



# Preparation for “E-Learning”: ICT Literacy and Usage of Australian University Students (2001)

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## ABSTRACT

University students require considerable computer literacy to enter and then succeed at their studies. Many courses, whether technology focussed or not, are using advanced Web technology to deliver educational content. This paper explores the changing nature of Information & Communication Technologies (ICTs) literacy of university students and explores whether gender and age factors affect student's ICT literacy and Web usage. There was a focus on first-year (freshman or transition) students. Main findings show that there is a significant difference in how females and males use the Web and first year (transition) students come to University with advanced ICT literacy.

## INTRODUCTION

The OCED commissioned the PISA (PISA, 2001) project to report and track the reading, mathematical & science literacy of students leaving k-12 schools. The PISA project seeks to explore:

*“... the increasing role of science, mathematics and technology in modern life, the objectives of personal fulfilment, employment, and full participation in society increasingly require an adult population which is not only able to read and write, but also mathematically, scientifically and technologically literate.”*

The PISA project has focussed on reading literacy in the 2000 survey and will focus on mathematical literacy in 2003 and scientific literacy in 2006. The International Adult Literacy Survey (IALS) (ISR 122, 1999) studied the literacy patterns of the OECD countries in 1994 and 1995. The 1995 report commented:

*“While most people can read, the real question is whether their reading and writing skills meet the challenge of living and working in today's information-rich and knowledge intensive society and economy.”*

The IALS report identified gaps in the “knowledge society” where re-skilling the workforce tends to narrow the pool of highly skilled workers rather than increasing the spread of skilled workers. The report went further and placed Australia in the bottom rank of OECD countries when looking at basic reading, teamwork, problem solving and ICT skills. In 1999 the Adult Literacy and Lifeskill Survey (ALLS, 1999) formed the Information and Communication Technology (ICT) team to further develop the ICT component of the International Life Skills Survey (ILSS). The ICT team incorporated Brinkley's framework (ALLS, 1999) and incorporated 5 ICT areas:

- General use of ICT;
- Computer use and skills;
- Use in specific contexts;
- Benefits of computer use;
- Receptivity of computer use among non-users.

The IALS and PISA project are part of the significant research on computer literacy that has been carried out with a variety of target groups. These groups included cross-cultural surveys (Collis and Andersen, 1994), TOEFL students (Kirsch, Jamieson & Taylor, 1997), adult populations (Oderkirk, 1996; Lowe, 1997) and student populations (Miller and Varma, 1994). These studies used the Technology Acceptance Model (TAM) (Davis, 1986) and the Computer Experience Questionnaire (CEQ) (Lee, 1986) as a basis for survey design. The Alberta Education Foundation (Alberta, 1997) developed a survey that describes the skills, knowledge, and attitudes that are applied in a variety of learning and work settings. Most of the research describes computer literacy as including:

- Incidence of computer use;
- Frequency of use;

- Location of use;
- Complexity of use;
- Adaptability of use and methods of skill development.

Whilst we can measure computer use under various circumstances there are also sets of factors that influence use. These include: education & occupation; gender (Sacks et al, 1993); age (Linden and Adams, 1992); location (Oderkirk, 1996); and cognitive ability (Authur and Hart, 1990). This raises the question, to what extent are university students developing these skills and do Universities students reflect patterns of use from the wider community? To be able to best meet the student's needs university departments must first recognise the need for computer literacy and second be able to measure the information knowledge of students. Many studies, (NCES 1999-011, ILSSL 1997, NCES 1999-017, Wenglinsky 1998, Russell 1996, Oliver 1993) both in Australia and overseas have charted the ICT skills of University students. These studies all yielded results that showed that ICT skills of university students had increased significantly and anticipated that the ICT skills of students would always be escalating, matching the general trend within society. A recent comprehensive report (Meredith, 1999) reported on the ICT skills of year 6 & 10 students in Australian schools. This report found a developing divide is being created between ICT “have” and “have-nots”. The report recommends that students should be encouraged to develop ICT skills and further explore their own investigative, creative, problem-solving and communication activities when using ICT.

## Definitions

We can define the term ICT literacy as referring to the ability to use and comprehend information & communications technologies. For this survey research students emerging from K-12 into college or University are defined as transition students and can also be referred to as beginning or freshman students.

## Research Questions

Are transition students entering university with enhanced ICT skills and are these students leading the ICT curriculum within University courses? Do University students change in their patterns of ICT usage? Does gender have an impact upon the patterns of ICT usage? Are transition students ready for “E-Learning” and can Universities expect students with high ICT literacy? This paper seeks to add to the dialogue by presenting the latest results in a study looking at the changing ICT skills of University students. This study is part of a longitudinal project that tracks the changes in the ICT profile of University business students within the Victoria University of Technology. Two areas of ICT usage are proposed. ICT literacy looked at the availability and students' self-assessed literacy. These included home access, usage at home, number of home computers, previous information systems courses studied, computer knowledge, computer confi-

dence and comparability. ICT usage referred to the use of ICTs. This included the familiar word processing, spreadsheet and database as well as the Internet, chat, email and multimedia packages. The general research question for this study involves ascertaining the ICT skills/practices of University students. More specific research questions were:

RQ1. What is the self-assessed ICT literacy of university students?

RQ2. How do University students use the Web?

RQ3. Does gender effect ICT literacy, ICT usage & Web usage?

RQ4. Are Transition or Freshman students prepared for "E-Learning"?

## METHODOLOGY

Data was gathered through a survey to all first year commencing business undergraduate students on all five undergraduate campuses of the university. Students were surveyed in either the orientation week or the first week of classes at VUT. Questionnaires were distributed and collected in lectures. From a possible 1000 students, 627 students completed the survey with 598 useable surveys giving a response rate of 60%.

### The Questionnaire

The questionnaire comprised two sections. The first section gathered information concerning each student. This included campus, study mode, student/parent birthplace, languages spoken at home, family history of participation in higher education and course studied. The second section gathered information on ICT issues and skill levels. This included home use of computer, student self-perception of computer knowledge and confidence, previous experience in the use of computers and ICT packages. Karsten & Roth (1998) demonstrated the use of computer self-efficacy as a viable measure of student computer knowledge. The question relating to their use of ICT packages and ICT literacy required the student to select their weekly use of packages from None, < 2 hours and > 2 hours. This question sought a more quantifiable measure of student's use of technology. For each question students responded to either preselected options or a 5-point Likert scale together with an option for additional comment. The student use of the Internet looked at the degree and type of use. Research questions were tested by time series comparative frequencies, mean m, standard deviation s and cross-tabulation frequency.

### Demography

The proportion of female students (47%) is slightly lower than the proportion of females in the first year undergraduate population as a whole (50%). Students born overseas accounted for 28% of the cohort with higher proportions coming from families whose parents were born overseas (mother) 64% and (father) 68%. These figures have been consistent with previous surveys (Stein 2000). These figures should be considered together with the number of students who speak a language other than English at home (50%). First year students accounted for 59% of the cohort with 25% being second year. The remaining were a mixture of TAFE articulators. Students who have University qualified parents account for 40% of the cohort. Students with siblings who have studied at University account for 46%. These "University family" figures are important as Victoria University would be identified as being populated by first generation university students.

## RESULTS

### ICT Literacy: Computer Access, Knowledge, Confidence & Comparability

The PC home market has boomed and a high proportion of the student cohort (94%) had access to a home PC (Table 2), this was consistent with previous results (Stein & Craig; 2000, 1999, 1998). Home access to the Internet was 84% compared with 65%(2000), 45%(1999) and 33%(1998). The mean for computer knowledge (Table 1) was 3.00 with a tight standard deviation of 0.92, this was in line with results for previous surveys. The cohort indicated that 19% felt they

had low confidence with 44% of average confidence and 37% having high levels of confidence. The mean value for computer confidence was slightly higher than knowledge at 3.19 with a standard deviation of .95. When compared with previous surveys, both knowledge and confidence whilst stable seem to be trending down. Comparability ( $m=3.16$ ) is a new construct measuring the student's self-assessed comparison with their peers and is to be used in future studies.

Table 1: Self-assessed computer knowledge, confidence & comparison %

	2001 1 <sup>st</sup> Year N=351	2000 1 <sup>st</sup> Year N=369 Stein 2001	1999 1 <sup>st</sup> Year N=389 Stein 2000	1998 1 <sup>st</sup> Year N=521 Stein 1999
Low Knowledge	22	26	24	21
Avg Knowledge	53	47	42	48
High Knowledge	25	27	34	31
Knowledge - $\mu$	3.00	3.01	3.10	3.07
Knowledge - $\sigma$	.92	.94	.97	.92
Low Confidence	19	27	19	19
Average	44	35	35	40
High Confidence	37	38	46	41
Confidence - $\mu$	3.19	3.13	3.34	3.30
Confidence - $\sigma$	.95	1.08	1.05	1.05
Less Than Peers	19	na	na	na
About Same	48	na	na	na
More Than Peers	33	na	na	na
Comparison - $\mu$	3.16	na	na	na
Comparison - $\sigma$	1.04	na	na	na

### ICT Background

The 2001 first year student showed laptop ownership trending up, home access to a computer pervasive and access to internet at home rapidly increasing when compared to previous studies. In Table 3 there is no gender bias in laptop, home access, internet access or number of computers at home.

Table 2: Computer background by year of study % (N=598)

	2001 1 <sup>st</sup> Year N=351	2000 1 <sup>st</sup> Year N=369 Stein 2001	1999 1 <sup>st</sup> Year N=389 Stein 2000	1998 1 <sup>st</sup> Year N=521 Stein 1999
Own Laptop	19	14	14	na
Computer at Home	96	96	95	83
Internet at Home	84	65	45	33

Table 3: Computer background by gender (N=351)

		2001 1 <sup>st</sup> Year N=351	2001 Male Cohort	2001 Female Cohort
Use Laptop		19	18	20
Computer at Home		96	94	95
Internet at Home		84	83	85
>1 computers at Home		42	37	40
Comp Hours at Home	0	7	11	8
	<2	37	30	44
	>2	56	59	47
Games Hours Play	0	56	49	67
	<2	33	36	28
	>2	11	15	5
Play Internet Games		13	16	7

There is a significant gender bias in games play as well as the female cohort being more likely to be moderate users of the computer at home (44% vs 30% <2hrs) but far less likely to be heavy users of the home computer (47% vs 59% >2hrs). This could also be tied up with the male bias in games play. The male cohort rules the use of Internet games and this trend is explored further in the Table 4.

### ICT Usage

Several trends are evident in Table 4. Males (32% vs 22%) are more likely to have shopped on the Web. Future surveys should try to distinguish between shopping and purchasing. There are significant differences in how males and females use the Web. Females are more likely to use the Web for research over males whilst the reverse is true for using the Web for entertainment. Communication is more likely to be the purpose of Web usage for females. Using the Web for entertainment is almost a male domain, the figures show that almost no females say they are heavy users of the Web (2% vs 17%) for entertainment. Both males and females use Web tools like email and web pages equally. Students were then asked to report use of common ICT applications with the hours of use as reported in Table 5. The “big 3” applications showed variable results with word processing being stable and spreadsheets and database trending down in usage. The “Internet” applications: Internet (90% vs 72%), Chat (58% vs 42%) and Email (91% vs 71%) showed dramatic increases in usage. Games showed a trend down in usage. The only gender bias in use of applications was for games (51% vs 33%) with males the heavier users.

Table 4: Web usage patterns by gender % (N=351)

		2001 1 <sup>st</sup> Year N=351	2001 Male Cohort	2001 Female Cohort
Have Email eg Hotmail		89	90	87
Have Own WEB Page		15	16	13
Used HTML Code		37	30	27
Shopped on WEB		26	32	22
Use WEB for Research	Low	57	64	49
	Mod	29	24	34
	High	14	12	17
Use WEB for Entertainment	Low	51	41	70
	Mod	28	41	28
	High	11	17	2
Use WEB for Comms eg. Email	Low	45	49	39
	Mod	39	39	35
	High	16	12	26

Table 5: Use of ICT (%) applications [combined <22+ hours] by year of study

	2001 1 <sup>st</sup> Year N=351	2000 1 <sup>st</sup> Year N=369 Stein 2001	1999 1 <sup>st</sup> Year N=389 Stein 2000	1998 1 <sup>st</sup> Year N=521 Stein 1999
Word Processing	89	83	90	84
Spreadsheet	49	46	64	60
Database	23	31	48	39
Internet	90	72	56	34
Chat	58	42	34	19
Music	79	na	na	na
Email	91	71	51	27
Programming	20	14	20	22
Slideshows	21	16	18	14
Games	44	44	50	47

Table 6: Use of ICT (%) applications [combined <2&2+ hours] by gender

	2001 1 <sup>st</sup> Year N=351	2001 Male Cohort	2001 Female Cohort
Word Processing	89	84	89
Spreadsheet	49	48	49
Database	23	31	38
Internet	90	87	88
Chat	58	54	52
Music	79	73	67
Email	91	88	93
Programming	20	21	16
Slideshows	21	21	21
Laptop	17	17	17
Games	44	51	33

## DISCUSSION & CONCLUSION

### RQ1. What is the Self-Assessed ICT Literacy of University Students?

There is considerable evidence to suggest that the ICT practices and skills of University students are continuing to change. Home access continues to climb indicating that the majority of University students possess access to a computer away from University. The access rate to the Internet by first year students (84% home Internet & 89% “Hotmail” email) compares with the 77% rate for 18-24 year olds in the wider Australian community (ABS 8147, 2000). The continuing rapid growth of the Internet applications and Web technology is evident in the home access to the Internet. This figure has increased 52% over the 1998-2001 period from 33% to 84% for the cohort. The growth in home Internet usage outstrips the 56% of homes that have Internet access in the wider Australian population (ABS 4901, 2001). The transition or “freshman” University student is an ICT “Have”. Advanced access, connection to the internet, coverage of a wide variety of ICT packages all are a hallmark of the 2001 transition student.

### RQ2. How do University Students Use the Web?

The rapid growth in the University student’s use of Internet applications is fortuitous given that many University schools and faculties are exploring Web delivery for subject material. An interesting feature is the far greater number of first year students reporting use of HTML and web pages over previous surveys. First year students also are greater users of all Internet applications, email, chat, and games. This may seem to indicate an emerging surge of students coming into Universities with advanced Internet skills, an ICT “Have” generation. This surge of Web savvy students will pose many questions for University schools, not only the obvious one about course content. Will Universities change delivery platforms to make them Web enabled? Will the ICT “Hayes” lead the move of Universities to become Web enabled? Will University course designers harness the computer literacy of the incoming students? Much of the published research concerning “E-Learning” comes from technical and educational analysis. The results from this survey show that the target of “E-Learning” are very well positioned to explore the online classroom.

### RQ3. Does Gender Effect ICT Literacy, ICT Usage & Web Usage?

As in previous surveys (Stein & Craig, 2000) gender differences are marked in several areas. Males prefer to use the Web for entertainment whereas females prefer research and then communication. This “Toystore vs Toolbox” comparison was coined by Margolis (Margolis,



Fisher & Miller, 2000) and reinforces the findings that show that there is no difference in level or degree of use and no difference in computer knowledge or confidence between the genders. The difference lies in the type of use, entertainment versus communication and research. This trend is also evident in the wider Australian community where 84% of teenage boys use computer games as opposed to 53% of teenage girls (ABS 4901, 2001). For University courses and the delivery of course content this is important as the male students may need additional work on developing Web communications, specially if course content has heavy components of email or group decision making via chat and email. This difference in how the genders use the Web is not to be downplayed. Online learning environments rely heavily on communications and any students that are loath to check their email or loathe to engage in online chat will be at a disadvantage.

#### RQ4. Are Transition or Freshman Students Prepared for "E-Learning"?

A fundamental question that must be asked concerns the ability of Universities to lead change in adopting "E-Learning" environments. At Victoria University course web pages range from the simple "brochure" type course site where students only download course material to the "fully interactive" decision support type site where students engage each other in course outcomes. This research proposes that the students who are the recipients of "E-Learning" are ready willing and able to thrive in on-line environments. They have access to the internet, advanced web practices in email and chat, knowledge and confidence in using the technology and a widespread coverage of other ICT practices. It is to be hoped that as "E-learning" advances it will take into account the sophisticated ICT literacy on the student cohort.

#### Further Studies

With any study that is based in one faculty of one University the question of generalisability is raised. This study is a longitudinal analysis of the students at Victoria University. It is proposed that further studies allowing for a broader view of University students should be carried out to see if the trends raised and discussed in paper can be extrapolated to other cohorts.

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