

## **A SURVEY OF ICT IN POST-PRIMARY SCHOOLS**

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Information was obtained in conjunction with PISA 2003 about computer resources in schools in participating countries, and students' use of, and confidence with, computers. The ratio of students to computers in Ireland (9.0:1) was higher than the OECD average (6.2:1). The percentage of computers in schools connected to the Internet (67%) was lower than the OECD average (79%), as was the percentage of computers with Local Area Network (LAN) connectivity (36% compared to 69%). In Ireland and in other OECD countries, the socioeconomic composition of schools was only weakly related to these three indicators of school ICT resources. Some differences in computer resources were observed between school types. The student-computer ratio was higher in secondary schools than in community/comprehensive and vocational schools. It was also higher in single-sex than in mixed-sex schools. Levels of access of Irish students to computers at school and at home were similar to OECD averages. However, students' use of computers was comparatively low in Ireland, particularly in schools. One-third of students in Ireland (over twice the OECD average) said that they never used a computer at school. Irish students also reported comparatively low levels of confidence in computer use, although gender differences favouring boys on these measures were smaller in Ireland than in many other countries.

Information and Communications Technology (ICT) plays an increasingly important role in work and in social and personal life, and is now of central importance for successful and critical participation in the knowledge society and has obvious implications for education systems. Three primary rationales for its inclusion in education have been proposed. First, pedagogically, the use of ICT is said to increase the breadth and nature of learning; second, socially, it is increasingly viewed as an essential life skill (akin to reading or mathematical literacy) and therefore should form a core curriculum subject; and third, economically, there is a need to prepare school-goers to meet the perceived needs of the work place (OECD, 2001, 2004).

Data are available from a number of studies on aspects of computer equipment and use in Irish schools. The 2002 ICT schools census found that the student-computer ratio in post-primary schools was 9.4:1, an improvement from 13:1 in the 1998 census (NCTE, 2003). However, just 22% of classrooms had one or more computers. While 69% of schools had a LAN, only 38% of computers in classrooms were networked. Furthermore, although 66% of

computers were linked to the Internet, only 13% of classroom computers had Internet connectivity. These disparities suggest that computers with connectivity are confined to a computer room in many schools.

PISA 2000, which represents a time between the two NCTE censuses, has comparable results regarding student-computer ratio, but the percentages of computers attached to a LAN and with a link to the Internet are lower than in the 2002 census. In PISA 2000, principals of schools reported an overall average student-computer ratio of 10.8:1.<sup>1</sup> On average, 45.0% of these were connected to the Internet, and 27.9% to a LAN. The results of the 2001 OECD survey of upper secondary schools suggests that Internet connectivity rates were comparatively low in Ireland, with 58% of computers attached to the Internet, compared to an international country mean of 69 percent. Denmark, Finland, Norway, Sweden, and Korea all reported connectivity rates of over 90% (OECD, 2005b).

The 2002 ICT schools census also found that, although Internet connectivity was widespread, just 6% of post-primary schools had some form of broadband connection; the majority (87%) had Internet connectivity via ISDN lines, which are considerably slower. However, in 2004, an €18 million broadband provision programme was launched by the government with the Telecommunications and Internet Federation with the aim of having all schools enabled with a broadband connection by 2006.<sup>2</sup>

There are some variations between schools due to such factors as type of educational institution and socioeconomic composition of school. In 2002, vocational schools had a student-computer ratio of 6.6:1, which was lower than community schools (8.3:1), comprehensive schools (8.5:1) and voluntary secondary schools (11.3:1). Schools designated as disadvantaged also had a lower student-computer ratio (7.8:1) than non-disadvantaged schools (10.0:1) (NCTE, 2003).

In 2002, 33% of students in Irish post-primary schools used the Internet at school frequently, 44% occasionally, and 23% never used it (NCTE, 2003). This is consistent with students' responses in PISA 2000: about one-quarter of 15-year olds said that they never used a computer at school. Indeed, Ireland had the lowest reported use of 25 countries on an index of frequency of use in school. Perhaps of greater concern is the fact that there has been no increase in the reported frequency of use in Irish schools between 2000 and 2003 (OECD, 2005a).

<sup>1</sup>Note that these figures were computed on the basis of the school data disaggregated to the student level.

<sup>2</sup>Details of the broadband initiative are on <http://www.ncte.ie>

In the OECD survey of upper post-primary schools, Ireland had the second lowest score of 14 countries on an index of variety of ICT use in schools (OECD, 2004). Comparing the percentages of upper secondary school students (i.e., in senior cycle or its equivalent) in schools where principals reported 'a lot' of computer use for six specific activities, Irish students were comparatively low on five of the six, which were developing independent learning skills; allowing learning to occur at different paces; combining subjects; learning via simulation; and obtaining information on the Internet. The exception was the use of computers for additional instruction and practice, for which the percentage for Ireland was similar to the OECD country average. This survey also suggested that while the frequency with which Irish students operated computers generally, carried out word processing, and used graphics packages was similar to the OECD country average, they used spreadsheets, wrote programs, used email, conducted information searches, and used educational software less frequently.

The study described in this paper draws on data from the Programme for International Student Assessment (PISA) 2003 international optional survey of students' access to and engagement with ICT, as well as data from the PISA 2003 school questionnaire, to augment the information in previous studies on ICT in Irish post-primary schools. It adds an international dimension to the information, comparing conditions in Irish schools with conditions in schools in OECD member states relating to provision of computer equipment (student-computer ratio, percentage of computers with Internet and LAN connectivity) and computer use (including length of time students had been using computers, student access to computers at home and at school, frequency of computer use, and engagement/confidence with various computer tasks). The study also carried out analyses for which only Irish data were used to examine the extent to which school resources and use of computers varied with respect to school characteristics and the extent to which student engagement with computers (frequency of use and confidence with use) varied with characteristics of students' home background.

It should be noted that since the design of PISA 2003 entailed a random sample of students within schools rather than intact classes, it was not possible to examine teacher or instructional variables in relation to ICT literacy. Furthermore, the PISA questionnaires did not provide a direct measure of ICT literacy, relying instead on students' reports of how often they engaged in various aspects of computer use and of their confidence in carrying out various computer tasks.

## METHOD

School data were derived from principals' responses to the PISA 2003 school questionnaire and, for some of the within-country analyses of the Irish data, from the school database of the Department of Education and Science. In many countries, the percentage of missing data for variables collected through the school questionnaire is greater than 10<sup>3</sup>, limiting the value of the data. Student data were derived from responses to the PISA 2003 student questionnaire, which included an optional component asking about ICT.<sup>4</sup> Table 1 lists the countries which administered either one or both questionnaires and also provides information on the percentage of 15-year olds enrolled in school. Table 2 lists all school and student variables.

Table 1

*Countries Which Administered the School Questionnaire and/or the Student ICT Questionnaire in PISA 2003*

OECD Countries		Partner Countries
<b>Australia*</b>	Luxembourg*	Brazil***
<b>Austria*</b>	<b>Mexico***</b>	Hong Kong-China*
<b>Belgium*</b>	Netherlands*	Indonesia***
<b>Canada*</b>	<b>New Zealand*</b>	<b>Latvia*</b>
<b>Czech Republic*</b>	Norway*	<b>Liechtenstein**</b>
<b>Denmark*</b>	<b>Poland*</b>	Macao-China**
<b>Finland*</b>	<b>Portugal*</b>	<b>Russian Federation*</b>
<b>Germany*</b>	<b>Slovak Republic*</b>	<b>Serbia Montenegro*</b>
<b>Greece*</b>	Spain*	<b>Thailand**</b>
<b>Hungary*</b>	<b>Sweden*</b>	<b>Tunisia*</b>
<b>Iceland*</b>	<b>Switzerland*</b>	<b>Uruguay***</b>
<b>Ireland*</b>	<b>Turkey***</b>	
<b>Italy*</b>	<b>United Kingdom*</b>	
<b>Japan*</b>	<b>United States*</b>	
<b>Korea (Rep. of)*</b>		

Countries in bold text administered both questionnaires. Countries in plain text administered only the school questionnaire.

\* more than 90% of 15-year-old students enrolled \*\* between 75% and 90% of 15-year-old students enrolled \*\*\*between 50% and 75% of 15-year-old students enrolled

<sup>3</sup>Taking student-computer ratio as an example, Mexico is missing over 50% of data; Norway, Turkey and the USA are missing between 20% and 50%; and Australia, Brazil, Canada, Switzerland, Germany, Denmark, Spain, Ireland, Iceland and Liechtenstein are missing between 10% and 20% of data.

<sup>4</sup>Copies of the questionnaires and data compendia are available at <http://www.pisa.oecd.org/>

In all descriptive analyses, data are weighted to adjust for differences in sampling probability and non-response (see OECD, 2005c). Sampling and measurement error were incorporated into the standard errors (and any resulting tests of statistical significance) by using a replicate weighting method in WesVar 4.2 (Westat, 2000).

Table 2  
*Variables Examined in Analyses*

School-level Variables	Description
<i>School Resource Variables</i>	
Student-computer ratio	Total number of students enrolled in the school divided by the total number of computers available for students' use.
Proportion of computers connected to the Internet	Total number of computers in school divided by the number of computers connected to the Internet.
Proportion of computers connected to a LAN	Total number of computers in school divided by the number of computers connected to a LAN.
<i>School Demographic Variables</i>	
School sector	Community/comprehensive, secondary, vocational.
School average SES	The average of individual student SES for each school.
School sex composition	All boys, all girls, mixed sex.
Student-level Variables	Description
<i>Demographics of Computer Use</i>	
Length of time using a computer	Four response categories: 'less than one year', 'one to three years', 'three to five years', 'more than five years'.
Access to a computer at home	Binary variable (yes/no).
Access to a computer at school	Binary variable (yes/no).
<i>Frequency of Computer Use</i>	
Frequency of use at home	Five response categories: 'almost every day', 'a few times each week', 'between once a week and once a month', 'less than once a month', 'never'.
Frequency of use at school	Five response categories: 'almost every day', 'a few times each week', 'between once a week and once a month', 'less than once a month', 'never'.
<i>Composite Measures of Engagement with Computers</i>	
Frequency of program and software use	Derived from students' responses on six items (e.g., frequency of the use of educational software; frequency of the use of a computer to help learning school material). Five response categories: 'almost every day' = 0, 'a few times each week' = 1, 'between once a week and once a month' = 2, 'less than once a month' = 3, 'never' = 4. OECD average = 0.0; SD = 1.0.

Table 2 - Contd.

Student-level Variables	Description
Self-confidence in routine computer tasks	Derived from students' responses on how well they could execute several routine computer tasks (e.g., open a file; move files from one place to another). Response categories: 'I can do this very well by myself' = 0, 'I can do this with help from someone' = 1, 'I know what this means but I cannot do it' = 2, 'I don't know what this means' = 4. OECD average = 0.0; SD = 1.0.
Self-confidence in high-level computer tasks	Derived from students' responses on how well they could execute several high-level computer tasks (e.g., create a computer program in Logo, Pascal and Basic; create multimedia presentation). Response categories as for self-confidence in routine tasks. OECD average = 0.0; SD = 1.0.
Self-confidence in internet-related computer tasks	Derived from students' responses on how well they could execute several internet-related computer tasks (e.g., get onto the internet; attach a file to an e-mail message). Response categories as for self-confidence in routine tasks. OECD average = 0.0; SD = 1.0.
<i>Student Demographic/Background Variables</i>	
Gender	Male/female
SES (parental occupation)	Students' descriptions of their parents' occupation and the nature of their work transformed onto an International Socioeconomic Index (ISEI) (Ganzeboom, de Graaf, & Treiman, 1992; Ganzeboom & Treiman, 1996).
Parental education	Highest level of parents' formal education, ranging from primary to third-level degree.
Lone-parent status	Whether the student resides in a household headed by one or two parents.
Number in paid employment	Ranging from 0 to 4, where 0 = no parent employed, 1 = one part-time job; 2 = two part-time or one fulltime job, etc.
Books in the home	Number of books at home; response categories = 0-10, 11-25, 25-100, 101-200, 201-500, 500+

## RESULTS

## International Comparisons

*School Resources*

In Ireland, the student-computer ratio was 9.0:1, which is higher than the OECD average (6.2:1), and is the tenth highest ratio of 40 countries (Table 3). The average percentage of computers in Irish schools connected to the Internet (67.4%) is some 12% below the OECD average (79.4%), ranking Ireland 29th of the 40 countries on this measure. In 12 countries (including Sweden,

Finland, New Zealand, Korea, Australia, and Canada), the percentage of computers in schools with an Internet connection was over 90. In Ireland, the percentage of computers in schools connected to a local area network (LAN) (35.7%) is well below the OECD average (69.1%). Ireland ranks 34th of 40 countries on this measure. In countries such as Luxembourg, Australia, and New Zealand, over 90% of computers in schools were connected to a LAN.

Table 3  
*Mean Scores and Standard Errors for School ICT Resource Variables – OECD and Partner Countries (2003)*

	Computer-Student Ratio*			% Computers with Internet Connection		% Computers connected to LAN	
	Mean	SE	Inverse of ratio (student:computer)	Mean	SE	Mean	SE
Australia	0.28	0.01	3.6	93.5	0.86	92.8	1.10
Austria	0.22	0.01	4.6	87.3	1.87	70.9	3.10
Belgium	0.15	0.01	6.8	73.8	1.54	54.5	2.34
<i>Brazil</i>	0.02	0.00	47.0	42.2	3.30	32.1	3.22
Canada	0.21	0.01	4.7	94.2	0.67	87.7	1.47
Czech Republic	0.11	0.01	8.8	76.5	1.60	68.4	2.57
Denmark	0.19	0.01	5.4	87.8	1.37	77.0	2.21
Finland	0.17	0.01	5.9	92.1	0.89	76.1	2.89
Germany	0.08	0.00	12.4	70.7	1.99	44.8	2.91
Greece	0.08	0.01	11.8	69.2	3.74	55.5	4.40
<i>Hong Kong-China</i>	0.01	0.21	161.3	91.1	1.16	89.1	1.49
Hungary	0.23	0.01	4.4	78.8	1.96	79.3	2.16
Iceland	0.18	0.00	5.6	95.7	0.05	88.6	0.14
Indonesia	0.03	0.01	29.3	3.5	0.76	3.9	1.52
Ireland	0.11	0.00	9.0	67.4	2.57	35.7	3.47
Italy	0.13	0.01	7.7	70.8	2.12	49.6	2.65
Japan	0.19	0.02	5.3	73.8	2.47	72.6	2.26
Korea	0.27	0.01	3.7	92.4	1.22	91.4	1.41
<i>Latvia</i>	0.06	0.00	16.5	60.5	3.40	71.2	2.50
<i>Liechtenstein</i>	0.33	0.00	3.0	96.6	0.16	96.6	0.16
Luxembourg	0.18	0.00	5.4	95.9	0.01	94.8	0.01
<i>Macao-China</i>	0.12	0.00	8.3	90.7	0.13	84.4	0.15
Mexico	0.09	0.01	11.5	44.2	4.22	50.5	4.39
Netherlands	0.14	0.01	6.9	84.8	2.56	81.3	2.95
New Zealand	0.23	0.01	4.4	92.2	1.34	92.5	1.55

Table 3 - Contd.

	Computer-Student Ratio*			% Computers with Internet Connection		% Computers connected to LAN	
	Inverse of ratio			Mean	SE	Mean	SE
	Mean	SE	(student:computer)				
Norway	0.18	0.01	5.7	81.2	1.66	48.2	3.16
Poland	0.07	0.00	14.9	82.7	2.01	63.9	2.79
Portugal	0.07	0.00	13.6	60.4	2.31	49.7	3.37
<i>Russian Federation</i>	0.03	0.00	32.9	16.0	2.52	34.3	2.92
<i>Serbia and Mont.</i>	0.03	0.00	29.4	15.5	2.14	27.5	3.26
Slovak Republic	0.07	0.00	14.7	50.8	1.86	53.2	2.17
Spain	0.08	0.00	12.0	79.3	1.69	59.1	3.35
Sweden	0.16	0.00	6.4	91.9	1.06	79.9	2.23
Switzerland	0.17	0.03	5.9	80.2	1.76	69.9	2.88
<i>Thailand</i>	0.05	0.00	19.4	40.4	2.76	38.4	2.57
<i>Tunisia</i>	0.01	0.00	83.5	67.7	4.78	15.5	4.27
Turkey	0.04	0.00	25.2	27.5	3.12	12.0	2.44
United Kingdom	0.23	0.01	4.3	89.7	1.30	87.8	1.66
United States	0.30	0.01	3.4	91.1	1.34	84.1	2.02
<i>Uruguay</i>	0.05	0.00	20.0	26.9	2.07	31.8	2.52
OECD Average	0.16	0.00	6.2	79.4	0.35	69.1	0.48

OECD partner countries are in italics.

\*The inverse of the computer-student ratio is provided since it is more commonly used in the Irish context. The OECD reports the computer-student ratio.

Source: OECD (2005a), Table 2.4; OECD (2005b), Tables 2.1 and 2.2.

### Computer Use

*Length of Time Using Computers.* About three-tenths of Irish students said that they had been using computers for more than five years, which is a little below the OECD average (37.5%) (Table 4). In Australia, Canada, the USA, Sweden, New Zealand, and Denmark, over 50% of students reported having used a computer for more than five years.<sup>5</sup> Just 8% of students in Ireland indicated that they had been using computers for less than one year, which is similar to the OECD average (9.3%). Gender differences in length of time using computers are not particularly in evidence in Ireland, in contrast with OECD averages, which show that more males (42.1%) than females (32.9%) had used computers for

<sup>5</sup>Country-by-country comparisons for data corresponding to individual questionnaire items can be found in the PISA 2003 data compendia, available on [http://pisaweb.acer.edu.au/oecd\\_2003/oecd\\_pisa\\_data\\_s1.html](http://pisaweb.acer.edu.au/oecd_2003/oecd_pisa_data_s1.html)



more than five years. In many countries (e.g., Czech Republic, Turkey, Slovak Republic, Germany), boys reported using computers for longer than girls.

Table 4  
*Percentages and Standard Errors for Length of Computer Use in Years, by Gender – Ireland and OECD Average*

	Ireland						OECD Average					
	Total		Males		Females		Total		Males		Females	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Less than one year	8.0	0.61	8.9	0.66	7.2	0.93	9.3	0.14	9.0	0.16	9.6	0.20
One to three years	28.0	0.84	27.7	1.09	28.4	1.28	26.1	0.18	23.5	0.20	28.6	0.26
Three to five years	32.9	0.68	31.2	0.95	34.6	1.05	27.1	0.16	25.4	0.19	28.9	0.20
More than five years	31.0	1.12	32.2	1.29	29.9	1.58	37.5	0.21	42.1	0.26	32.9	0.30
Total	100.0		100.0		100.0		100.0		100.0		100.0	

*Access to Computers.* In Ireland, 87.4% of students said that they had access to a computer at home, which is close to the OECD average (85.5%) (Table 5). There are no appreciable gender differences in rates of access to a computer at home. In twelve countries (including Sweden, Denmark, and Australia), over 90% of students had access to a computer at home.

Table 5  
*Percentages and Standard Errors for Access to a Computer at Home, by Gender – Ireland and OECD Average*

	Ireland						OECD Average					
	Total		Males		Females		Total		Males		Females	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Yes	87.4	0.70	88.0	1.04	86.8	1.28	85.5	0.26	87.1	0.33	83.8	0.28
No	12.6	0.70	12.0	0.85	13.2	0.98	14.5	0.17	12.9	0.21	16.2	0.21
Total	100.0		100.0		100.0		100.0		100.0		100.0	

In Ireland, 89.5% of students had access to a computer at school, which is close to the OECD average (92.4%) (Table 6). In countries such as Australia and Canada, over 95% of students said they had access to a computer at school.

In considering the data in Tables 5 and 6, it should be borne in mind that some students may be interpreting availability of a computer at home or at school to imply actual use. While one might expect all Irish post-primary schools to have computers, not all students will report using them.

Table 6  
*Percentages and Standard Errors for Access to a Computer at School, by Gender – Ireland and OECD Average*

	Ireland						OECD Average					
	Total		Males		Females		Total		Males		Females	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Yes	89.5	0.90	87.0	1.33	92.1	1.29	92.4	0.26	91.6	0.31	93.3	0.29
No	10.5	0.85	13.0	1.09	8.1	1.09	7.6	0.18	8.4	0.2	6.8	0.2
Total	100.0		100.0		100.0		100.0		100.0		100.0	

*Frequency of Computer Use.* In Ireland, 61.5% of students said that they used a computer at home at least a few times a week, which is below the OECD average (74.6%) (Table 7). About one in eight Irish students said they never used a computer at home, which is close to the OECD average (13.2%). Countries in which students reported the most frequent computer use at home are Canada (70.7% reported use almost every day), Iceland (66.6%), and Sweden (65.1%). Generally, computers were used at home more frequently by males than by females. In Ireland, 65.3% of male students, compared to 57.6% of female students, used a computer at home at least a few times a week.

Table 7  
*Percentages and Standard Errors for Frequency of Computer Use at Home, by Gender – Ireland and OECD Average*

	Ireland						OECD Average					
	Total		Males		Females		Total		Males		Females	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Almost every day	25.8	0.84	31.2	1.13	20.3	1.19	49.8	0.20	58.7	0.27	40.7	0.27
A few times each week	35.7	0.79	34.1	1.09	37.3	1.15	24.8	0.15	21.1	0.18	28.7	0.21
Between once a week and once a month	18.8	0.71	16.2	0.91	21.5	0.95	8.9	0.09	6.1	0.11	11.8	0.15
Less than once a month	7.0	0.39	6.5	0.54	7.6	0.61	3.3	0.06	2.6	0.08	4.0	0.09
Never	12.7	0.65	12.1	0.81	13.3	0.94	13.2	0.15	11.6	0.17	14.9	0.2
Total	100.0		100.0		100.0		100.0		100.0		100.0	

One-third of students in Ireland (32.4%) reported that they never used a computer at school, which is over twice the OECD average (13.7%) (Table 8).

Only 24.3% of students in Ireland indicated that they used a school computer more than once a week, compared to an OECD average of 43.1 percent. In fact, Uruguay is the only country in which more students than in Ireland never used a computer at school (38.5%). In Ireland, results for female and male students are similar at each frequency level, consistent with the OECD average percentages.

Table 8  
*Percentages and Standard Errors for Frequency of Computer Use at School, by Gender – Ireland and OECD Average*

	Ireland						OECD Average					
	Total		Males		Females		Total		Males		Females	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Almost every day	2.2	0.32	2.1	0.39	2.3	0.45	8.1	0.15	9.0	0.18	7.2	0.16
A few times each week	22.1	1.24	19.6	1.23	24.5	1.88	35.0	0.24	36.2	0.30	33.9	0.34
Between once a week and once a month	26.9	1.72	27.3	2.41	26.5	2.13	28.9	0.25	28.4	0.34	29.4	0.29
Less than once a month	16.4	1.06	17.1	1.30	15.7	1.41	14.2	0.18	12.8	0.20	15.7	0.22
Never	32.4	1.55	33.9	2.03	31.0	1.86	13.7	0.23	13.6	0.26	13.9	0.29
Total	100.0		100.0		100.0		100.0		100.0		100.0	

*Engagement with Programs and Software.* The mean score on the composite scale measuring frequency of engagement with computer programs/software for Irish students (-0.35; SE=0.02) is about a third of a standard deviation below the OECD average (Table 9). Only Japan (-1.03; SE=0.03) has a lower mean score. Countries for which mean scores on this scale are more than one-fifth of a standard deviation above the OECD average include the United States and Australia. There is a gender difference in Ireland (0.17) in the range of a sixth of a standard deviation: male students reported significantly higher use. Significant gender differences of more than a quarter of a standard deviation exist in 15 countries, all in favour of male students. Countries with large gender differences include Denmark, Sweden, and Germany.

Table 9  
*Mean Scores, Standard Errors, and Gender Differences on the Composite Scales 'Computer Program and Software Use' and 'Self-Confidence in Routine Computer Tasks' – OECD and Partner Countries*

	Program and Software Use			Self-Confidence-Routine Tasks		
	Total	SE	Difference	Total	SE	Difference
	Mean		M-F	Mean		M-F
Australia	0.23	0.01	<b>0.19</b>	0.39	0.01	<b>0.13</b>
Austria	0.13	0.02	<b>0.15</b>	0.25	0.02	0.05
Belgium	-0.19	0.01	<b>0.24</b>	0.11	0.02	<b>0.25</b>
Canada	0.15	0.01	<b>0.19</b>	0.33	0.01	<b>0.21</b>
Czech Republic	0.08	0.02	<b>0.20</b>	0.20	0.02	<b>0.43</b>
Denmark	0.17	0.02	<b>0.48</b>	0.15	0.02	<b>0.62</b>
Finland	-0.28	0.01	<b>0.29</b>	0.08	0.01	<b>0.76</b>
Germany	-0.03	0.02	<b>0.31</b>	0.15	0.02	<b>0.44</b>
Greece	0.11	0.02	<b>0.29</b>	-0.38	0.03	<b>0.34</b>
Hungary	0.03	0.02	<b>0.12</b>	-0.12	0.02	<b>0.49</b>
Iceland	0.10	0.02	<b>0.34</b>	0.21	0.02	<b>0.58</b>
Ireland	-0.35	0.02	<b>-0.17</b>	-0.03	0.02	0.05
Italy	0.23	0.02	<b>0.31</b>	-0.20	0.02	<b>0.27</b>
Japan	-1.03	0.03	<b>-0.13</b>	-0.80	0.03	<b>0.14</b>
Korea	-0.33	0.02	-0.06	0.08	0.01	<b>0.26</b>
<i>Latvia</i>	-0.23	0.03	<b>0.41</b>	-0.33	0.03	<b>0.54</b>
<i>Liechtenstein</i>	0.13	0.05	<b>0.51</b>	0.24	0.05	<b>0.35</b>
Mexico	0.18	0.03	<b>0.20</b>	-0.68	0.05	<b>0.12</b>
New Zealand	0.16	0.02	0.05	0.20	0.01	<b>0.18</b>
Poland	0.22	0.02	<b>0.41</b>	0.04	0.03	<b>0.23</b>
Portugal	0.23	0.02	<b>0.26</b>	0.21	0.02	<b>0.17</b>
<i>Russian Federation</i>	-0.30	0.04	<b>0.23</b>	-0.57	0.05	<b>0.34</b>
<i>Serbia and Mont.</i>	0.07	0.03	<b>0.14</b>	-0.60	0.03	<b>0.24</b>
Slovak Republic	0.02	0.02	<b>0.26</b>	-0.36	0.03	<b>0.54</b>
Sweden	-0.17	0.01	<b>0.38</b>	0.21	0.01	<b>0.53</b>
Switzerland	-0.15	0.02	<b>0.37</b>	-0.02	0.02	<b>0.46</b>
<i>Thailand</i>	-0.05	0.03	-0.04	-0.91	0.04	0.07
<i>Tunisia</i>	0.00	0.04	<b>0.26</b>	-1.44	0.06	<b>0.26</b>
Turkey	0.10	0.04	<b>0.31</b>	-0.74	0.05	<b>0.16</b>
United Kingdom	0.32	0.03	0.02	0.25	0.02	<b>0.19</b>
United States	0.33	0.02	0.04	0.26	0.02	0.04
<i>Uruguay</i>	0.25	0.03	<b>0.18</b>	-0.23	0.03	0.08
OECD Average	0.00	0.00	<b>0.20</b>	0.00	0.01	<b>0.31</b>

OECD partner countries are in italics. Significant gender differences are in bold.

Source: OECD (2005a), Tables 3.4 and 3.8.

*Self-Confidence in Routine Computer Tasks.* Ireland's mean score (-0.03; SE=0.02) on the composite scale assessing students' confidence with routine computer tasks does not differ from the OECD average (Table 9). Mean scores are highest for Australia, Canada, and the United States. There is no gender difference in students' self-confidence in routine tasks in Ireland, in contrast to significant differences favouring males in 25 countries, including Finland, Denmark, Iceland, Latvia, the Slovak Republic, and Sweden, where the difference exceeds half of a standard deviation.

*Self-Confidence in High-Level Computer Tasks.* Ireland's mean score (-0.24; SE=0.02) on the scale assessing students' self-confidence in high-level tasks (e.g., creating a multi-media presentation) is about a quarter of a standard deviation below the OECD average (Table 10). Students from just nine countries, including Hungary, Latvia, and Japan, indicated a lower self-confidence in high-level computer tasks. Students from the United States, Australia, Austria, Canada, and Liechtenstein reported the highest self-confidence. Their mean scores are over a quarter of a standard deviation above the OECD average.

In all countries except Thailand, there is a significant difference favouring males in self-confidence in high-level computer tasks (Table 10). Countries with gender differences of more than two-thirds of a standard deviation include Finland, Denmark, and Germany. In Ireland, the gender difference is in the region of one-tenth of a standard deviation, considerably less than the OECD average difference, but statistically significant nonetheless.

*Self-Confidence in Internet-Related Computer Tasks.* Ireland's mean score (-0.37; SE=0.02) on the confidence in Internet tasks scale is almost two-fifths of a standard deviation below the OECD average (Table 10). In Australia, the United States, and Sweden, mean scores exceed the OECD average by close to two-fifths of a standard deviation. Mean scores for students in Korea and Canada are more than a half of a standard deviation above the OECD average. In almost all countries, female students reported significantly lower self-confidence than male students on Internet-related computer tasks. Finland, Denmark, and Latvia are among countries with gender differences greater than half a standard deviation favouring male students. In Ireland, the gender difference, 0.20, is smaller than the OECD average (0.33), but nonetheless statistically significant.

Table 10  
*Mean Scores, Standard Errors, and Gender Differences on the Composite Scales 'Self-Confidence in High-Level Computer Tasks' and 'Self-Confidence in Internet-Related Computer Tasks' - OECD and Partner Countries*

	Self-Confidence – High-Level Tasks			Self-Confidence – Internet Tasks		
	Total		Difference	Total		Difference
	Mean	SE	M-F	Mean	SE	M-F
Australia	0.42	0.01	<b>0.46</b>	0.41	0.01	<b>0.17</b>
Austria	0.28	0.02	<b>0.41</b>	0.24	0.02	<b>0.09</b>
Belgium	0.04	0.02	<b>0.47</b>	0.23	0.02	<b>0.20</b>
Canada	0.35	0.01	<b>0.52</b>	0.57	0.01	<b>0.09</b>
Czech Republic	0.05	0.03	<b>0.70</b>	0.06	0.02	<b>0.48</b>
Denmark	0.06	0.02	<b>0.88</b>	0.11	0.02	<b>0.71</b>
Finland	-0.04	0.01	<b>0.90</b>	0.06	0.01	<b>0.79</b>
Germany	0.08	0.02	<b>0.70</b>	0.14	0.02	<b>0.42</b>
Greece	-0.21	0.02	<b>0.49</b>	-0.45	0.03	<b>0.42</b>
Hungary	-0.33	0.02	<b>0.48</b>	-0.44	0.02	<b>0.40</b>
Iceland	0.14	0.02	<b>0.88</b>	0.41	0.01	<b>0.39</b>
Ireland	-0.24	0.02	<b>0.10</b>	-0.37	0.02	<b>0.20</b>
Italy	-0.15	0.02	<b>0.48</b>	-0.39	0.02	<b>0.40</b>
Japan	-0.71	0.02	<b>0.09</b>	-0.71	0.03	0.08
Korea	-0.09	0.01	<b>0.20</b>	0.77	0.01	0.02
<i>Latvia</i>	-0.35	0.02	<b>0.63</b>	-0.53	0.03	<b>0.56</b>
<i>Liechtenstein</i>	0.47	0.05	<b>0.78</b>	0.47	0.04	<b>0.21</b>
Mexico	-0.13	0.03	<b>0.16</b>	-0.54	0.04	0.14
New Zealand	0.22	0.02	<b>0.35</b>	0.31	0.01	<b>0.18</b>
Poland	0.20	0.02	<b>0.62</b>	-0.17	0.03	<b>0.40</b>
Portugal	0.12	0.02	<b>0.53</b>	-0.22	0.03	<b>0.50</b>
<i>Russian Federation</i>	-0.49	0.04	<b>0.45</b>	-1.27	0.05	<b>0.55</b>
<i>Serbia and Mont.</i>	-0.43	0.02	<b>0.38</b>	-0.93	0.03	<b>0.40</b>
Slovak Republic	-0.50	0.03	<b>0.54</b>	-0.81	0.03	<b>0.48</b>
Sweden	0.00	0.02	<b>0.72</b>	0.39	0.01	<b>0.37</b>
Switzerland	-0.03	0.02	<b>0.69</b>	0.09	0.02	<b>0.35</b>
<i>Thailand</i>	-0.68	0.03	-0.01	-1.36	0.04	0.06
<i>Tunisia</i>	-0.58	0.04	<b>0.38</b>	-1.38	0.04	<b>0.28</b>
Turkey	-0.16	0.02	<b>0.20</b>	-0.55	0.04	<b>0.34</b>
United Kingdom	0.31	0.03	<b>0.45</b>	0.28	0.02	<b>0.25</b>
United States	0.43	0.02	<b>0.23</b>	0.39	0.01	0.05
<i>Uruguay</i>	-0.07	0.02	<b>0.24</b>	-0.46	0.03	<b>0.26</b>
OECD Average	0.00	0.01	<b>0.49</b>	0.00	0.01	<b>0.33</b>

OECD partner countries are in italics. Significant gender differences are in bold.

Source: OECE (2005a), Tables 3.10 and 3.12.

## Within-Country Analyses for Ireland

In this section, school and student variables are related to computer resources, access, and use in Ireland. In some of the tables, the mean scores of groups are compared (e.g., the student-computer ratios in secondary and vocational schools are compared). For these comparisons, we have selected one group, termed the reference group (RefGroup), with which to compare the others. For all analyses involving school-level variables, the data have been disaggregated and analysed at the student level.

*School Resources and School Demographic Characteristics*

Lower computer-student ratios<sup>6</sup> are associated with schools of high average SES (i.e., the higher the SES, the more students per computer) (Table 11). Higher rates of LAN connectivity are also associated with higher average SES (with a borderline statistically significant association). The association between school SES and rate of Internet connectivity is not statistically significant.

Table 11

*Linear Associations Between School-Level ICT Resources and School Average Socioeconomic Status (SES)*

School-Level Resources	School Average SES		
	r	t	p
Computer-student ratio	<b>-.381</b>	-4.70	<.001
Percentage of computers attached to Internet	.080	0.76	.450
Percentage of computers attached to LAN	<b>.160</b>	1.76	.082

Significant correlations are in bold. Df=80 [number of strata associated with balanced repeated replication (BRR) method of variance estimation].

Secondary schools have a significantly lower computer-student ratio (which is equivalent to a higher student-computer ratio) than other school types. Single sex schools also have significantly lower computer-student ratios than mixed sex schools (Table 12). The relationships between school sector and Internet or LAN connectivity and between school sex composition and these variables are not statistically significant.

<sup>6</sup>In the analyses presented in this section, the student-computer ratio for one outlier school with a value of 0.002 was recoded to missing. The recode was not applied to the international comparisons since outliers were not recoded for other countries. The outlier does not affect the overall average but affects analyses of subgroups and of associations between this ratio and other variables.

Table 12  
*Means and Standard Errors for Computer-Student Ratio and Proportions of Schools with Internet and LAN Connections, by School Sector and School Sex Composition*

	%	Computer-Student Ratio		Prop. With Internet Connection		Prop. With LAN Connection	
		Mean	SE	Mean	SE	Mean	SE
<i>Sector</i>							
Community/Comprehensive	18.9	<b>0.14</b>	0.011	0.73	0.036	0.38	0.069
Secondary (RefGroup)	59.3	0.08	0.005	0.67	0.036	0.34	0.044
Vocational	22.3	<b>0.16</b>	0.011	0.65	0.054	0.38	0.085
<i>Sex Composition</i>							
All Boys	19.4	<b>0.08</b>	0.006	0.67	0.071	0.48	0.075
All Girls	24.1	<b>0.08</b>	0.005	0.58	0.051	0.23	0.075
Mixed Sex (RefGroup)	56.5	0.14	0.007	0.71	0.031	0.36	0.046

Significant correlations are in bold. DF = 80 [number of strata associated with balanced repeated replication (BRR) method of variance estimation].

Since ICT resources vary across school types, the frequency with which students use computers might also be expected to vary. There is no association, however, between school average SES and the frequency with which students used computers in school ( $r = .008$ ;  $df = 80$ ;  $p = .302$ ).

Although a greater percentage of students in secondary schools than of students in other school types reported never using a computer, the difference is not significant (Table 13). A comparison of the mean frequencies and standard errors<sup>7</sup> in the three school types indicates that students in vocational schools (mean=3.2; SE=0.11) used computers significantly more often than students in secondary schools (mean=3.7; SE=0.06) but not more often than students in community/comprehensive schools (mean=3.5; SE=0.14). The mean frequencies of use in all boys', all girls', and mixed sex schools do not differ significantly (all girls' mean=3.7; SE=0.12; all boys' mean=3.5; SE=0.06; mixed sex mean=3.5; SE=0.05).

<sup>7</sup> 95% confidence intervals around the means reported here can be derived by taking 1.96 times the standard error and adding and subtracting this value to/from the mean.



Table 13  
*Percentages of Students (SEs) Using Computers with Varying Levels of Frequency, by School Type and School Sex Composition*

	%	Frequency of Use									
		Almost every day		Few times a week		Once a week to once a month		Less than once a month		Never	
		Mean	(SE)	Mean	(SE)	Mean	(SE)	Mean	(SE)	Mean	(SE)
<i>Sector</i>											
Community/Comprehensive	17.2	1.9	(0.56)	24.6	(3.91)	24.5	(2.95)	19.6	(2.97)	29.5	(4.60)
Secondary (RefGroup)	61.1	1.9	(0.37)	19.7	(1.68)	24.9	(2.40)	16.5	(1.48)	37.0	(2.13)
Vocational	21.6	3.3	(1.08)	26.8	(2.21)	34.5	(4.37)	13.5	(2.19)	21.8	(3.80)
<i>Sex Composition</i>											
All Boys	19.4	2.1	(0.52)	25.0	(3.28)	24.8	(2.99)	15.6	(2.35)	32.5	(3.26)
All Girls	24.4	2.3	(0.53)	23.2	(1.67)	26.9	(2.20)	16.9	(1.48)	30.7	(2.29)
Mixed Sex (RefGroup)	56.2	2.2	(0.34)	22.1	(1.31)	26.9	(1.83)	16.4	(1.15)	32.4	(1.72)

*Student Engagement with Computers and Demographic Characteristics*

Correlations between frequency of computer use at home and four student background variables are all significant and positive, although none exceeds -.20 (Table 14).

Table 14  
*Linear Associations Between Frequency of Computer Use at Home and Student Background Variables*

Student Background Variables	Frequency of Computer Use at Home		
	r	t	p
Student SES	<b>.166</b>	9.30	<.001
Parental Education	<b>.191</b>	10.42	<.001
Number in Paid Employment	<b>.125</b>	6.45	<.001
Books in the Home	<b>.184</b>	10.67	<.001

Significant correlations are in bold. Df = 80 [number of strata associated with balanced repeated replication (BRR) method of variance estimation].

Correlations between length of time using a computer and four student background variables are all significant and positive, ranging from .11 to .28 (Table 15). Thus, both home use and extent of experience with computers are related (if only weakly) to student home background.

Table 15  
*Linear Associations Between Length of Time Using a Computer and Student Background Variables*

Student Background Variables	Time Using a Computer		
	r	t	p
Student SES	<b>.226</b>	12.17	<.001
Parental Education	<b>.241</b>	13.22	<.001
Number in Paid Employment	<b>.109</b>	5.21	<.001
Books in the Home	<b>.277</b>	16.33	<.001

Significant correlations are in bold. Df = 80 [number of strata associated with balanced repeated replication (BRR) method of variance estimation].

None of the correlations between frequency of program and software use and four student background variables is significant, except for books in the home, for which the correlation (.06) is weak and unlikely to be of substantive importance (Table 16). These weak correlations may reflect low variation in program and software use among students.

Table 16  
*Linear Associations Between Program/Software Use and Student Background Variables*

Student Background Variables	Program/Software Use		
	r	t	p
Student SES	-.018	-0.99	.324
Parental Education	.014	0.69	.494
Number in Paid Employment	.021	1.27	.209
Books in the Home	<b>.057</b>	3.03	.003

Significant correlations are in bold. Df = 80 [number of strata associated with balanced repeated replication (BRR) method of variance estimation].

Correlations between students' ratings of their confidence with routine computer tasks and four home background variables are all positive and significant, ranging from .06 to .19 (Table 17). The lowest correlation is for number of parents/guardians in paid employment.

Table 17  
*Linear Associations Between Confidence with Routine Computer Tasks and Student Background Variables*

Student Background Variables	Routine Computer Tasks		
	r	t	p
Student SES	<b>.136</b>	6.23	<.001
Parental Education	<b>.141</b>	6.89	<.001
Number in Paid Employment	<b>.064</b>	3.56	.001
Books in the Home	<b>.187</b>	10.47	<.001

Significant correlations are in bold. Df = 80 [number of strata associated with balanced repeated replication (BRR) method of variance estimation].

Correlations between students' confidence with high-level computer tasks and home background variables are all significant with the exception of number of parents/guardians in paid employment (Table 18). Correlations are again quite weak, ranging from .09 to .14.

Table 18  
*Linear Associations Between Confidence with High Level Computer Tasks and Student Background Variables*

Student Background Variables	High Level Computer Tasks		
	r	t	p
Student SES	<b>.086</b>	4.32	<.001
Parental Education	<b>.111</b>	5.50	<.001
Number in Paid Employment	.020	1.18	.240
Books in the Home	<b>.138</b>	6.85	<.001

Significant correlations are in bold. Df = 80 [number of strata associated with balanced repeated replication (BRR) method of variance estimation].

Correlations between students' confidence with Internet-related tasks and four home background variables are all significant and positive; the correlation between confidence with Internet tasks and the number in paid employment (.07) is weakest (Table 19).

A slightly lower percentage of students in lone-parent households than of students in dual-parent families indicated that they had more than five years' experience using computers. The percentage of students in lone-parent families that had less than one year's experience was close to twice the percentage of students in dual-parent families (Table 20). However, a comparison of the mean number of years' computer use by students in the two household types indicates

that the average difference in duration of use is not statistically significant (single parent mean = 2.7; SE = 0.05; dual parent mean = 2.9; SE = 0.03).

Table 19

*Linear Associations Between Self-Confidence in Internet-Related Computer Tasks and Student Background Variables*

Student Background Variables	Internet Tasks		
	r	t	p
Student SES	<b>.152</b>	7.63	<.001
Parental Education	<b>.164</b>	8.44	<.001
Number in Paid Employment	<b>.072</b>	3.47	.001
Books in the Home	<b>.164</b>	8.95	<.001

Significant correlations are in bold. Df = 80 [number of strata associated with balanced repeated replication (BRR) method of variance estimation]

Table 20 also shows the frequency with which students in lone-parent and dual-parent households said that they used a computer at home. A greater percentage of students in lone-parent families than in dual-parent families never used a computer at home. However, a comparison of the mean frequency of use in the two household types indicates that the average difference in frequency of use is not statistically significant (single parent mean = 2.6; SE = 0.07; dual parent mean = 2.4; SE = 0.03).

Table 20

*Percentages of Students Indicating Length of Time Using a Computer, and Frequency of Use at Home, by Number of Parents in Family*

	%	Percentage of Students Indicating Length of Time using Computer				
		<1 Year	1-3 Years	3-5 Years	>5 Years	
Lone Parent	15.5	12.9 (1.88)	31.7 (2.18)	28.7 (1.81)	26.7 (1.91)	
Dual Parent	84.5	7.0 (0.59)	27.0 (0.96)	34.0 (0.83)	32.0 (1.18)	
		Percentage of Students Indicating Frequency of Computer Use				
		Once a week or				
		Almost every day	Few times a week	once a month	Less than once a month	Never
Lone Parent	15.0	24.8 (2.01)	32.7 (1.91)	15.1 (1.71)	8.5 (1.32)	18.9 (1.83)
Dual Parent	85.0	25.9 (0.97)	36.2 (0.90)	19.7 (0.84)	6.8 (0.43)	11.4 (0.73)

Table 21 provides the mean scores on the four computer composites of students in lone-parent and dual-parent families. Differences favouring students

in dual-parent families are significant with the exception of program and software use. The biggest difference is associated with confidence with routine computer tasks.

Table 21  
*Mean Scores and Standard Errors of Students on Four ICT Composites, by Number of Parents in Family*

	%	Program/ Software Use		Routine Computer Tasks		High Level Computer Tasks		Internet Tasks	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE
Lone Parent	15.5	-0.42	0.05	<b>-0.18</b>	0.04	<b>-0.33</b>	0.04	<b>-0.45</b>	0.04
Dual Parent (RefGroup)	84.5	-0.33	0.02	0.00	0.02	-0.23	0.02	-0.35	0.02

Significant differences are in bold.

#### CONCLUSION

In general, Irish schools are less well equipped for ICT than schools in many OECD member states. The average student-computer ratio in 2003 was 9.0:1 which is higher than the OECD average of 6.2:1, and the average percentage of computers in schools with an Internet connection (67%) is lower than the OECD average (79%). The percentage of computers in schools in Ireland connected to a LAN (36%) was particularly low, at about half the OECD average (69%). However, it is likely that this figure has increased since 2003 (see Shiel & O'Flaherty, in press).

Associations between school average SES and the three school-level computer resource indicators (student-computer ratio, rate of connectivity to the Internet, and rate of connectivity to a LAN) are weak. There is no association between school SES and the percentage of computers with an Internet connection, while higher school SES is associated with both lower rates of LAN connectivity and more students per computer. The student-computer ratio is higher in secondary schools than in community/comprehensive and vocational schools. It is also higher in single sex than in mixed sex schools. Differences in rates of Internet and LAN connectivity in different school types were found but are not statistically significant. Frequency of computer use at school varied across school types, but not substantially. Students in secondary schools and in single sex schools reported lower frequencies.

The percentages of Irish students indicating varying levels of experience in using computers (length of time using computers in years) are similar to the

OECD average percentages, with about 31% in Ireland indicating over five years' experience, and 8% less than one year. The rate of perceived access to a computer at home in Ireland (87%) is also similar to the OECD average (86%), although considerably lower than in some countries such as Sweden, Denmark, and Australia. The rate of perceived access to a computer at school in Ireland (90%) is also similar to the OECD average (92%). However, while rates of access at home and at school are comparable to OECD averages, frequency of use is lower. About 62% of Irish students reported using a computer at home at least a few times a week, compared to 75% on average across the OECD. Further, a third of students in Ireland reported never using a computer at school, which is over twice the OECD average (13%). In general, males reported higher rates of use at home, and Ireland was no exception. Frequency of computer use at school is not related to gender.

Comparisons of scores on composite indicators based on students' reports of the frequency with which they used various computer programs and software, of their confidence in high-level computer tasks, and their confidence on Internet-related tasks, indicate that Irish students are significantly below the corresponding OECD averages by between one-quarter to two-fifths of a standard deviation. Gender differences, whereby boys generally scored higher on these composites, are smaller in Ireland than OECD average differences, but nonetheless statistically significant.

Generally speaking, associations between student home background (SES, parental education, number of parents/guardians in paid employment, books in the home, and lone-parent status) and various indicators of computer use and engagement (frequency of computer use at home, length of time using a computer, program/software use, confidence with routine computer tasks, confidence with high-level computer tasks, and confidence with Internet tasks) are weak but significant, although there are some exceptions. Frequency of program/software use is only very weakly associated with student home background variables. Parental education and number of books in the home both show slightly stronger associations with student engagement with computers than the other home background variables.

Rates of LAN and of Internet connectivity in schools have been earmarked by the Irish government for further improvements in the near future. However, LAN connectivity remains well below the OECD average, and this, coupled with the fact that both LAN and Internet connectivity rates are low in classrooms, merits attention, since the lack of connectivity may be acting as a significant barrier to the regular and effective (integrated) use of ICT in lessons other than those offered in computer rooms. Furthermore, greater use of

computers by teachers during lessons would create a demand for more computers and higher rates of connectivity.

The finding that the student-computer ratio is lower in schools of lower average SES, and in community/comprehensive, vocational, and mixed sex schools, is largely consistent with previous research. The finding that LAN connectivity is higher in high-SES schools (and somewhat higher in all-boys' and mixed-sex schools than in all-girls' schools) indicates that, at present, there is not equal opportunity for students and teachers to take advantage of LAN connections for teaching and learning. LAN connectivity in teaching has advantages distinct from, and complementary to, Internet connectivity. The results of the NCTE (2003) schools ICT census indicate that the majority of networked computers in schools are in computer rooms rather than in classrooms where they might be used more frequently during lessons. Schools might benefit from enhanced guidelines and technical support to allow more equitable, and more frequent, use of networking and the Internet, particularly within classroom settings.

In a number of countries (Australia, Canada, Iceland, New Zealand, USA), school ICT resources were consistently high. The student-computer ratio was less than 6:1; Internet connectivity rates exceeded 90%; and LAN connectivity rates exceeded 80 percent. Further, students had mean scores on the four computer engagement composites that were about one-sixth or more of a standard deviation above the OECD average. It would be worthwhile exploring the policies of these countries' education systems in more depth to try to identify factors associated with successful implementation and development of schools' ICT infrastructure and the promotion of student engagement with ICT.

While the availability of computers at home and in schools in Ireland is comparable to the OECD averages, students in Ireland for some reason do not seem to be given the opportunity, or lack the motivation, to use computers to the same extent as their peers in other countries with comparable levels of access. More research into the reasons why students are not using computers more regularly is required. Some, but not all, of the explanation may lie in the comparatively low levels of use in school (and the type and quality of use). Such research would need to take gender differences in frequency of use at home into account.

While there are adequate data on access to ICT and frequency of use, the lack of available indicators on type of use, and more generally, direct measures of students' ICT literacy, should be noted. The development of appropriate measures in these two areas is warranted, particularly for monitoring the effects

of the implementation of educational policies relating to ICT. Information from teachers on their level of ICT use in teaching is also required.

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