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Information Science student IT experience and attitude toward computers: results of a five-year longitudinal study

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Introduction

A decade ago, in 1991, a sample survey of Information Science (IS) students revealed that 22% of the intake had no keyboarding experience at all and that experience with databases and spreadsheets was low. (Stephens & Rowland 1993).

A decade later there appears to be a particular expectation among both Information Science and Computing Science staff regarding the level of IT experience of each new undergraduate intake. It is assumed by many that each year will see an increase in the student level of experience and confidence with computers and knowledge of software packages for word-processing, spreadsheets and databases. Indeed, at Loughborough University Department of Information Science the introductory module 'Applications of IT' was ended recently. It was felt that students were entering with existing IT skills gained at school, and had more than enough support available via the web, in the form of help and self-directed practical materials. Yet in a more recent study (McMahon *et al*, 1999) students, once at university, expressed disappointment that staff felt they had sufficient information to make a good attempt at '*teaching themselves*'. Indeed, it was found that only half of the sampled undergraduate students entering university from 1994-1997 had previously received computer training at school. In fact home use played a significant part in providing their IT experience. The survey concluded that university staff felt sufficient initial IT training was available whereas students did not agree. This raises the issue of computer access in households without computers, especially given the government's expressed policy of widening access to higher education from all sections of society. The implications for mature students who obviously are less likely to have received IT training in school also need to be addressed.

Although IT skills are often given as one of the key outcomes of university education it is apparent that

higher education must take into account what students initially bring to university. In addition issues need to be raised regarding IT support whenever academic staff modify existing programmes or design new ones that do not include an introductory IT element.

This paper describes the results of a five-year longitudinal study of the actual trends in prior experience of new IS undergraduates in IT, and discusses the implications for the use of computer-based learning and assessment. The results give an invaluable insight into real trends in this key area, which may prove useful for future module planning.

Literature

Academic staff and central support services have often surveyed first year undergraduates regarding their perceived level of IT experience. This is usually to ascertain whether there are implications for student support, the teaching of IT specific modules or modules with a high level of IT in them. Staff often use student perceptions of their own knowledge and ability to 'stream' them into appropriate classes. A review of the relevant literature reveals that several issues have been raised over the years regarding students and IT. These include prior experience, gender, attitudes toward computers, computer anxiety and student confidence. Indeed, these issues are not limited to the UK. In a cross cultural study of 3,000 students in 23 countries anxiety was identified as an inhibitor to students' use of computers (Weil & Rosen, 1995). Good experiences with IT can have a lasting effect on students over time. Moon (1994) concluded that word-processing experience contributed to higher confidence levels and more positive attitudes to computers and these were culture-free constructs. Other research has indicated that home experience with IT was associated with a greater liking for computers among females, greater confidence among males and less anxiety for both sexes (Colley *et al*, 1994).

In particular gender had been identified as a very important consideration, as males and females have different views and approaches to computers (Koohang, 1989). This aspect may have an increasing importance as higher education moves toward an increasingly on-line learning environment, in information science education for example (Main, 1998). Indeed, it has been suggested that females could be disadvantaged both in higher education and in employment. Todman (2000) has suggested that since only 16% of students on computer science degrees are female that this will act as an employability factor inhibiting female job prospects. This is despite the fact that, until GCSE level, females do at least as well as males in computer studies. Todman's study indicates that females were experiencing much greater computer anxiety than males, over a period from 1992 to 1998. In comparison to computer science, the usual intake to information science programmes has traditionally been more heavily weighted towards females. However in the past few years IS departments in the UK have introduced more computer and business related programmes and for example at Loughborough Department of Information Science the gender balance was exactly 50:50 in 2000/01. This changing profile of IS intake and a desire by the department to move away from self-contained IT modules to more self-directed IT teaching required data on this changing intake. Hence our interest in the perceptions of our new first year undergraduates regarding their IT experience and attitudes to computers. In addition our concern was whether the changing profile of degree programmes and changing gender balance had any implications for our own teaching practices and the information science discipline in general.

In order to identify the extent of student prior IT experience and their attitude toward computers in undergraduate information science students, a longitudinal study was conducted at Loughborough University. It was based on research by Temple & Lips (1989). Their results had indicated key differences regarding student attitudes toward science, computers and self-confidence between school leavers and mature students for example.

Methodology and sample size

Questionnaires were distributed at the start of each academic year to all new undergraduate students in the Department of Information Science at Loughborough University on induction day. The survey

was carried out over five successive years from 1995 to 1999. The questionnaire was in two parts (see appendix). Part A was designed by the first author and asked students to rate their experience, ability, knowledge and confidence on a variety of IT topics, and to state where any experience had been gained. Part B comprised 51 attitude items devised in Canada (Temple & Lips, 1989). Information was also recorded on the programme of study, gender and age of respondents. The sample comprised a total of 298 first year undergraduates on a variety of information science programmes, with an average of 60 respondents each year out of an average of 65 annual intake. Over the five years, 59% of respondents were female, 41% male, 62% were school leavers and 38% mature students. There was a higher proportion of mature students in 1995 (50%), and less in 1998 and 1999 (29%). The trend in the gender balance was toward more males in recent years All analysis was carried out using SPSS for Windows, version 10.0.

Analysis of attitude survey responses

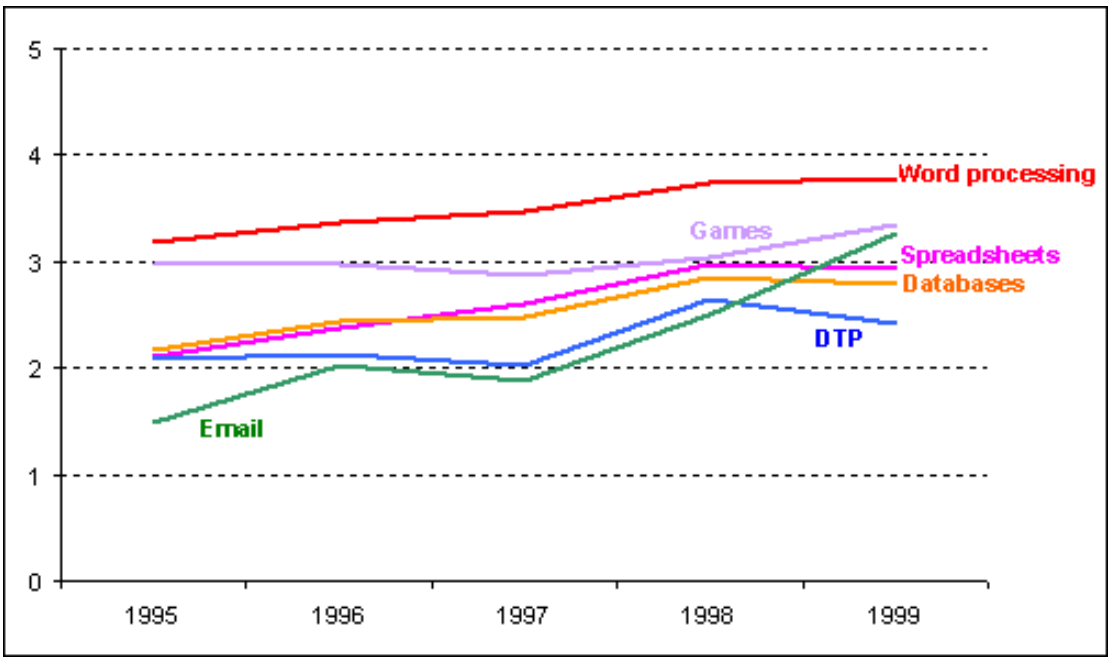
Part A - experience and ability

Experience

Respondents were asked to rate their level of experience on a scale from one (none) to five (excellent). Fig 1 shows the changes in average levels of experience of the general and office items included in the questionnaire. The greatest levels of experience reported throughout the five years were in word processing, followed by games. Experience ratings for spreadsheets and databases were very similar, with desktop publishing below these. The greatest increase was in E-mail, which had the lowest level of experience in 1995, but had risen to third highest by 1999. Differences over time were statistically significant for all items except games, although there is evidence of increasing experience in this area.

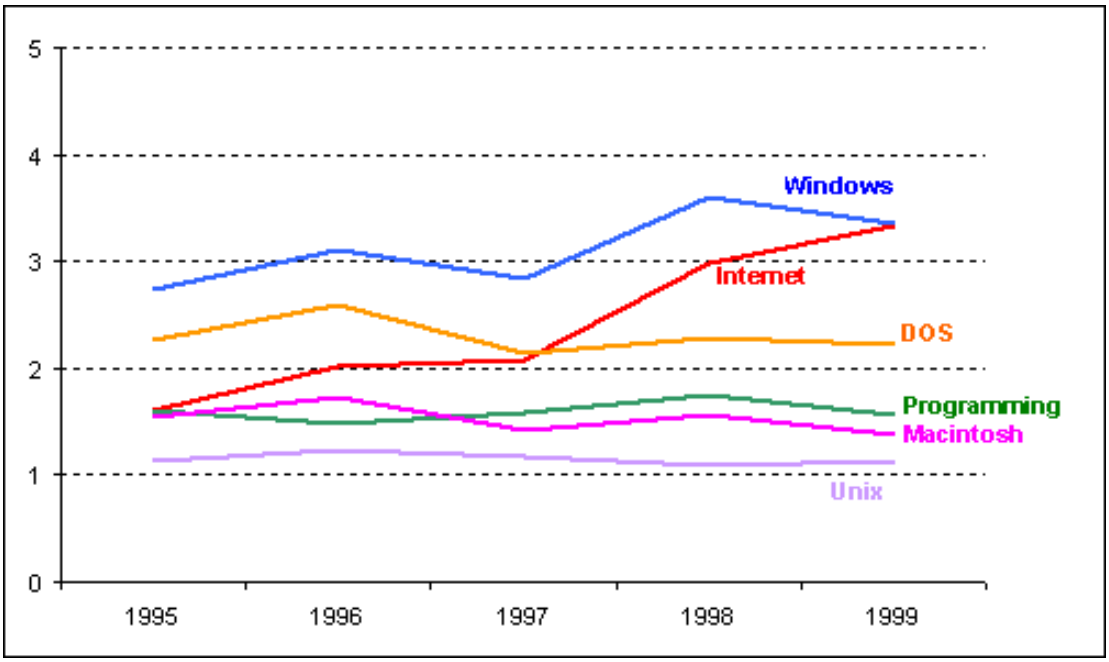
This was also the picture for Internet experience, but experience of specialised areas such as programming, and operating systems did not change significantly over the five years of the survey (Fig 2). Experience with Windows was the most highly rated in every year, but by 1999 it was matched by Internet experience. The lowest levels of experience in these areas were with Unix; programming and Macintosh experience also rated relatively low throughout the period (Fig 2).

Fig 1 Experience of general/office software



The experience scale ranges from 1=none to 5=excellent

Fig 2 Experience in other areas



The experience scale ranges from 1=none to 5=excellent

It may be of interest that the average level of experience of areas which might be expected to be covered by schools under the national curriculum - word processing, spreadsheets and databases - changed relatively little between 1998 and 1999. The majority of experience was gained at school, except for games, Windows and DOS (experience gained at home). Table 1 shows the proportion of students reporting their levels of experience as ‘good’ or ‘excellent’ in some of the key IT skills. The only area in which all students reported having at least ‘fair’ experience by 1999 was word processing.

Table 1 Proportion of respondents reporting experience ‘good’ or ‘excellent’

	1995	1999
Word processing	42%	72%
Spreadsheets	9%	33%
Databases	12%	30%
E-mail	4%	52%
Internet	9%	56%

When considered by gender, combining all years’ data, males reported significantly greater levels of experience than females in all areas except the Macintosh operating system, where there was no difference. By age, school leavers reported significantly greater levels of experience than mature students in word processing, databases, spreadsheets, desktop publishing, games and Windows. In contrast, mature students reported significantly greater levels of experience in Unix. There were no differences in the other items.

Because of the complex nature of the sample, and the perceived differences in reported experience by the various subgroups of students, a series of analyses of variance were carried out to examine the composite effects of year, gender and age. In many instances, the differences observed between years could be explained by differences in the patterns of age and gender within the sample. The pattern of significant effects is summarised in Table 2, where 'yes' indicates that a statistically significant difference in average ratings was found between the different sub-groups in the sample. Gender is clearly the most important factor determining computer experience prior to university.

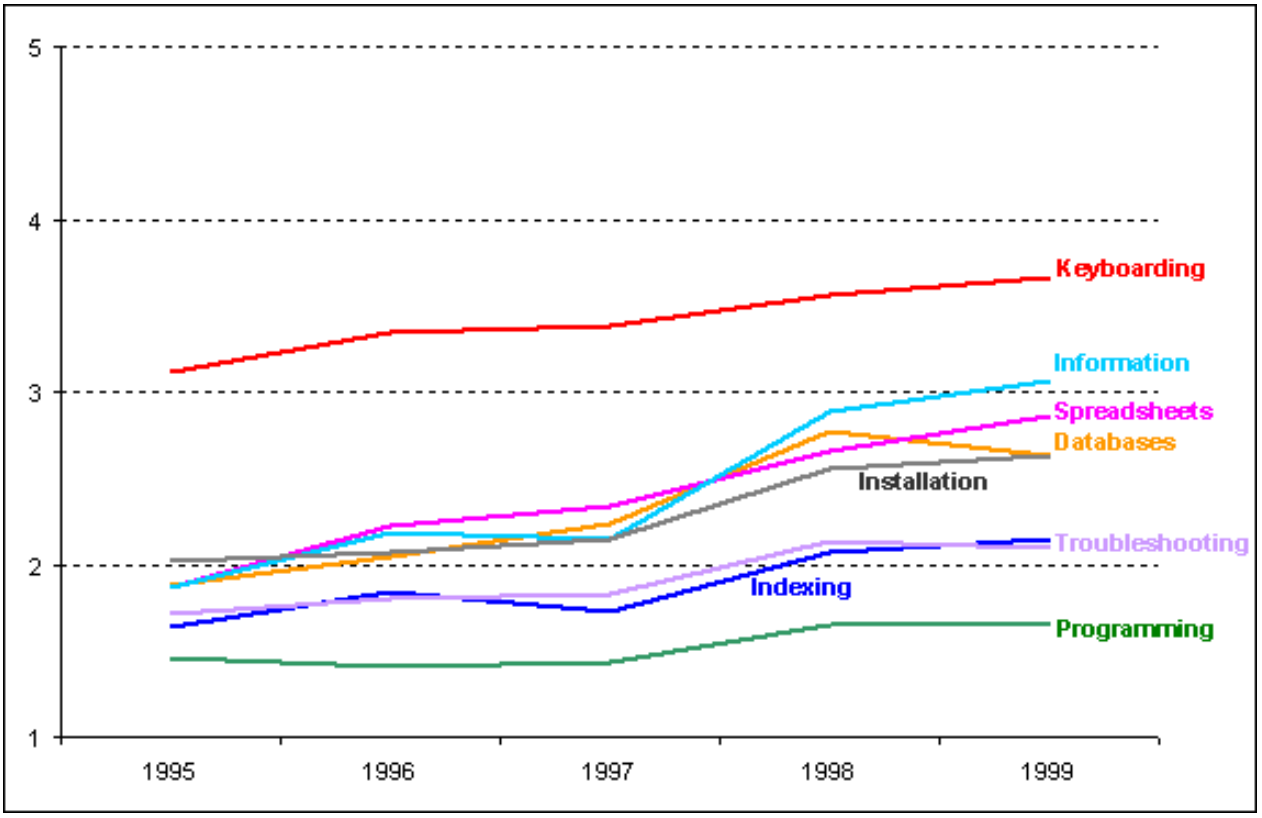
Table 2 Significant differences in average experience

	year	gender	age	interactions
Word processing		yes	yes	
Databases		yes		
Spreadsheets	yes	yes	yes	
Desktop publishing		yes	yes	
E-mail	yes	yes		
Games		yes	yes	
Internet	yes	yes		
Programming		yes		
DOS		yes		
Windows		yes		Year/gender
Macintosh				Gender/age
Unix		yes	yes	

Ability

The same rating scale was used for a set of eight skills items. There was evidence of increasing ability each year in all skills except programming, which had the lowest average ability ratings of the skills listed (Fig 3). The greatest increase was in information skills, covering online searching and downloading information from electronic resources. Keyboarding ability was the most highly rated throughout the period. There was little difference in the rating levels for ability with databases, information skills, installation and spreadsheets, all of which improved significantly over the five years. Indexing and troubleshooting skills were consistently below these, with the lowest rating of all for programming skills.

Fig 3 Average ability ratings



There were significant differences in average ability by gender in all skills except keyboarding. Males rated their ability more highly than females. On average, females were generally two to three times as likely to record no ability in these skills as males (Table 3).

Table 3 Proportion of respondents reporting no ability

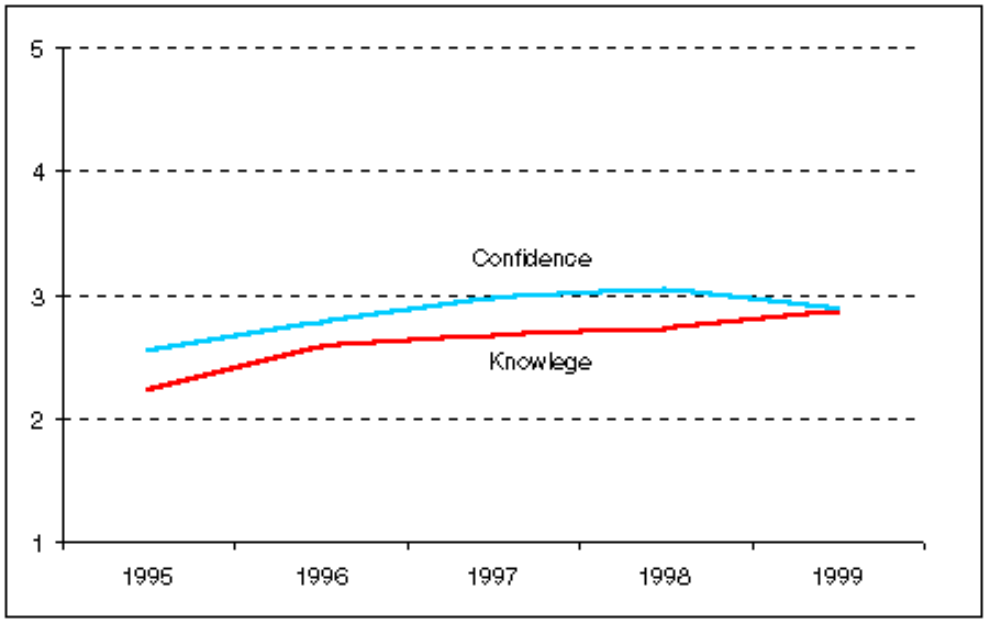
	Females	Males	Total
Keyboarding	5%	2%	3%
Spreadsheets	37%	13%	27%
Databases	39%	13%	28%
Information skills	47%	16%	34%
Installation	60%	20%	44%
Indexing	60%	28%	48%
Troubleshooting	68%	30%	53%
Programming	80%	54%	70%

Figures are the average of all years

There were also significant differences in average ability rating by age group in keyboarding and indexing skills. School leavers rated their ability in these areas more highly than did mature students.

As with the analysis of experience ratings, analysis of variance indicated that gender was the most influential factor determining levels of ability (Table 4).

Table 4 Significant differences in average ability



Part B – attitudes to computers

Data reduction

In order to make optimum use of the available data, responses from all five surveys were combined, and factor analysis used to derive a small set of components which it was hoped would describe the main features of the data. Scores on each of the factors derived were calculated for each respondent, and differences between intake years, gender and age examined. A number of exploratory analyses were carried out initially, with the aim of deriving factors which were meaningful in terms of the attitudes they described, and which accounted for an acceptable proportion of the variance of the original data. The analyses were carried out using SPSS for Windows, version 10.0.

An initial factor analysis (principal components extraction with varimax rotation) reduced the original 51 attitude statements to 16 factors with eigenvalues (i.e. factor variances) greater than one. Examination of the rotated factor pattern matrix showed that a number of items failed to load at a level of 0.45 on any factor (a level which indicates 20% overlap of variance between the item and the factor). Two of the factors comprised a single item, two more were based on one low-loading item plus one other, and five factors comprised only two items. It was clearly necessary to reduce the data further for detailed analysis.

A scree plot of eigenvalues indicated there were at least five, and potentially up to eight significant factors. A second analysis was carried out, omitting those 13 items with low loadings, or which loaded on only one factor, and forcing a series of solutions extracting between five and eight factors.

Examination of the rotated factor loadings matrices indicated that the best solution was that with eight factors. This accounted for 54% of the total variance, and is described in Table 5. The factor loadings in Table 5 indicate the relative importance of the item within the factor, and negative values relate to disagreement rather than agreement with the statement.

Table 5 Results of factor analysis

Factor 1	**Attitude to computers**	**loading**
33	I enjoy working with computers	.789
23	Computers are fun	.694
45	I have a lot of self-confidence when it comes to working with computers	.674
20	Computers do not interest me	-.625
36	Computers are boring	-.620
42	Computers don't scare me at all	.618
17	Working with computers is not my idea of fun	-.598
7	Computers are exciting	.573
1	I think that a home computer can be very interesting	.568
43	Computers make me feel uncomfortable, restless, irritable and impatient	-.559
26	If my family had a home computer, I would probably use it more than anyone else	.356
Factor 2	**Attitude to mathematics**	
25	I am proud of the work I can do in mathematics	.816
3	Mathematics is one of my best subjects	.814
19	No matter how hard I try, I cannot understand mathematics	-.810
46	I think I could handle more difficult mathematics	.792
5	When I hand in an essay I feel I'm going to do poorly	-.476
Factor 3	**Social aspects of computers**	
15	The world would be better off if computers were never invented	.711
2	People managed before without computers, so computers are not really necessary now	.581
41	Computers are valuable and necessary	-.544
44	People who enjoy work with computers are a bit peculiar	.487
6	People who like computers are often not very sociable	.472
30	I am concerned that people might make computers too powerful in the future	.339

Factor 4	**Gender issues**	
27	Females have as much ability as males when learning to use a computer	.678
29	Learning science is just as important for girls as for boys	.614
37	Females are just as good as males in science	.597
4	I would like to learn how to use a computer	.538
Factor 5	**Attitude to writing**	
38	I do enjoy writing stories or essays	.789
22	I feel confident in my ability to express my ideas clearly in writing	.688
28	I sometimes write stories at home even if they are not assigned for university	.663
11	I look forward to writing down my ideas	.567
Factor 6	**Attitude to science**	
32	I never find myself thinking about science	.740
8	I want to learn all I can about science	-.673
16	I hope I never have a job where I have to use science	.614
Factor 7	**Class confidence**	
47	I will admit confusion about a point under discussion in class and ask for clarification	.814
48	I would not hesitate to ask the demonstrator in a computer lab for help	.785
50	If another student is doing something that bothers me, I ask them to stop	.407
Factor 8	**Perceptions**	
9	I would expect a good athlete to like computers	.643
14	If you like science you will like computers	.561

Negative loadings indicate disagreement with the statement.

Comparison with previous results

Temple & Lips (1989) used the same questionnaire in a study in Canada in 1988. They followed similar analysis procedures, and it is of interest to compare the two sets of results.

Temple & Lips also extracted eight factors from their data, after deleting some items as being unreliable. Six of the factors obtained in both analyses were essentially the same – covering attitudes

towards mathematics, science and writing, gender and social issues and self-confidence. These are factors 2-7 in Table 5.

Factor 1 in Table 5 covers attitudes to computers. The Temple & Lips analysis found two separate factors here, one covering interest and enjoyment and the other dealing with computer confidence. These two aspects could not be separated in our analysis, even when many more factors were allowed.

One difference which cannot be readily accounted for relates to the contribution of question 5 *(When I hand in an essay I feel I'm going to do poorly). In our analysis, this loaded most strongly with factor 2, mostly relating to attitudes to mathematics, although it cannot be described as a 'good' descriptor for this factor, having only 23% common variance. In the Temple & Lips study, this item loaded on the factor related to writing, where you might expect it to appear. In our study, question 5 can be associated with factor 5, attitude to writing, but less strongly, having only 16% common variance between item 5 and factor 5.*

The items contained in factor 8 in the current analysis had been omitted from the Temple & Lips analysis as being unreliable. We found no evidence of unreliability, and so had no statistical reason to exclude them; however, they are clearly items which have little relevance to other areas and attitudes, and factor 8 will not be analysed further.

Identical results would not be expected - the two studies are separated by several years in time and a different student profile. It is encouraging that so many similarities have been found, giving confidence that the items comprising the questionnaire and the factors derived from them give a good and reliable picture of students' attitudes towards information technology.

Analysis of factor scores

Scores for the first seven of the eight factors were calculated for each respondent, and analysed by age, year of study and gender. Potential interactions between these areas were also considered, using analysis of variance.

Attitude to computers:

Males were found to have a significantly more positive attitude to computers than females. There were no differences between the intake years, nor between the two age groups, and no interactions between them. This is in line with the findings of previous studies such as Koohang (1989) and Colley (1994).

Attitude to mathematics:

No significant differences were found between any of the groups analysed in their attitude to mathematics, and no interactions between them.

Social aspects of computers:

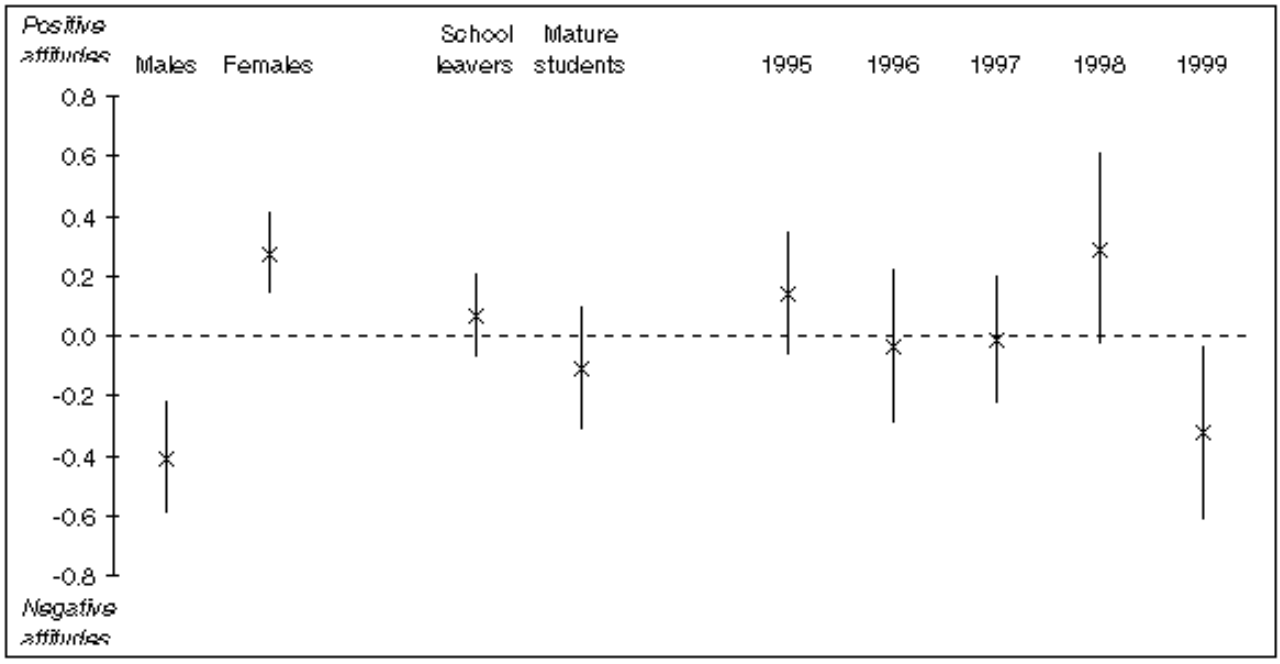
Again, no significant differences were found between any of the groups in their attitudes concerning the social aspects of computers.

Gender issues:

There were several significant differences in attitudes to gender issues. The analysis of variance showed that males had a significantly more negative attitude than females; school leavers had a significantly more positive attitude than mature students. There were also significant differences

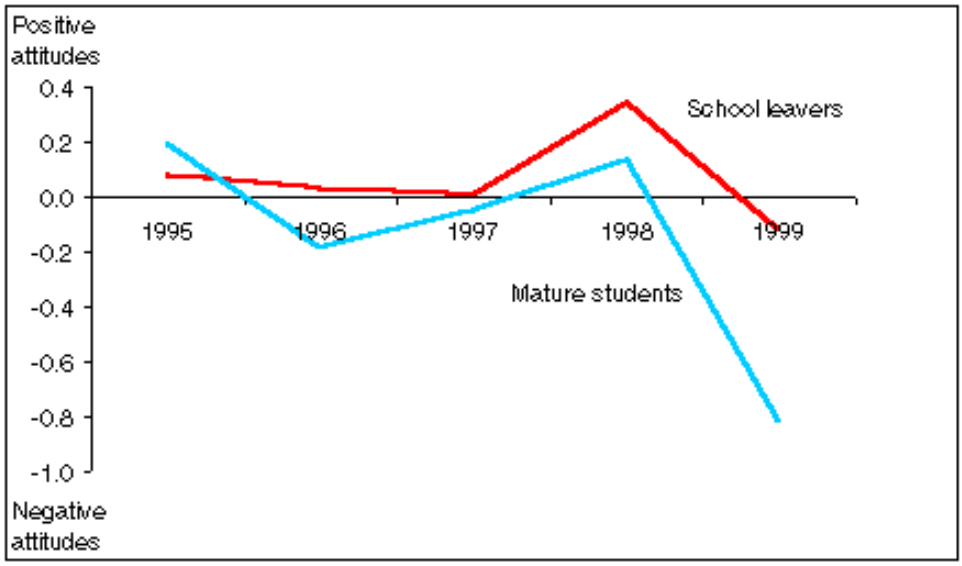
between years of study, but no consistent pattern emerged. Fig 5 shows the average factor score on this measure for each group, together with 95% confidence limits for those averages. The results for 1998 appear to be somewhat out of line with the general trend for intake years.

Fig 5 Attitudes to gender issues



There was some evidence of interaction between age and year of study, with mature students having a more positive attitude than school leavers in 1995, but more negative attitudes in other years. In 1999, mature students had particularly negative attitudes to gender issues (Fig 6)

Fig 6 Attitudes to gender issues – age group by intake year

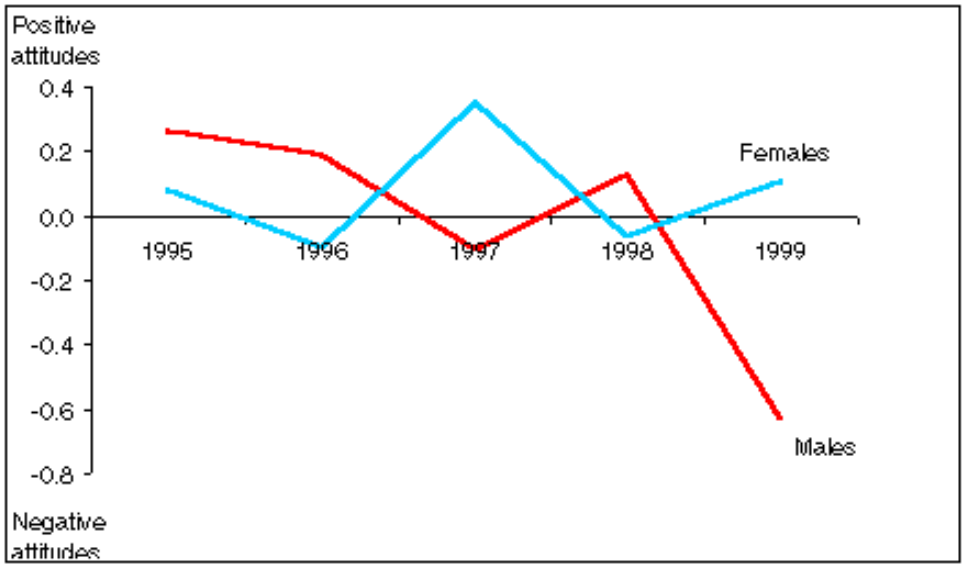


Attitude to writing:

There was an interaction between gender and year of study in attitudes to writing, although neither variable was significant by itself. In 1995 and1996 males had a positive attitude with females neutral, whereas in 1997 males had a neutral attitude with females positive. In 1998, both genders expressed

neutral attitudes, but in 1999, males had a strongly negative attitude, with females remaining neutral (Fig 7). The reasons for such differences are not entirely clear, but whether the pattern in males' attitudes to writing may be indicative of a wider trend warrants further investigation.

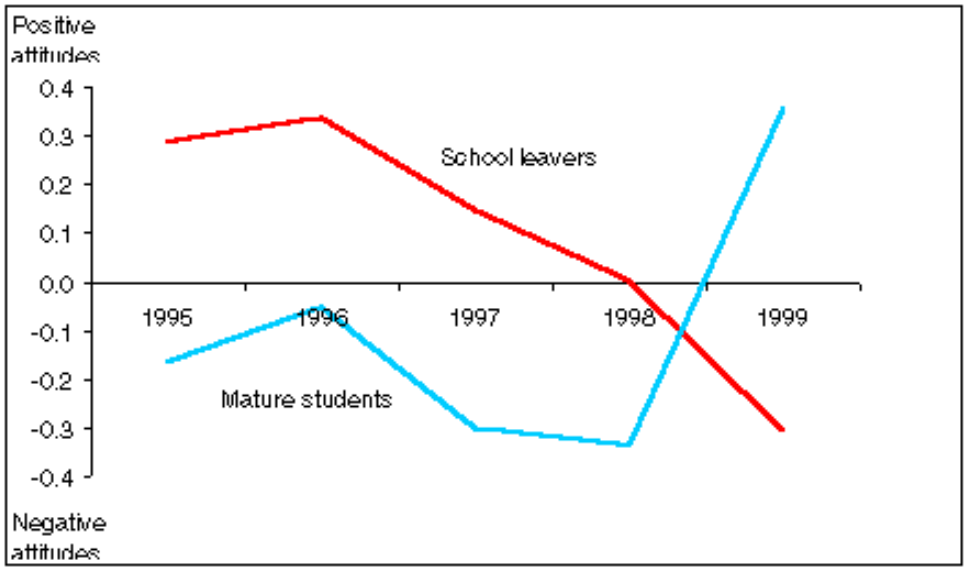
Fig 7 Attitudes to writing – gender by intake year



Attitude to science:

There was an interaction between year of study and age group in attitudes to science. The attitudes of school leavers became more negative over time, whereas there was no pattern for the more mature students, although they reported significantly more positive attitudes in 1999 than in any previous year (Fig 8).

Fig 8 Attitudes to science – age group by intake year



Class confidence:

Mature students were significantly more confident in class than school leavers, as might be expected. No other significant differences or interactions were found.

Relationship with ability and experience:

In part A of the questionnaire, respondents had been asked about their levels of experience and confidence in using computers and a number of significant differences had been found, particularly between males and females. It is therefore of interest to examine whether the differences described above, particularly those by gender, can be accounted for by the differences reported in experience and ability.

An average experience rating and average ability rating was calculated for each student, based on the main items in questions 5 and 6 of Part A. The analyses of variance were then repeated, allowing these averages as co-variates in each case.

As might be expected, attitude to computers was highly correlated with both average experience and average ability. Respondents with greater experience and ability (which were also highly correlated with each other) tended to have more positive attitudes towards computers than those with less. Analysis including these measures as co-variates showed that the primary influence on attitudes to computers was previous experience, with ability and gender no longer significant. Average ability was not a significant measure, and there were no interactions.

Computer ability was found to be associated with attitudes to mathematics, but neither experience nor ability influenced attitudes to gender issues, or any of the other factors analysed.

Conclusions

Student experience of general office software is increasing and a significant increase in Internet experience is apparent. However prior experience with programming is not increasing in IS students. Incoming IS undergraduates also see themselves as having less ability with programming that with most other computing skills. Males rate their ability more highly than females and mature students were less likely to rate themselves highly than school leavers. Attitudes were very similar to those found by Temple and Lips (1989) in Canada, indicating that these are not culturally dependant concerns.

Indeed Orr (2001) points out that computer competency is no longer a skill to be learned only by students majoring in technology related fields. All individuals must acquire basic computer literacy to function successfully.

Consequently, university staff must make more effort to redress the hidden level of computer anxiety, especially among females. There is a need for increased appreciation that students may have computer anxiety, and that this will be exacerbated unless dealt with early on in the year. This will benefit students both academically and into their employment. Assumptions about computer based learning environments must take into account student concerns.

A worrying trend – and with wider implications than the IS field - is the increasingly negative attitude toward science by school-leavers.

Future Implications

It is suggested by the authors that the increasing use of virtual learning environments (VLEs) and web-based materials makes the identification of barriers to use, such as IT experience and attitude toward computers, very important. Our technological capacity to deliver learning materials and assessments combined with our perceptions of students may be outstripping their ability to cope and benefit from deep learning strategies. The complexity of higher education with its emphasis on more frequent assessment highlights a dilemma for educators. It is possible to assess students electronically using computer-assisted assessment (Brown et al 1999), in the same way as it is possible to deliver the

learning materials. Our view of student learning is increasingly obscured by their inter-action with computers. There may come a time when the technological wonders become just another barrier to higher education, especially for those expected to come with assumed pre-requites of IT confidence to take advantage of what we deliver.

Recommendations:

1. Routine or regular testing of in-coming students to assess their real computer needs and not rely on possibly false perceptions that all students will have the required level of IT ability.
2. The introduction of specific measures to address possible computer anxiety early in the first year.
3. Increased emphasis on ensuring that the right level of support is available as introductory IT modules become extinct.
4. Attention to the differences exhibited by males and females, especially where the demographics of a department or degree programme are changing substantially.
5. Further research into student views on the use of computers to access learning materials and on being assessed using computer assisted assessment.

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Appendix: copy of the questionnaire

Department of Information Science

COMPUTER EXPERIENCE AND ATTITUDE SURVEY 1999 PART A

The information is required for research and your name will not be used therefore please answer as fully and truthfully as possible.

1 NAME.....
2 Circle LIM or IMC or PwE or IMBS
3 Circle Female or Male
4 Enter your Age in years_____

5 HOW MUCH EXPERIENCE DO YOU HAVE OF THE FOLLOWING?						WHERE DID YOU GAIN MOST OF YOUR EXPERIENCE ? Circle one item per line		
Circle one number per item						School/college	Work	Home
GENERAL & OFFICE	None	Fair	Avg	Good	Excellent			
1. Wordprocessing	1	2	3	4	5	S/C	W	H
2. Databases	1	2	3	4	5	S/C	W	H
3. Spreadsheets	1	2	3	4	5	S/C	W	H
4. Desktop publishing	1	2	3	4	5	S/C	W	H
5. Electronic mail	1	2	3	4	5	S/C	W	H
6. Computer games	1	2	3	4	5	S/C	W	H
INFORMATION								
7. INTERNET	1	2	3	4	5	S/C	W	H
SPECIALISED								
8. Programming	1	2	3	4	5	S/C	W	H
9. OTHER	1	2	3	4	5	S/C	W	H
Please specify_____								
OPERATING SYSTEMS								
10. IBM/Clone DOS	1	2	3	4	5	S/C	W	H
11. IBM/Clone WINDOWS	1	2	3	4	5	S/C	W	H
12. Macintosh	1	2	3	4	5	S/C	W	H
13. UNIX	1	2	3	4	5	S/C	W	H
14. OTHER	1	2	3	4	5	S/C	W	H
Please specify_____								

6	**Therefore how do you rate your ability in....**	None	Fair	Average	Good	Excellent
1.	Keyboarding and wordprocessing	1	2	3	4	5
2.	Setting up databases and managing the data	1	2	3	4	5
3.	Setting up spreadsheets and manipulating the data	1	2	3	4	5
4.	Online searching and downloading information from CDs and/or the Internet	1	2	3	4	5
5.	Indexing and classifying information using computers	1	2	3	4	
6.	Programming to supplement software use	1	2	3	4	5
7.	Installing software	1	2	3	4	5
8.	Troubleshooting hardware/software problems	1	2	3	4	5

7	**Rate your knowledge and confidence before your first year of information technology at university**					
	Knowledge	1	2	3	4	5
	Confidence	1	2	3	4	5

PART B COMPUTER ATTITUDES

		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1.	I think that a home computer can be very interesting.	1	2	3	4	5
2.	People managed before without computers, so computers are not really necessary now.	1	2	3	4	5
3.	Mathematics is one of my best subjects.	1	2	3	4	5
4.	I would like to learn how to use a computer.	1	2	3	4	5
5.	When I hand in an essay, I feel I'm going to do poorly.	1	2	3	4	5
6.	People who like computers are often not very sociable.	1	2	3	4	5
7.	Computers are exciting.	1	2	3	4	5
8.	I want to learn all I can about science.	1	2	3	4	5
9.	I would expect a good athlete to like computers.	1	2	3	4	5
10.	Computers will never interest me.	1	2	3	4	5
11.	I look forward to writing down my ideas.	1	2	3	4	5
12.	I would be embarrassed to tell my friends that I would like to join a computer club.	1	2	3	4	5
13.	If I don't see how to do a mathematics problem right away, I never get it.	1	2	3	4	5
14.	If you like science you will like computers.	1	2	3	4	5
15.	The world would be better off if computers were never invented.	1	2	3	4	5
16.	I hope I never have a job where I have to use science.	1	2	3	4	5
17.	Working with computers is not my idea of fun.	1	2	3	4	5
18.	Typing would be the biggest problem I would have in learning to use a home computer.	1	2	3	4	5
19.	No matter how hard I try, I cannot understand mathematics.	1	2	3	4	5
20.	Computers do not interest me.	1	2	3	4	5
21.	You have to be smart to like computers.	1	2	3	4	5
22.	I feel confident in my ability to express my ideas clearly in writing.	1	2	3	4	5

23.	Computers are fun.	1	2	3	4	5
24.	Computers are easy to use.	1	2	3	4	5
25.	I am proud of the work I can do in mathematics.	1	2	3	4	5
26.	If my family had a home computer, I would probably use it more than anyone else.	1	2	3	4	5
27.	Females have as much ability as males when learning to use a computer.	1	2	3	4	5
28.	I sometimes write stories at home even if they are not assigned for university.	1	2	3	4	5
29.	Learning science is just as important for girls as for boys.	1	2	3	4	5
30.	I am concerned that people might make computers too powerful in the future.	1	2	3	4	5
31.	I would rather spend an evening doing something new with a computer than go out with friends.	1	2	3	4	5
32.	I never find myself thinking about science.	1	2	3	4	5
33.	I enjoy working with computers.	1	2	3	4	5
34.	Using a computer in maths class would make more fun.	1	2	3	4	5
35.	It would be hard for me to learn how to program a computer	1	2	3	4	5
36.	Computers are boring.	1	2	3	4	5
37.	Females are just as good as males in science.	1	2	3	4	5
38.	I do enjoy writing stories or essays.	1	2	3	4	5
39.	If I had the money, I'd buy a home computer.	1	2	3	4	5
40.	Given a little time and training anyone could learn to use computers.	1	2	3	4	5
41.	Computers are valuable and necessary.	1	2	3	4	5
42.	Computers don't scare me at all.	1	2	3	4	5
43.	Computers make me feel uncomfortable, restless, irritable and impatient.	1	2	3	4	5
44.	People who enjoy work with computers are a bit peculiar	1	2	3	4	5
45.	I have a lot of self-confidence when it comes to working with computers.	1	2	3	4	5
46.	I think I could handle more difficult mathematics.	1	2	3	4	5
47.	I will admit confusion about a point under discussion in class and ask for clarification.	1	2	3	4	5

48.	I would not hesitate to ask the demonstrator in a computer lab. for help.	1	2	3	4	5
49.	If I have a problem in school I usually try to work it out alone or ask a friend before I ask the instructor.	1	2	3	4	5
50.	If another student is doing something that bothers me, I ask them to stop.	1	2	3	4	5
51.	If others are waiting in line for me to finish using a photocopier or computer terminal, I will always hurry to finish, or return later to complete the job.	1	2	3	4	5

Thank you for your help

	year	gender	age	interactions
Keyboarding				Year/gender
Databases	yes	yes		
Spreadsheets	yes	yes		
Information	yes	yes		
Indexing		yes		
Programming		yes		
Installation		yes		
Troubleshooting		yes		

	Females	Males	Total
Keyboarding	5%	2%	3%
Spreadsheets	37%	13%	27%
Databases	39%	13%	28%
Information skills	47%	16%	34%
Installation	60%	20%	44%
Indexing	60%	28%	48%
Troubleshooting	68%	30%	53%

Programming	80%	54%	70%

	year	gender	age	interactions
Word processing		yes	yes	
Databases		yes		
Spreadsheets	yes	yes	yes	
Desktop publishing		yes	yes	
E-mail	yes	yes		
Games		yes	yes	
Internet	yes	yes		
Programming		yes		
DOS		yes		
Windows		yes		Year/gender
Macintosh				Gender/age
Unix		yes	yes	

	year	gender	age	interactions
Word processing		yes	yes	
Databases		yes		
Spreadsheets	yes	yes	yes	
Desktop publishing		yes	yes	
E-mail	yes	yes		
Games		yes	yes	
Internet	yes	yes		
Programming		yes		
DOS		yes		

Windows		yes		Year/gender
Macintosh				Gender/age
Unix		yes	yes	