

Social Effects of New Technology in Education

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Abstract

The Social Effects of New Technology in Schools (SENTIS) project has been operating in Tasmania, Australia, since 1989. It probes student computer use at home and at school. The results from several thousand students have allowed us to consider questions about the effects of information and communication technologies upon friendship patterns.

The project found that teachers generally feared the one-on-one time that individual students spent using a computer. They were apprehensive of the dehumanizing effects that a relationship with a machine might have on a young and developing person. These fears were reinforced by popular media stories about Internet-related fraud or learning how to build a bomb.

However, in schools, the isolated teenage boy fixated on computers has become a member of a 'geek-gang' involving both genders. These clubs participate in the school culture alongside the 'surfies', 'princesses' and other popular culture groupings. Students see the computer at school as a poor relation to the one they got for Christmas. At home there are fewer fights over who is using the keyboard, since many older students are getting their own. Academic-type computer use at home exceeds that at school, and is not dominated by arcade games.

Keywords: Computer Usage, Children, Technology in Schools, Socialization, Relationships, Home Computers.

Introduction

The SENTIS (Social Effects of New Technology in Schools) Project was initiated in 1989. It sprang from teacher and parent concerns about the potential socially isolating effects of computers for young people. There was considerable media interest in the issue, giving rise to the Hobart Mercury newspaper (12th July 1990) publishing a story with the headline "Study finds teenager's best friend is a computer".

Some research in this affective domain has focussed upon gender issues (Durndell and Lightbody, 1993). Other statistical information is available on the general home access to computers and the Internet in Australian homes (Australian Bureau of Statistics, 1999). The

SENTIS project differs from these because of its longitudinal nature and its focus upon the correlation between school student friendship patterns and their computer use. The project also triangulates findings by relating survey results with sample interviews and some automatically collected information.

Methodology

The first rounds of the SENTIS project found that if school children were asked to give information about their friendship groupings, the results were virtually the same when they nominated three or five peers. Similarly, results were similar when the activity proposed was recreational play, schoolwork or any other. These validations were helpful in determining the format for the 1998 stage. Also, since previous student and teacher interviewees had speculated about the linkage between friendship patterns and the types of computer use, more detail was added to reveal the nature of both home and classroom use.

Following the precedent of the earlier stages of the SENTIS project, schools were invited in mid-1998 to participate in the tri-annual round. For those that agreed to be involved, the researcher briefed coordinators, and arrangements made for a mass survey (see Appendix) to be conducted in those schools towards the end of the academic year. This was in October/November, being in the Southern Hemisphere. The survey was conducted on a day following a normal school day (not just after a weekend or school holiday) so students could respond to questions about their computer activity. The survey was also conducted when students were having a class in the group they spent most time with. These conditions were designed to maximize the potential for group-integration to be measured in comparable conditions between institutions. Following the administration and collection of the survey, the researcher interviewed the coordinator and a random sample of teachers about their observations relating to computer use and student socialization. This structured interview used a short series of stimulus questions, and respondents were invited to amplify on areas of concern or researcher interest.

Previous SENTIS results

The SENTIS survey has been conducted tri-annually in a representative sample of Tasmanian High Schools since 1989. The survey represents a snapshot of each school's entire population, giving an insight into both home and school computer use. In addition to the capture of computer use information, students are asked to complete a small sociogram of friendship linkages. This was statistically analyzed to reveal group-integration in each class, thus providing a measure of friendship patterns in the classroom context.

The first results (Fluck, 1990) found that in schools where students were allowed unsupervised access to computers outside lesson times, the teaching staff reported more social unease than where this was forbidden. In subsequent years, the study came to the tentative conclusion that, provided computer use in schools was less than 20% of instructional time, there were no statistically significant effects upon friendship circles. It was also apparent that teachers were far more apprehensive than students about the social effects of computer use (Fluck, 1995a).

As the SENTIS study proceeded, technological developments changed the capabilities of school computers. The proliferation of networks joining computers together and increased Internet access gave rise to many uses that had potential social effects. Perhaps the more widely known examples included marriages celebrated after Internet courtships, student use of downloaded bomb-making instructions, and easy availability to culturally-sensitive material. The study therefore began to monitor the kinds of computer activities that students undertook, and the extent to which they conducted them at home.

Collated results to 1998

Table 1. Mean minutes of computer use, per student, per day

SENTIS	Data collecti on year	Number of students surveyed	Mean daily minutes of computer use in school	Mean daily minutes of computer use out of school	Mean daily minutes of computer use in school by girls	Mean daily minutes of computer use in school by boys	Mean daily minutes of computer use out of school by girls	Mean daily minutes of computer use out of school by boys
1	1989	1744	9.32	27.19	n/a	n/a	n/a	n/a
2	1992	5933	20.40	31.20	21.60	19.20	16.80	43.80
3	1995	3570	18.60	24.60	15.99	20.86	12.79	34.68
4	1998	1755	21.52	34.77	22.56	20.67	24.89	42.90

As Table 1 shows, over the life of the project so far, student computer use in schools has plateaued at around 20 minutes per day. This is about 6% of a regular school day. Some schools had average computer use for up to 20% of the school day. However, there are not yet enough schools in the data-set with such high mean student computer use to indicate any clear effect upon friendship groupings. It has become quite clear that home computer use outstrips classroom use by 30% to 60%, justifying student perceptions that schools are relative Information Technology (IT) deserts (Moursund & Bielefeldt, 1999, p 5). The Australian Bureau of statistics has also shown that households are about twice as likely to have a computer or and Internet connection if it include children (Australian Bureau of Statistics, 1999), making this technology much more widely available to school students than the general population. An interesting piece of future research would compare the quality of home and school equipment.

In respect of gender issues, girls appear to have slightly better computer access in the SENTIS project schools than boys. The SENTIS interview data indicated that these figures were probably related to the gender bias in keyboarding and similar subject areas. Respondents speculated that the generally greater amount of time girls used computers in schools was a product of their preferential choices for these curriculum areas. Teachers face interesting educational and equity issues, when considering the large amounts of time boys spend on computers out of school. Should they remediate the lesser time girls used home computers by positive discrimination in school, and to what degree? Or are the two contexts so different that the home use can be ignored, and in most of the schools, discrimination in favor of boys should be

applied to encourage them to use computers as much as the girls? Whether this equity area, or the largely untouched area of home-school computing relationships, receives greater attention will be an important issue for the coming decade.

Table 2: Enrolled students per computer

School Year	B	C	H	J	K	L	M	N	O	P	Q	R
1989	14	17	7									
1992	10	11	9	10	6	6	4	10	13	15	6	7
1995	8		5	8	9	6	5	9	8	11	6	8
1998	6		9							8		6

The reported equipment base largely substantiates the slowdown in computer use. Comparison of enrolled student populations with the equipment available to students, gave an indication of the student:computer ratios in each project school. These results are illustrated in Table 2. Some schools (such as B, C, O and P) have approximately doubled the availability of computers to students. Others have kept their ratios unchanged, or even worsened these indicators. Many schools elected not to invest in computers during the period before the 1998 election, since the Liberal government platform centered on the "Directions" policy that promised a centrally funded equipment expansion. The party failed to secure re-election (Bennett, 1998), but schools had already committed their available funds to other priorities.

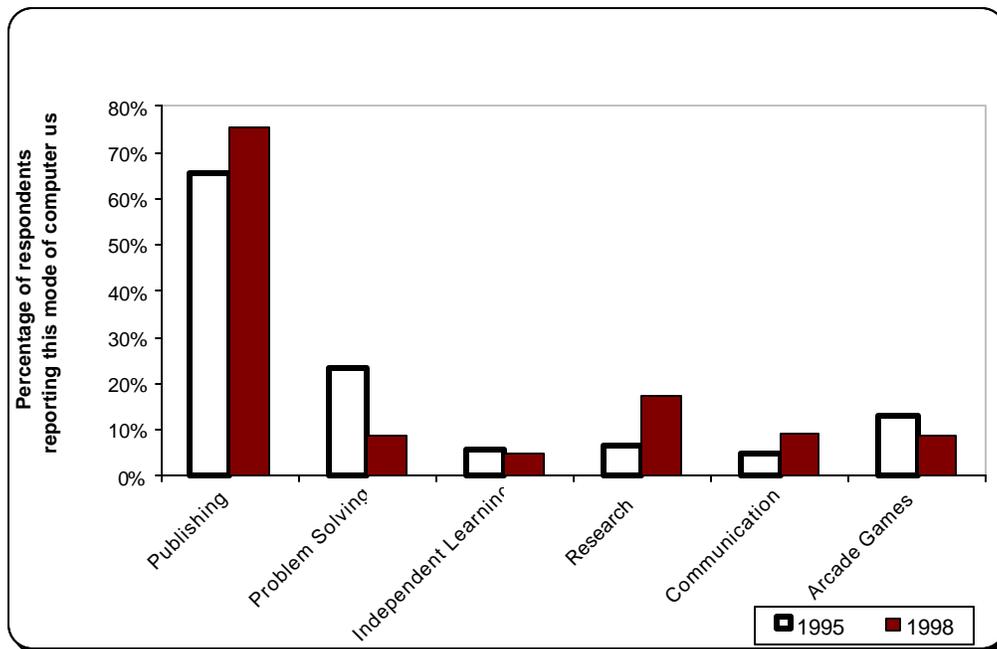


Figure 1: Modes of student computer use IN school

The kinds of activities that students are undertaking with computers in schools changed from 1995-1998 (Figure 1). Publishing (defined as word-processing, computer-aided drafting and design, desk-top publishing and computer graphics) was reported by a greater proportion of the students, and research (looking up information, encyclopedias), as well as personal communication also increased. It is probable that the latter changes have stemmed from relatively recent access to the World Wide Web in many schools. On the other hand, the more challenging area of problem solving using simulations, adventure games and control technology, declined.

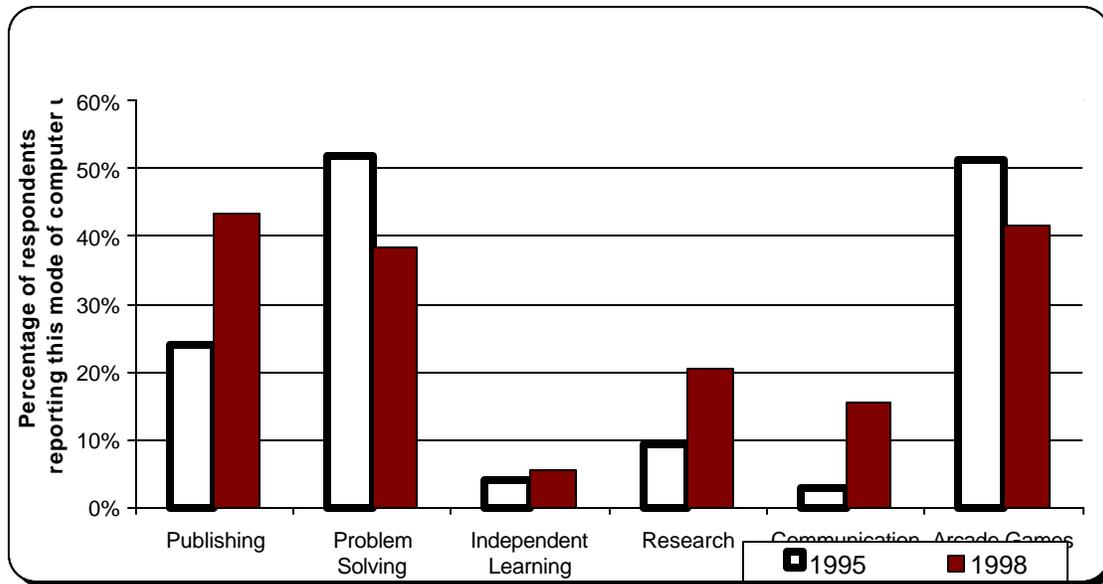


Figure 2: Modes of student computer use OUT of school

Over the same period, similar changes had been going on in student homes. A growth in publishing, a decline in problem solving, and the same effects of widening Internet access were reported. It can also be seen that the relative proportions of the different modes of computer use were dissimilar to those observed in school contexts. Arcade games, whilst declining in popularity, were reported as often as publishing activities at home. Problem solving activities (including adventure games, simulations, and control technologies) were nearly as popular. Overall, the range of computer use modes in homes was more balanced than in schools, where publishing continued to dominate the scene. This might be an effect of teacher professional development, which had continued to concentrate on this single skill, and largely failed to extol the educational benefits of a good mix of computer-use modes.

But what of friendships?

Although data available at the time of writing are incomplete (1995 Group-integration figures are not available), Figures 3, 4, and 5 illustrate the three kinds of changes recorded in SENTIS project schools. Group-integration measures the degree of reciprocal choosing between peers, and therefore can be seen as a component of social capital in terms of shared friendships. Group-

integration (GI) was measured using a sociogram technique asking students to nominate three peers with whom they would be happy to work. In previous studies (Fluck, 1995b), it was found that the measure was related strongly to group size, and a correction was applied to make it comparable between groups of different size.

Generally, computer use increased in project schools (six positive and only three negative changes) during the project. In the same interval, corrected group-integration also increased (four positive and three negative changes), leading one to suspect that computers help friendships. However, whilst the evidence is not clear enough to unequivocally substantiate such a finding, it would also fail to prove the contrary hypothesis.

Group-integration and mean student computer use were graphed for each SENTIS school over time. As computer use increased, three kinds of changes were observed on this chart:

- Type I - when group-integration remained unchanged as computer use increased
- Type II - when group-integration declined as computer use increased
- Type III - when group-integration increased with computer use.

The first kind of change (Type I) was seen in schools where increased computer use had no significant impact upon socialization. Figure 3 shows two schools with Type I changes that substantially increased the general level of computer use for students, but their friendship patterns were virtually unchanged. This is a result that most teachers would probably find reassuring, since it indicates that any apprehension about isolation and the de-humanizing effects of computers were largely unfounded. However, the mean level of 22 minutes of computer use per day reached by students in these schools represents only 7% of the instructional school time. This is a relatively low proportion, and therefore any negative effects may not have been apparent at this stage.

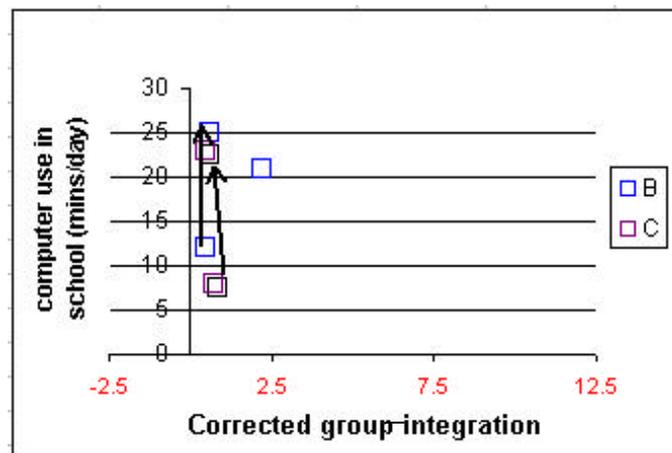


Figure 3: Unchanged group-integration associated with increasing computer use

The second kind of change (Type II) represent a confirmation of any technophobic attitudes. This categorization was used for schools where there was a similar increase in computer use as for Type I changes, but group-integration fell dramatically (Figure 4). If Type II changes were found in a large proportion of schools, there might be significant evidence to rein in many of the current initiatives to promote on-line learning and the integration of information and communication technology across the curriculum. However, this example is an isolated case, and there are some possible explanations. Firstly, the initial level of group-integration was substantially higher than in other project schools. This may represent a particularly good time for the school, where a recent success may have pre-dated the SENTIS survey day. The surveys were always conducted towards the end of the school year, and therefore it was expected that group formation would be at a stable stage. Also, there was a change of principal shortly after the first SENTIS survey in this school, and it is possible that this was a more significant event than the overall rise in computer use.

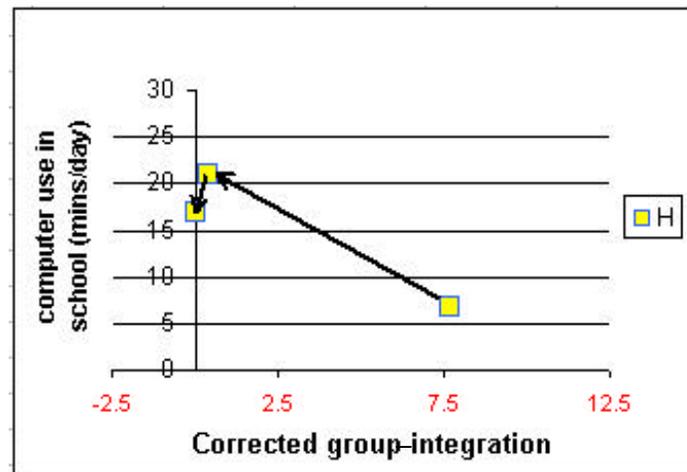


Figure 4: Declined group-integration associated with increasing computer use

Type III changes were found in schools where computer use had marginally increased, but group-integration had also increased (Figure 5). This confirms the suggestion that factors other than increased computer use can affect group-integration. In both schools mean computer use increased marginally by a matter of a few minutes per day, but group-integration changed significantly. To understand why, it would be necessary to be aware of a much wider range of environmental factors affecting the school community than were captured in the study. This last example helps to confirm that at current levels of use, computers are having little impact upon the general friendship patterns of high school students.

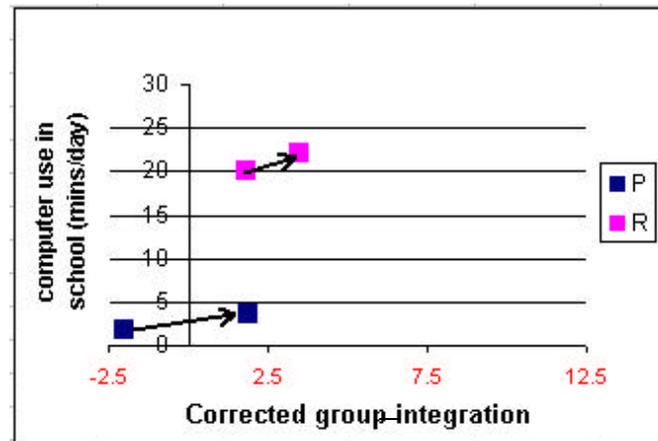


Figure 5: Increased group-integration associated with increasing computer use

What the teachers said

The teachers interviewed in the latest round of SENTIS data collection were generally the computer coordinators for the participating high schools. All of them had been instrumental in preparing IT policy for the school, and most sat on a computer coordination committee overseeing its implementation. As keen observers of the progress of information technology (and increasingly, information and communications technologies) in their schools, they were also keen observers of culture and playground interactions amongst their students.

Although no school in 1998 had a written policy on the relationship between home and school computing, there were many comments about this topic. For example, one interviewee commented: "it's sickening sometimes, when a student asks you for advice about their Christmas stocking computer, and you realise it has a higher specification than the main [school] server".

One computer coordinator had adopted a very simple scheme to enable all students to have e-mail and a web site. Rather than implementing and administering these services on the school server, the teacher informed and educated students about the location and use of free Internet based services such as Hotmail or Geocities. By following the teacher's instructions on registering for these services, students established their accounts, and the teacher was able to subsequently communicate electronically with them by replying to their first e-mail. This technique spoke volumes about her assessment of the social impact of computers upon students.

In respect of the impact upon friendships, it was noted that "computers are the focus of some friendship groups", and that these groups "cross social boundaries" indicating that membership was socio-economically heterogeneous. When prompted as to their reaction about computers promoting social isolation, these teachers saw computer-using students forming groups (called 'geek gangs' in one school) similar to those formed by students interested in sport, surfing, dressing in fashion, riding horses or doing academic studies. They did see computer use having merit as a safe haven for "kids with social problems" and were prepared to continue providing

access to the computer laboratories in this way outside lesson times. This gave opportunities for such students to develop confidence and social skills in a safe environment.

Whilst earlier phases of the SENTIS project had found teachers commenting on the typical socially isolated adolescent teenage boy, the 1998 interviewees agreed that these were no longer such a focus for attention, and in fact were very rare. By contrast, the computing skills and confidence of teaching staff in the school were a cause for concern. "Most of them think they know less about computers than most other teachers" commented one coordinator. This was leading to difficulties in implementing IT policies that call for the integration of computer use across the curriculum.

Where do we go from here?

The accumulated evidence from the SENTIS project continues to provide a developing map of the incursion of computers into schools, and an idea of some related social consequences. The implications of this map for the Tasmanian situation is that computer use stalled over the large part of the 90s, as schools faced resourcing problems and the rapid obsolescence of equipment. Computer use seems to have grown rapidly in the early part of the decade, then remained largely the same with equipment levels improving only slightly overall.

There is increasing evidence of stress in the relationship between homes and schools in the domain of information and communication technologies. On the one hand students have been seen in this project to be consistently using computers at home much more than at school. Anecdotal evidence from the school computer coordinators indicates that this home use is generally on a more sophisticated machine than is available at school. Parents and students are clear about the benefits of a computer at home (Downes, 1998), and students employ them in a wider variety of modes than is generally the case in school. The lack of confidence and skills in teachers observed in the SENTIS project and a recent national study (Meredyth et al., 1999) are in sharp contrast to the practice and knowledge of students. This generational dichotomy is certainly cause for considerable concern, and the stresses emanating from it have been attended to in other countries by massive professional development campaigns.

The developing picture of social implications shows that girls in the project sample are far from the technophobes and computer deprived group frequently portrayed in the media. In a majority of cases they use school computers more than boys, and are also strong home users. However, in this gender-related comparison, the boys make far more use of information technology in the home arena. Whilst the story about any possible relationship between computer use and friendships has not become completely clear, the evidence is still showing no effect upon group-integration when mean use is about 25 minutes per day.

Future research projects are going to look at the difference Internet access in the home can make to friendship patterns. We will see if students in one municipality meet their friends more or less outside school when the home computer allows them to chat to cyber-pals overseas as an alternative. The issue of friendship circle size and range - the micro-geography of affiliations - will be examined and the home computer factored in. Many of us in the older generation are skeptical, whilst our kids grow up seeing all this as the norm.

Appendix - the SENTIS instrument

SENTIS - Social Effects of New Technology in Schools			
			MARK IN THIS COLUMN
1. Please enter your name in this section.			
2. Mark a 1 if you are female here.			
3. Please write the names of three students currently present in the			
4. For how long did you use a computer in school yesterday?	Not at all		
	Up to 30 minutes		
	Up to one hour		
	Up to 1 hour 30 minutes		
	Up to 2 hours		
	Up to 2 hours 30 minutes		
	Up to 3 hours		
	Up to 3 hours 30 minutes		
	More than 3 hours 30 minutes		
5. Which activities did you do with the computer in school?	Word processing, CADD, DTP, graphics		
	Adventure games, simulations, control		
	Quizzes, software that teaches you		
	Looking up information, encyclopedias		
	Communicating with other people		
	Arcade games etc.		
6. For how long did you use a computer out of school yesterday?	Not at all		
	Up to 30 minutes		
	Up to one hour		
	Up to 1 hour 30 minutes		
	Up to 2 hours		
	Up to 2 hours 30 minutes		
	Up to 3 hours		
	Up to 3 hours 30 minutes		
	More than 3 hours 30 minutes		
7. Which activities did you do with the computer out of school yesterday?	Word processing, CADD, DTP, graphics		
	Adventure games, simulations, control		
	Quizzes, software that teaches you		
	Looking up information, encyclopedias		
	Communicating with other people		
	Arcade games etc.		

THANK YOU FOR COMPLETING THIS SURVEY

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