being used. Academic standards are hence dependent on teacher expectations. Up to date ICT equipment and software alone will not improve teaching and learning and hence maintain or improve academic standards.

Some interviewees believe that the use of the Web as an information source and the use of computer based packages to produce project reports has served to enhance self-esteem and as a motivational factor for some (especially less able) students. Whilst this does not contribute directly to raising academic standards, increased motivation and self esteem may serve as a contributing factor to raising academic standards for some students.

### Evidence in support of the rival Hypothesis:

Most student use during the open-access period is for recreational and personal purposes i.e. Web browsing and sending email. As this is during the post school period it will currently serve to neither heighten nor lower academic standards. However the lack of use for learning purposes during this period points to the need for teacher support and direction in order for students to make productive use of the time allocated during formal school hours. Students may need to be allocated specific ICT based work for completion outside class times otherwise students' use will not contribute to raising academic standards.

The approach taken by the Technology teacher is an example of how large scale Web browsing can be eliminated and serves as recognition of the need to structure Web based searches. Taking this approach the teacher sends emails to students containing addresses of Web pages that are relevant to their project work. Used purposefully the Web can expose students to a greater range and depth of information than was previously possible. It is acknowledged that the academic value of this is dependent of the quality of the information found. Searching the Web for information for projects and reports is one of the most common ICT based activities evident in the school.

In summary there is evidence to support both the hypothesis and rival hypothesis in Shenley College.

## Projections to the Future

### Sustainability

Given the commitment by the Board of Management and the infrastructure already in place in the school it is evident that ICT will remain prominent in Shenley College. However there are a number of issues arising that warrant addressing in the near future in order to best enhance and preserve the future of ICT in the school.

Currently there are a number of teachers attending ICT based courses who have not previously been involved in using ICT for teaching and learning. It remains to be seen how many of these teachers will become involved in this context and is dependent on the willingness and motivation of the teachers themselves. There is scope also for those teachers who have not been involved to do so. This is especially the case in the arts and humanities based subjects. It is acknowledged that, as a boarding school, there is a particular difficulty for teachers wishing to attend evening courses given that there is an evening duty rota, which varies from week to week. One interviewee finds that it is difficult to find enough teachers in a certain area who wish to complete a certain course and who can find the time to do so. This interviewee also finds that teachers attending courses are often at too varied levels for the course to be productive and that there is a high drop out rate. It is felt that smaller courses with more specific targets would lead to better outcomes for teachers.

For more teachers in the school to become involved in using ICT there is need for teachers to find appropriate uses in their subject areas. This is linked to the provision of subject related software. Staff members need to be aware of the budget available as a means towards giving structure and direction to software expenditure in the school. Interested teachers might benefit from being made aware of software and resources available in their specific areas.

Some interviewees believe there is need for expansion in terms of ICT resources with provision of a second lab and the introduction of laptop computers mentioned as possible ways to facilitate this. This was put forward mainly by teachers who find it difficult to get sufficient access to the existing lab. Some interviewees believe there is need to use the existing resources to their full potential. In respect of any expansion there is need for consultation and agreement amongst school management and staff in order to foster and encourage use by as many teachers as possible. This is especially so in relation to the platform to be adopted (Mac or PC) should there be a decision to expand. Some teachers believe that previous such decisions were taken without consultation and that the installation of the Mac platform has hindered diffusion.

Given current and potential expansions there is recognised need to address the issue of maintenance and support in the school. A decision on how best to address this issue will need to be taken and the possibility of employing a full time technician will be one of the main considerations. Reducing the teaching load of the IT Specialist may also be considered in respect of this.

The description of the development of ICT in Shenley College as a slow organic process appears accurate in light of the evidence gathered. The IT Specialist believes that there is need for more direction and planning to aid diffusion amongst more staff members. It is recognised that because it has not been a forced development, and teachers have been facilitated, it has been a slower process. A more directive approach may have produced negative reactions from the teaching staff. However there is need for long term planning given the high costs involved and in the context that the IT Specialist does not have all the characteristics of an innovator as described by Rogers (1995). According to the IT Specialist failure to plan a coherent strategy may result in the failure to capitalise on opportunities to integrate ICT on a cross-curricular basis and give rise to problems in the future due to disparate hardware.

# Appendix A

All fieldwork was undertaken during January 2001.

## Teacher Interviews

Principal interview (Dr. Jim Gleeson) (90 minutes approx.)

IT Specialist interview (Dr. Jim Gleeson) (1hr approx.)

Business Studies teacher 1 interview (David O Grady) (45 minutes approx.)

Business Studies teacher 2 ( Oliver McGarr) (45 minutes approx.)

Career Guidance teacher (Oliver McGarr) (45 minutes approx.)

English teacher (David O Grady) (45 minutes approx.)

Irish/History teacher interview (David O Grady) (45 minutes approx.)

Music teacher interview (Oliver McGarr) (45 minutes approx.)

Technology teacher 1 interview (Keith Johnston) (45 minutes approx.)

Technology teacher 2 interview (Oliver McGarr) (45 minutes approx.)

## Parent Interviews

Parent interview 1 (David O Grady) (30 minutes approx.)

Parent interview 2 (Oliver McGarr) (30 minutes approx.)

Parent interview 3 (Keith Johnston) (30 minutes approx.)

Parent interview 4 (Keith Johnston) (30 minutes approx.)

## Student interviews

Student interview 1: First Year Group (Oliver McGarr) (40 minutes approx.)

Student interview 2: Transition Year Group (Oliver McGarr) (40 minutes approx.)

Student interview 3: Fifth Year Group (David O Grady) (40 minutes approx.)

## Classroom Observations

Year	Subject	Teacher	Location	Observer
1st	Computer Studies	IT Specialist	Computer Lab	Keith Johnston
2nd	Computer Studies	IT Specialist	Computer Lab	Keith Johnston
5th	Computer Studies	IT Specialist	Computer Lab	Keith Johnston
6th	Computer Studies	IT Specialist	Computer Lab	Keith Johnston
5th	Business Studies	Business Studies teacher	Business Lab	David O Grady
5th	Career Guidance	Career Guidance teacher	Computer Lab	Dr. Jim Gleeson
6th	Engineering	Technology teacher	Computer Lab	Oliver McGarr
2nd	English	English teacher	Computer Lab	David O Grady
6th	Chemistry	Science teacher	Science Lab	Keith Johnston
2nd	Technical Graphics	Technology teacher	Technical Graphics Room	Keith Johnston

## Outside-of-Classroom Observations

Keith Johnston and Oliver McGarr

## Appendix B

Questionnaire distributed to all staff members (70 approx.) with 34 responses.

How comfortable are you with using a computer to do each of the following?

Choices are:

1. Very comfortable
2. Comfortable
3. Somewhat comfortable
4. Not at all comfortable

	1	2	3	4
1. Write a paper	71%	26%	0%	3%
2. Search for information on the World Wide Web WWW	32%	26%	24%	18%
3. Create and maintain web pages	6%	6%	17%	71%
4. Use a data base	15%	15%	23%	47%
5. Develop a data base	12%	15%	20%	53%

6.Send and receive e-mail	47%	26%	6%	21%
7.Write a programme	12%	9%	17%	62%
8.Draw a picture or diagram	35%	9%	21%	35%
9.Present information (e.g., use PowerPoint or equivalent)	29%	12%	30%	29%

How important is each of the following computer-related skills for your teaching?  
Choices are:

1. Very important,
2. Important,
3. So-so, and

1. Not important at all

	1	2	3	4
10.Write a paper with a word processor	35%	26%	24%	15%
11.Search for information on the WWW	29%	33%	9%	29%
12.Create web pages	6%	6%	18%	70%
13.Use a data base	3%	9%	33%	55%
14.Develop a data base	9%	9%	23%	59%
15.Send and receive e-mail	9%	9%	32%	50%
16.Write a programme	12%	9%	15%	64%
17.Draw a picture or diagram with a graphing/drawing application	21%	27%	9%	43%
18.Present information (e.g., use PowerPoint or equivalent)	21%	24%	23%	32%

During the past school year, how often did your students on average do the following for the work you assigned? Choices are:

1. Several times each week
2. Several times each month,
3. A few times
- Never

	1	2	3	4
19.use the World Wide Web	9%	18%	33%	40%
20.create web pages	0%	0%	12%	88%
21.send or receive e-mail	3%	6%	12%	79%
22. use a word processing program	3%	21%	24%	52%
23. use a computer to play games	3%	0%	12%	85%
24. use a spreadsheet	3%	3%	9%	85%
25. use a graphics program	9%	3%	15%	73%
26. join in an on-line forum or chat room	0%	0%	9%	91%
27. use a presentation program (e.g., PowerPoint)	3%	0%	13%	84%
28. use an instructional program (including simulations)	3%	3%	15%	79%
29. other computer uses (specify)	7%	7%	13%	73%

30. How would you rate your ability to use a computer?

Choices are: *(Please tick appropriate box)*

Good	41%
Fair	32%
Poor	27%

Answer questions 31-38 based on experiences or policies from the last school year.

31. Was student computer use ever evaluated for grading?

*(Please tick appropriate box)*

Yes	6%	No	94%
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32. If you assigned World Wide Web searching, how much freedom did you allow students in locating sites to visit?

*(Please tick appropriate box)*

no restrictions	11%	some restrictions	56%	designated sites only	33%
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33. Did you create or modify a Web site with any of the classes that you taught?  
(Please tick appropriate box)

Yes	3%	No	97%
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34. What portion of the computer use in your classes was directly related to the course content?  
(Please tick appropriate box)

all	17%	most	30%	some	18%	very little	35%
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35. What portion of the computer use that you assigned was done by students individually?  
(Please tick appropriate box)

all	16%	most	28%	some	36%	very little	20%
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36. If you have a computer at home, how often did you use it for preparing for teaching?  
(Please tick appropriate box)

Several times a week	33%	Several times a month	17%
A few times	23%	Never	10%
No computer	17%		

37. Did you participate as a student or instructor in a virtual course through the Internet/World Wide Web?  
(Please tick appropriate box)

Yes	9%	No	91%
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38. Did you involve your students in collaborative learning over the Internet/World Wide Web with students from other classes?  
(Please tick appropriate box)

Yes	0%	No	100%
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39. Are you currently using technology to collaborate with other teachers (professional chat rooms, forums, or the like)?

*(Please tick appropriate box)*

Yes	9%	No	91%
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40. How many e-mail messages do you send each week on average?

*(Please tick appropriate box)*

More than 12	6%	6-11	6%
1-5	53%	None	34%

How many of the following have you ever done?

41. Made changes to a computer's hardware

*(Please tick appropriate box)*

Yes	15%	No	85%
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42. Updated an application program (word processor, graphics program, etc.)

*(Please tick appropriate box)*

Yes	24%	No	76%
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43. Recovered a damaged file

*(Please tick appropriate box)*

Yes	21%	No	79%
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44. Created a web site

*(Please tick appropriate box)*

Yes	12%	No	88%
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45. Developed a data base

*(Please tick appropriate box)*

Yes	24%	No	76%
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