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Influence of Socioeconomic Status and Gender on High School Seniors' Use of Computers at Home and at School

This article critically assesses the proposition that computers have a democratizing effect in schools by increasing job-relevant skills among diverse groups of students. Drawing on arguments that schools are limited in their ability to counter long-standing patterns of inequality, we examine how gender and socioeconomic status interact to shape computer use patterns among high school seniors both at home and at school. Our data come from a large representative sample of grade 12 students in a western Canadian province. We find that social inequalities are being reproduced in the home through access to, and use of, home computers, with job-relevant uses higher among both female and male students from more advantaged backgrounds. Home environment conditions the effect of school use of computers because students from higher SES families—who have higher academic achievement and goals—are more likely to use computers at home but less likely to do so in school. This finding challenges claims that computers in schools can level differences in cultural capital that students acquire at home.

Cet article présente une analyse critique de la proposition selon laquelle l'ordinateur a un effet démocratisant dans les écoles en ce qu'il améliore des habiletés professionnelles chez divers groupes d'élèves. Puisant dans des arguments qui démontrent que les capacités qu'a l'école de redresser des inégalités de longue date sont limitées, nous nous penchons sur la façon dont le statut social des hommes et des hommes (le sexe) et le statut socio-économique influencent l'emploi que font les élèves de l'ordinateur à l'école et à la maison. Les données proviennent d'un échantillon important d'élèves en 12e année dans une province de l'ouest canadien. Les résultats indiquent que les inégalités sociales se reproduisent à la maison par l'accès à un ordinateur et l'emploi que l'on en fait. Plus précisément, les élèves (garçons et filles) provenant de foyers plus aisés se servaient plus de l'ordinateur de façon à améliorer leurs compétences professionnelles. L'environnement à la maison affecte l'emploi que font les élèves des ordinateurs à l'école dans le sens que les élèves de familles de statut socio-économique plus élevé (et dont le rendement et les objectifs académiques sont plus élevés) sont plus portés à employer un ordinateur à la maison mais moins portés à le faire à l'école. Cette conclusion remet en question les arguments selon lesquels les ordinateurs à l'école peuvent niveler les différences dans le capital culturel que les élèves acquièrent à la maison.

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Introduction

Computer literacy is widely recognized as a crucial employability skill (Advisory Council on Science and Technology, 2000; Conference Board of Canada, 1992). However, there is growing concern about the implications of a "digital divide" whereby some social groups lack the skills and other resources needed to access information and communication technology, whereas others reap labor market rewards for being on the cutting edge of these technologies (Dickinson & Ellison, 1999). Because today's youth will be competing for work in an information economy where computer literacy is an important criterion for success, it is especially important to understand how they acquire job-relevant computer skills. Indeed, job preparation has been a prominent objective for the introduction of computers into schools (Goodson & Mangan, 1996). At the same time, many educators have emphasized the potentially democratizing effect of introducing computers into schools. This rationale assumes that computers have the potential to enhance learning opportunities for all, thereby reducing education-based inequality. Thus a mix of labor market and democratizing goals underlies large investments in educational computer technologies (Fletcher-Flinn & Suddendorf, 1996; Oderkirk, 1996). Equipping the maximum number of students with the kinds of computer skills required to do well in school and in the job market should reduce inequalities by expanding career opportunities.

However, claims about computer skills contributing to students' academic success and job preparation rest on the assumption that the integration of computers into the school curriculum will either not be affected by prior patterns of inequality or will ameliorate the effect of these patterns. Both the labor market and democratizing goals of using computers in schools imply reduced socioeconomic and gender differences in access to and use of computers. However, it remains unclear whether new opportunities for the acquisition of computer skills in high schools will reproduce or reduce existing social inequalities that traditionally have influenced career success. Prior research on computer use among high school students has not fully accounted for how it may be influenced by existing stratification patterns in the education system and society as a whole.

This article contributes to the ongoing debate about the effect of computers on the social and economic goals of high school education. Using data collected in 1996 from a representative sample of grade 12 students in the province of Alberta, we critically assess claims about the democratizing and the labor market outcomes of integrating computer training into the high school curriculum. From a theoretical perspective, our findings lend some support to the social reproduction thesis (Bourdieu, 1973) that schools build on what they get in terms of students' cultural capital. Reshaping prior patterns of social inequality presents formidable challenges, even with the aid of new information technologies. We add an important nuance to this argument by examining how two basic dimensions of inequality—a student's socioeconomic status (SES) and gender—interact in home and school contexts to influence the development of job-relevant computer skills.

The Effect of Computers in Education

For some time now a central theme in research on the educational uses of computers has been student access, the assumption being that educational inequality can be reduced over time if students from all socioeconomic backgrounds acquire computer skills (Kling & Iacono, 1988). When computers emerged as a viable instructional tool in the early 1980s, there was considerable speculation about their potential positive effect on education and society (Collis & Martinez, 1989). Advocates of the educational use of computers predicted that they would improve the quality of life and reduce social inequalities (Levy, Navon, & Shapira, 1991; Linn, 1985). However, some critics began to see new information technology contributing to social inequality, a reduced quality of working life, and political disempowerment (Aronowitz & DiFazio, 1996; Livingstone, 1997; Menzies, 1996). Others raised concerns that, without careful intervention by educators, social class and gender inequities could be reinforced by the educational use of computers (Chen, 1986; Lepper, 1985).

Reconciling these perspectives is difficult given the conceptual and methodological limitations of research on the effect of computers in education (Clark, 1991; Robyler, 1990; Singh, 1992). Moreover, attempts to devise valid and reliable indicators of computer skill acquisition, or "computer literacy," are still ongoing (Alberta Learning, 1997; Collis & Anderson, 1994; Gamst & Otten, 1992; Jones & Pearson, 1996; Olson, 1990). Some positive effects of computer use on students' learning outcomes have been documented for most grades and classes (Kulik & Kulik, 1991; Niemiec, Samson, Weinsteing, & Walberg, 1987; Robyler, 1990; Ryan, 1991). Again, research design and measurement limitations have made it difficult to isolate the independent effect of computers (Clark, 1991). Thus to this point, there is inadequate evidence to test claims about the democratizing and employability effects of computers in the secondary school system.

Yet even before asking how computers affect learning outcomes, we need to know more about how patterns of computer use and skill acquisition vary by students' sociodemographic characteristics. This would help us better understand what influences the potential effects of computers on students' learning. Specifically, we need to look more closely at differential access to, and use of, computers across sub-populations of students. At issue is how computers may reduce, reproduce, or even strengthen existing patterns of social inequality among students. Such an approach would provide a more solid foundation for future analysis of the effect of computers on a range of learning outcomes.

The Influence of Sociodemographic Factors on Computer Use

Despite claims that computers in schools will help socially disadvantaged groups (Levy et al., 1991), there is little research that directly examines the combined effects of gender *and* SES on access to and use of computers. Each of these personal characteristics has been studied independently in earlier research; our intent is to examine systematically how they interact to influence patterns of computer use. There are well-documented gender differences in young people's attitudes toward, access to, and use of computers. Generally, boys tend to have more positive attitudes toward computers regardless of their level of familiarity (Crombie & Armstrong, 1999; Newman, Cooper, & Ruble, 1995; Sacks, Bellissiomo, & Mergendoller, 1993). Boys have better access to

computers, are socialized to have positive attitudes toward computers, and as a result exhibit greater interest in and use of new information and communication technology (Badagliacco, 1990; Shashaani, 1993, 1994). In fact the gendered dimensions of the Internet and e-mail are a growing research focus (Green & Adam, 1998; Nachmais, Mioduser, & Shemla, 2000). As gendered socialization to technology develops first in the home, schools cannot fully control technology-based learning outcomes (Shashaani, 1994). It also has been suggested that home access to computers may influence whether computers in schools have a democratizing effect (Schall & Skeele, 1995).

Of all the factors associated with home computer ownership and use, socioeconomic status appears to be the most important. By 1997, although close to 40% of Canadian and United States households reported owning a computer, the top household income quartile had four times the computer penetration rate compared with the bottom quartile (Dickson & Sciadas, 1999). Thus the focus of research on the educational uses of computers must be broadened to include home *and* school, given that class and gender effects are embedded in both contexts. There is a strong positive relationship between home computer ownership and use and SES as measured by family income and parents' educational attainment (Nakhaie & Pike, 1998; Oderkirk, 1996). This finding alone underscores the importance of documenting patterns of computer skills among high school students.

More broadly, the potential benefits of computers in schools are shaped by contextual factors and students' backgrounds. Among these influences are political priorities in educational bureaucracies, resource allocation in schools, and the level and sophistication of curriculum development (Robertson, 1998). When educational resources are strained, there can be a differential effect, with "gifted" or "special-education" students being given priority at the expense of computer access for students from poorer families (Kirby, Oescher, Wilson, & Smith-Gratto, 1990). The location of the school also matters, with those in affluent neighborhoods being more likely to provide instruction in higher-level competences. This could reflect the greater access that higher SES students have to home computers, which in turn may influence computer use patterns both at home and at school (Fishman, 1999). Socioeconomic status also influences a student's high school program and achievement and through this her or his chances of entering college or university (Andres & Krahn, 1999). Surprisingly, these academic factors have not been systematically examined in research on school-based computer use. Home computer use may also influence gendered patterns of use in schools (Dugdale, DeKoven, & Ju, 1998). High school students who use home computers may also have more positive attitudes toward computers (Selwyn, 1998).

However, despite these gender and SES effects, there are suggestions in the literature that the rapid spread of information and communication technology and its adoption by adolescents has transformed learning contexts as students take more control of the technology (Holmes & Russell, 1999). This more recent variant of the democratizing thesis counters the critical tradition in the sociology of education and sets up an interesting debate. The research gap addressed by this article is whether ingrained patterns of social inequality are seen in home and school computer use among Canadian high school students.

To summarize, although research documents how boys and students from higher SES backgrounds are more likely than girls or lower SES students to have access to and use home computers, several important aspects of these trends require further investigation. A home computer is a potential educational resource, a new form of cultural capital that is crucial in a knowledge-based economy (Advisory Council on Science and Technology, 2000). Thus we need to know more about SES and gender effects, both additive and interactive, on home and school computer use, the two main locations where young people acquire computer skills. To examine this issue we directly compare the types of computer skills developed in various sociodemographic groups in both home and school contexts. Home computer use among high school students could reproduce inequalities through job-related skill acquisition. At the same time, school computer use might reduce SES or gender differences given the recent investments in school computers and the strong democratizing values underpinning their use. More specifically, this article addresses two research questions:

1. How and to what extent does family socioeconomic status (SES) influence access to computers, at home and at school, by female and male high school students?
2. Does the secondary school system perpetuate or reduce existing SES and gender inequalities by providing opportunities to acquire job-relevant computer skills?

Research Design and Sampling

The 1996 Alberta High School Graduate Survey (AHSGS) was designed to collect baseline data on the educational and employment values, experiences, and goals of the provincial high school graduating class that year (Lowe, Krahn, & Bowlby, 1997). A cluster sampling strategy was used to construct a representative sample of Alberta grade 12 students, because a simple random sample of the complete provincial population of grade 12s would have been much too costly. Relying on administrative data provided by Alberta Education, we first calculated the desired number of respondents in each of six geographic regions based on the size of grade 12 enrollments. In each geographic region, with the cooperation of school district administrators, we then purposively sampled schools in order to include a representative mix of small, medium, and large-sized schools in smaller and larger urban centers.

Sixty Alberta high schools participated in the study. In the selected schools, principals (or their designated contact persons) assisted in identifying grade 12 classes that would provide the required number of respondents and a representative mix of students in diploma, certificate, and other programs. Members of the research team supervised the in-class completion of questionnaires by students. In all participating schools a high proportion (well in excess of 90%) of students in the selected classrooms completed the questionnaire. This high response rate, as well as a close match between characteristics of our sample and available information about the population of Alberta grade 12 students (Lowe et al., 1997), make us confident that our sample is representative of the population from which it was drawn. The final sample comprised 2,681 respondents, yielding estimates that are accurate within plus or minus 1.9%, 19 times out of 20.[1] The article uses weighted estimates to compensate for varia-

tions in class size among schools and in participation rates across school districts.

Measuring Computer Use

To set the context, Statistics Canada's (1994) *General Social Survey* documented that the province of Alberta significantly exceeded the national average in computer literacy and home computer ownership. In the province computers have been widely integrated into the primary and secondary educational system. Alberta Learning, the provincial government department responsible for the primary, secondary, and postsecondary education system, has developed information technology "learner outcomes" measures (Alberta Learning, 1997). Although Alberta may be ahead of national trends in computer access and use, this survey nonetheless fills a major gap in our information about the determinants of computer use among Canadian high school students.

Respondents in the AHSGS were asked if they could use a computer "to do things other than playing games?" The 90% of respondents who answered "yes" were then asked if in the past 12 months they had done any of the following, at home, at school, and at work: word-processing; database/data entry/record keeping; spreadsheet/data analysis; graphics/desktop publishing; programming; access the Internet; and any other activities they could describe. We adopted Statistics Canada's approach to measuring computer skills in the 1994 General Social Survey (Lowe, 1997), which assumes that computer literacy means having the ability to use a computer for practical purposes. By examining word-processing and technical applications, we have focused on uses that can help students meet educational and labor market goals. This definition reflects the use of computers as learning tools in the formal education system in an attempt to help students gain a level of competence in applying information technology to everyday problem-solving (Lowther, Bassoppo Moyo, & Morrison, 1998). Furthermore, conceptualizing computer use in terms of skills makes it consistent with other forms of literacy (McMillan, 1996).

Our analysis below focuses on two broad categories of job-relevant computer use: word-processing and specific technical uses (i.e., database/data entry/record keeping; spreadsheet/data analysis; graphics/desktop publishing; programming).[2] With respect to the latter, our initial analysis examined the distribution of *yes* responses for each of the four computer use activities (see Table 1). Then, to conduct multivariate analyses, we created a binary variable that indicated whether in the previous 12 months the respondent had engaged in at least one of these activities (see Tables 2-6).[3] In these analyses we also compare use patterns in the past 12 months in the two main venues for using and learning computer skills: home and school.

The AHSGS also asked respondents who had held jobs during the school term about computer use in those jobs. However, given the low level of computer use in students' jobs reported (see Table 1), we do not examine job-based computer use in the subsequent analyses. Although computer literacy has been widely promoted as a key employability skill (Conference Board of Canada, 1992), it would appear that the low skill requirements in most student jobs do not provide the opportunity to use computer skills in a work setting. This justifies examining the acquisition of these skills in other venues.

Research Findings

Computer Use at Home and at School

Table 1 displays the percentages of respondents who had used computers in the previous 12 months for word-processing and for four specific types of technical uses at home, at school, and at work.[4] The corresponding percentages for the *technical use* binary variable are also included in this table. Computers appear to be used by grade 12 students for word-processing somewhat more often than for technical uses. Almost two thirds of the sample (64.7%) had used a computer for word-processing at home, whereas almost as many (59.8%) had done word-processing at school. In contrast, only 45.1% of the sample had used a computer at home for at least one technical use, whereas just over half (51.1%) had used a computer for a technical reason at school.

It is noteworthy that computers were used for technical reasons at school somewhat more often than at home, whereas the pattern for word-processing was reversed. Students with access to home computers may complete more of their written assignments at home than at school, but not all of these students may have access to home computers with hardware and software capacity for technical uses. With respect to technical uses in either location, database and data analysis uses were reported somewhat more frequently than were graphics and programming uses. The latter may require additional computer skills that are not as widely distributed in the grade 12 population. As noted above, our sample members reported much less frequent computer use at work. Only 6.2% indicated that they had done word-processing in a paid job during the previous year, whereas 11.1% reported at least one technical use of a computer in their job. We should note that students who had not held a job during the previous year are included among the *no* responses. However, 72% of our sample had held a paying job at some point during the previous school term. Thus the low at-work percentages shown in Table 1 are not a function of limited paid work experience so much as limited computer use in student jobs.

Gender Differences

Table 2 continues our analysis of computer use at home and at school by cross-tabulating word-processing and the technical use index percentages by gender. Male sample members were somewhat more likely than their female

Table 1
Computer Use by Type and Location, 1996 Alberta Grade 12 Students

Type of use	*Location of use*		
	At home %	*At school %*	*At work %*
Word-processing	64.7	59.8	6.2
Technical uses[1]	45.1	51.1	11.0
Database/data entry/Record keeping	27.3	33.4	10.2
Spreadsheet/Data analysis	20.6	36.2	5.3
Graphics/Desktop publishing	27.2	29.3	3.0
Programming	15.4	22.1	2.1

[1]Respondent reported using a computer for at least one of the four technical uses during the previous 12 months.

Table 2
Computer Use at School and Home by Gender,
1996 Alberta Grade 12 Students

Type and location of computer use	*Total*	*Gender*	
		Female	*Male*
	%	%	%
Word-processing			
At school	59.8	57.2**	62.4
At home	64.7	63.5	66.1
Technical uses[1]			
At school	51.1	48.3**	53.9
At home	45.1	39.0**	50.9
N[2]	2,656	1,291	1,346

*$p<.05$ (Chi-square test).
**$p<.01$ (Chi-square test).
[1]See Table 1.
[2]Number of respondents varies slightly across types and location of computer use due to missing data.

counterparts to report using computers for word-processing at school and at home, although only the former difference was statistically significant. Boys were also more likely than girls to use computers for technical purposes at school, and particularly at home (50.9% vs. 39.0%). This is consistent with earlier research showing that young men are more likely than young women to participate in the computer culture. If computer skills do in fact influence employment outcomes, then young women may be at a disadvantage.

Differences by Educational Performance/Plans

It is well documented that children from more advantaged backgrounds (as measured by parents' income, occupation, and education) tend to have higher academic aspirations, which translates into higher educational and occupational attainment (Andres & Krahn, 1999; Anisef, Axelrod, Baichman-Anisef, James, & Turrittin, 2000; Kerckhoff, 1996; Sewell, Hauser, & Featherman, 1976). Our approach follows this sociological tradition, using multiple indicators of direct and indirect effects of socioeconomic status (SES) on students. Not surprisingly, we find the expected SES effects on educational attainment. Earlier analyses of the AHSGS data showed that grade 12 students from high SES families (measured by parents' education and occupation) were significantly more likely to be enrolled in an academic program, the only route into university, and to achieve higher grades (Lowe et al., 1997). In this article we go on to examine SES effects on computer use via educational attainment. By employing multiple indicators of SES, we are essentially setting up a stronger test of our hypothesis. Specifically, if access to computers reproduces social inequalities, we would expect to see more frequent use of computers among students in academic programs, among those with higher grades, and among those with postsecondary educational plans.

Table 3 provides empirical support for this hypothesis with respect to home use of computers, particularly for word-processing. That is, 69% of students in

Table 3
Computer Use at School and Home by High School Program, Educational Plans, and Self-Reported Grades, 1996 Alberta Grade 12 Students

Type and location of computer use	Total	High School Program		Education plans for the fall		Grades in current school year		
		Academic	Non-academic	Attend university	Other	<65%	65-79%	>79%
	%	%	%	%	%	%	%	%
Word-processing								
At school	59.8	58.4**	65.0	53.2**	62.5	59.2	61.0	58.0
At home	64.7	69.0**	48.3	80.9**	58.0	51.3**	64.4	82.1
Technical uses[1]								
At school	51.1	49.9*	55.5	43.6**	54.2	53.2**	52.7	44.9
At home	45.1	46.6**	39.4	53.2**	41.6	38.7**	44.1	55.2
N[2]	2,656	2,105	551	770	1,859	714	1,354	581

*p<.05 (Chi-square test).
**p<.01 (Chi-square test).
[1]See Table 1.
[2]See Table 2.

academic programs had used a computer at home for word-processing at least once in the previous 12 months, compared with only 48% of students in nonacademic programs. A large majority of students (82%) with high grades had done word-processing at home in contrast to only 51% of those with the lowest grades. Similar differences, albeit not as large, are observed for home use of computers for technical purposes. Focusing on only one of the three relevant comparisons in Table 3, we find that 53% of the respondents who planned to attend university reported home use of a computer for technical purposes compared with only 42% of those who did not plan to attend university.

However, Table 3 displays an unexpected pattern of results for school use of computers. With only one exception (school use of computers for word-processing cross-tabulated by self-reported grades) where they are inconsequential, the percentage differences are in a direction opposite to what we predicted. For example, compared with their academic counterparts, nonacademic students were *more* likely to use computers at school for word-processing (65% versus 58%). Students not planning to attend university were more likely than those with university aspirations to use computers at school for technical uses (54% compared with 44%).

Thus for home computer use, we find some evidence of social inequalities being reproduced. More academically successful students and those with postsecondary plans were more likely to have used computers at home for both word-processing and technical uses. We do not observe the same pattern for school computer use. As we observed in Table 3, more advantaged and successful students were less likely to have used computers at school for either purpose.

Differences by Socioeconomic Status

The underlying logic in our analysis of school computer use is that students from more advantaged (higher SES) backgrounds tend to do better in school and typically have higher educational aspirations. Table 3 does not directly test the SES effect, examining instead the relationship between educational performance/plans and computer use. However, Table 4 focuses directly on the hypothesized SES effect. We use a simple binary measure of SES (whether or not students have at least one parent with a university degree) given that parental education is highly correlated with occupation and income. For both word-processing and technical uses, students from more advantaged (i.e., university-educated) families are more likely to report having used a computer at home in the previous 12 months. For school computer use the pattern is reversed. Higher SES students are less likely to report using computers at school for either word-processing or technical uses. This finding fits neither the cultural reproduction nor the democratization perspectives on the effect of computers, because the first would predict higher school computer use among higher SES students, whereas the latter would predict no differences on the basis of SES. Instead we observe that less advantaged students, both in terms of SES and academic performance, are the main beneficiaries of schools' investments in computers.

Differences by Educational Performance and Socioeconomic Status

Although broadly speaking a student's SES clearly influences her or his school performance, this relationship is complex. It is possible that SES and school performance have combined effects on patterns of computer use. Table 5 checks for such interactions by examining the relationship between school performance and computer use controlling on SES (parents' education). We use only one measure of school performance (academic vs. nonacademic pro-

Table 4
Computer Use at School and Home by Parents' Education, 1996 Alberta Grade 12 Students

Type and location of computer use	*Total*	*Parents Education (SES)*[1]	
		Less than university	*University degree*
	%	%	%
Word-processing			
At school	59.8	62.7**	53.8
At home	64.7	58.3**	77.9
Technical uses[2]			
At school	51.1	54.9**	43.2
At home	45.0	42.1**	51.1
N[3]	2,656	1,792	864

*$p<.05$ (Chi-square test). **$p<.01$ (Chi-square test).

[1]SES measured as a two category variable: one or both parents have a university degree; neither has a degree.

[2]See footnote 1 in Table 1.

[3]See footnote 2 in Table 2.

grams) to simplify the analysis, but note that similar findings (not reported here) were observed when we substituted self-reported grades and educational plans for this indicator.

We continue to find evidence of the reproduction of inequalities with respect to home computer use. The differences are accented when we examine the effect of high school program on home computer use, controlling on SES. For example, in Table 3 we observed that 69% of academic students had used computers at home for word-processing, compared with 48% of students in nonacademic programs. In Table 5 we see an interaction effect whereby a full 80% of academic program students from university-educated families had used a computer at home for word-processing. In contrast, only 46% of non-academic students from lower SES backgrounds had used a computer at home for such purposes. We find the same interaction effect, albeit weaker, for technical uses of home computers. In short, students from more advantaged family backgrounds are more likely to use computers at home. They are also more likely to be in academic high school programs, which increases their chances of using home computers.

With respect to school-based computer use, Table 5 offers clarification of the links between family background and computer use. Compared with their less advantaged counterparts, students from higher SES backgrounds are significantly less likely to have used computers at school for word-processing and for technical uses (a finding already observed in Table 4). High school program accents this pattern. In both SES groups those in nonacademic programs are somewhat more likely to have used computers in school, but the differences are nonsignificant. Thus we are left seeking an explanation for why higher SES students are more likely to use computers at home but less likely to use them at school.

Table 5
Computer Use at School and Home by High School Program by Parents' Education, 1996 Alberta Grade 12 Students

Type and location of computer use	Total %	Parents' Education[1] Less than university: Academic program (student) %	Less than university: Nonacademic program (student) %	University degree: Academic program (student) %	University degree: Non-academic (student) %
Word-processing					
At school	59.8	61.4	66.4	53.2	58.0
At home	64.7	62.5**	45.7	80.3**	59.4
Technical uses[2]					
At school	51.1	53.6	58.5	43.5	42.0
At home	45.0	43.7*	37.5	51.5	48.0
N[3]	2,656	1,342	451	763	101

*$p<.05$ (Chi-square test). **$p<.01$ (Chi-square test).
[1]See footnote 1 in Table 4.
[2]See footnote 1 in Table 1.
[3]See footnote 2 in Table 2.

We might speculate that young people from more advantaged backgrounds have less need to use computers at school to complete their assignments and projects, or for other school-related purposes. We also know from this study (Lowe et al., 1997) and many others that a student's SES background influences her or his high school program and academic achievement. Perhaps through a combination of high school and program effects, young people from more affluent families take courses in which more emphasis is placed on core academic subjects that lead directly to university entrance.[5] In contrast, less advantaged youth may be more likely to attend schools or be enrolled in programs that place somewhat more emphasis on trades. Granted, controlling on family background, the differences in school computer use between those in academic and nonacademic programs are not statistically significant (Table 5). Nevertheless, these findings suggest that computers may have quite different functions in academic compared with nonacademic high school programs.

Differences by Gender and Socioeconomic Status

The final step in our analysis returns to the gender differences in computer use observed in Table 2. Recall that, compared with female grade 12 students, boys were somewhat more likely to use computers at home and at school for both word-processing and technical uses. Having noted that socioeconomic status interacts with school performance/plans in its effects on computer use, we conclude by examining whether SES also might interact with gender in a similar manner

Table 6 reveals similar gender differences for both lower and higher SES youth. Essentially, male grade 12 students are somewhat more likely to report having used computers for both word-processing and technical uses at home and at school. In addition, as observed in our earlier analyses, higher SES

Table 6
Computer Use at School and Home by Parents' Education by Gender, 1996
Alberta Grade 12 Students

Type and location of computer use	Total %	Parents' Education[1] Less than university Female Student %	Less than university Male Student %	University degree Female Student %	University degree Male Student %
Word-processing					
At school	59.8	60.7	64.7	49.6*	57.8
At home	64.7	57.3	59.4	76.3	79.9
Technical uses[2]					
At school	51.1	52.1*	57.4	40.3	46.6
At home	45.0	37.3**	46.5	42.2**	60.0
N[3]	2,656	874	904	418	443

*$p<.05$ (Chi-square test).
**$p<.01$ (Chi-square test).
[1]See footnote 1 in Table 4.
[2]See footnote 1 in Table 1.
[3]See footnote 2 in Table 2.

students are more likely to have used computers at home, but somewhat less likely to have used them at school. Thus gender patterns of use are embedded in the more pervasive influence exerted by a student's socioeconomic background.

Discussion

This article begins with the proposition that for computers to have a democratizing effect in schools, deeply rooted gender and SES influences on educational outcomes would have to be overcome. We further argue that more empirical evidence is needed about the influence of students' sociodemographic characteristics on computer use patterns in home and school, given that skill acquisition occurs in both locations. Our resulting hypotheses—that gender and SES would shape computer use patterns among high school seniors—are situated in the critical sociology of education tradition that holds that schools are limited in their ability to counter long-standing patterns of inequality that students bring with them into the educational system.

Before summarizing our main findings, we should note several limitations in our research design. First, we lack information on the intensity of computer use, so we cannot comment on which sociodemographic groups devote the most time to specific types of computer uses.[6] Hence our conclusions pertain to the incidence, types, and location of use, but not the frequency of use. Second, although we focus on gender and SES differences, race or ethnicity differences may also affect computer access and use (Ervine & Gilmore, 1999). Although we did ask respondents to self-identify as members of visible minority groups or as Aboriginal Canadians, the numbers of such individuals in the sample were too small to permit detailed analysis.

We found some gender differences in the incidence and type of computer use. Consistent with earlier studies of the gender gap on computer use, the boys in our study made more extensive use of computers than did girls at home and at school. An issue still unresolved is the extent to which home computer access and use for female students contributes positively to their success in using computers for school-based educational purposes (Dugdale et al., 1998; Selwyn, 1998).

The basic gender differences documented above are also evident in other forms of computer use, from games to the Internet (Green & Adam, 1998; Griffiths & Hunt, 1998; Nachmais et al., 2000). As a wider array of information and communication technologies shapes the lives of young people (Drotner, 2000; Roberts, 2000), the gender gap in information and communication technology use may become more difficult to close. To situate these gender differences in a larger context, they may be reflecting the gender-based cultural biases that are embedded in many forms of technology and that in turn underlie women's lower participation in science, technology, and engineering programs at the secondary and postsecondary level (Canadian Committee on Women in Engineering, 1992).

We documented that social inequalities are being reproduced in the home through access to, and use of, home computers. Both female and male students from more advantaged backgrounds are more likely to use computers at home for word-processing and technical purposes. This is consistent with the well-documented relationship between SES (family income, parental education)

and access to and use of home computers (Dickinson & Ellison, 1999). Parents who have the resources to do so are treating home computers as another form of essential cultural capital because computers may give their children an educational and economic advantage.

We also found SES differences in school computer use that were in a direction opposite to what we had predicted. Simply put, compared with their lower SES classmates, students from higher SES families were *more* likely to use computers at home but less likely to do so in school. We observed the same pattern when examining the effect of educational performance. Students in academic programs, those with higher grades, and those planning to attend university were less likely to use computers in school. Because students from higher SES backgrounds are also more likely to be performing well in school, these findings indicate that the home environment (SES) conditions the effect of school use of computers. Hence we should temper claims that the use of computers in schools can level differences in cultural capital that students acquire at home.

How can we explain this unexpected finding? Perhaps the widespread availability of computers in middle-class (and higher) families reduces the need for youth from these families to use school computers. It is also possible that we may be seeing some "vocationalizing" of computer use in high school, to the extent that computers are now a mainstay of many trades/technical courses. Such courses are seldom taken by university-bound students, who typically focus on the core academic subjects required for university admission. Given the limitations of our data, we can only speculate about this explanation. Further research could usefully provide the evidence needed to test this hypothesis.

However, it is important for future research to investigate the extent to which school-based computer use by lower SES youth, often in nonacademic programs or vocationally oriented courses, may pay off when they enter the labor market after graduating or in the pursuit of further education. This would be a more rigorous test of claims about the democratizing effects of the educational use of computers than what we present. In this regard it is important to bear in mind that although computer literacy is an important employability skill, it cannot be viewed in isolation. Increasingly, access to good jobs in today's knowledge economy depends on having postsecondary credentials (Little, 1995). In this regard, future research could usefully focus on how combinations of computer skills with specific forms of postsecondary credentials pay off in the labor market.

Still, there is a continuing need for schools to measure students' learning outcomes in the area of computer literacy (Collis & Anderson, 1994). It is interesting to note that the province of Alberta, for example, has proposed a framework for assessing a wide range of information technology learning outcomes (Alberta Learning, 1997). The principles underlying the framework are that outcomes are progressive and sequential, reflecting knowledge, skills, and attitudes that are integrated and applied in a wide range of learning and work settings. The overall thrust is that technology-based skills, knowledge, and attitudes acquired by students will be useful for entry-level jobs, lifelong learning, personal development, and citizenship. To the extent that schools

implement this learning-outcomes framework, it will be essential to take into account students' sociodemographic characteristics and their access to home computers.

Finally, it is arguable that we may have reached the point where school computers have become so ubiquitous that their ability to reproduce inequalities or to reduce them is minimal. Thus the family context becomes the determining factor in how useful computers will be in a student's future educational or work career. In this respect home computer use may be more crucial. And it is here that we find higher SES students continuing to be advantaged, at least in terms of word-processing and basic technical applications. In this critical sense, we continue to see evidence of the reproduction of inequality, rather than the democratization of the education system and the labor market, by the growing availability and use of computers.

Notes

1. We recognize that a cluster sampling approach such as ours does not involve random sampling. Hence the use of significance tests would not normally be seen to be appropriate. However, significance tests are useful tools that allow researchers to decide whether differences between groups are large enough to be taken seriously (i.e., are they statistically significant?). They are used to generalize from random samples to populations because random samples are assumed to be representative of the population. Having constructed our cluster sample to reflect variations in school districts size, community size, and high school programs, we are confident that our nonrandom sample is reasonably representative. Hence we feel that the use of significance tests to identify differences between groups large enough to be of substantive interest is justified.
2. Although we did ask about Internet access, we do not analyze these findings because it is difficult to determine the specific skills utilized and indeed whether the Internet is being used for research and information gathering, personal communications, or recreation.
3. We considered creating an index that measured the number (0-4) of technical uses reported, a tactic that might allow us to conduct multiple regression analyses. However, this index was severely skewed for both home and school-based computer use, making it unusable as a dependent variable in a multiple regression analysis.
4. Individuals who indicated (in the filter question preceding these computer use questions) that they could not use a computer for anything other than playing games are included in the calculations of percentages (as *no* responses) in all the tables.
5. Testing this hypothesis would require detailed analysis of the academic and nonacademic course curriculum in each school, which is beyond the scope of this research project.
6. An additional set of questions asking about frequency of use would have been an improvement, but given the large number of issues we tried to address in this study of school-work transitions (Lowe et al., 1997), we were limited in the number of questions we could ask about each issue.

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