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More than half of U.S. households and nearly half of Kentucky households now have one or more computers at home.

A survey of Kentucky high school students offers insight into where young people acquire computer skills.

The vast majority of these principally college-bound youth have access to a computer at home, but they acquire key skills at school.

Are Technology Investments Yielding Dividends for Kentucky Students?

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Whether high school students opt to pursue postsecondary education or enter the job market after high school, they will find that computing skills are integral to the way we live and work. Recognizing this, policymakers emphasized technology and its use in schools as one strand of the Kentucky Education Reform Act of 1990 (KERA). Since its inception in 1992, the Kentucky Education Technology System has spent approximately \$640 million on basic technology equipment in the schools, including wiring schools to the Internet, achieving a 6 to 1 student-to-computer ratio and providing every teacher with a workstation.¹ As public investment in education technology grows, it is vital that we determine what the returns are to students and to the state at large.

Already workplace essentials, increasingly affordable computers are fast becoming household staples as well. A recent report by the U.S. Census Bureau found that 51% of U.S. households had one or more computers in August 2000 compared to 42% in December 1998. In addition, two thirds of households with a school-age child had a computer, and 53% of these households had access to the Internet, suggesting that most parents now view computers as integral to learning.² Home computer ownership has also expanded broadly in Kentucky. According to the U.S. Department of Commerce, 46% of Kentucky households had home computer access in 2000 while 37% of households reported having home Internet access.³

A 2000 survey of Kentucky high school students yields information about student access to computers and the computer skills they are acquiring. Developed by the Kentucky Long-Term Policy Research Center with the University of Kentucky (UK) Policy Analysis Center for Kentucky Education, the survey, entitled *Talk Back!*, was administered by the UK Survey Research Center to a sample of about 1,100 high school students, ages 16 and 17, composed principally of *college-bound* youth.⁴

While a substantial portion of these principally college-bound students reported having access to computers at home, the effects of having computers in schools are evident from their survey responses. Almost 90% of our sample reported having a personal computer at home and more than three fourths (76%) have access to the Internet at home (see Table 1). Yet the overwhelming majority of students reported learning about key computer skills—word processing and spreadsheets—in school. In addition, more than a third of students reported acquiring skills in using the Internet to find information mostly in school. However, the development of skills in using the Internet and e-mail are largely taking place in the home.

Students not only have acquired computing skills, a substantial portion of them report having the capacity to use them independently. With the exception of analyzing data in a spreadsheet, which fewer than half of the students say they can do without

<i>Students Who Have Home Access to a Computer</i>	Number	Percent
Personal computer at home	887	87%
Internet at home	774	76
<i>Where did you acquire the following computer skills?</i>	Mostly Outside of School	Mostly in School
Use a spreadsheet to analyze data	22%	65%
Format documents using a word processor	38	60
Use the Internet to find information for a specific project	64	34
Use e-mail to communicate or to send and receive attachments	77	13
<i>How capable are you of performing the following computer skills?</i>	Without Help	With a Lot of Help
Use a spreadsheet to analyze data	39%	9%
Format documents using a word processor	84	2
Use the Internet to find information for a specific project	86	2
Use e-mail to communicate or to send and receive attachments	75	5



Policy Notes

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Computers in schools appear to be leveling the technology playing field.

help, the remaining skills—word processing, accessing the Internet, and using e-mail—appear to be solidly established among these students.

Lack of consensus on the purpose of education technology contributes to the difficulty of assessing its overall effectiveness. However, one obvious criteria is the role that public education plays in students' acquisition of computing skills, especially in light of the rapid growth of home computing opportunities. One national survey found that the general public is more likely to cite job readiness as the factor they would value most in deciding whether computers and technology are playing an effective role in education.⁵ Our analysis suggests that Kentucky's investment has positively affected student computer literacy and, arguably, job readiness. What's more, these survey responses suggest that schools are "leveling the playing field," compensating for a lack of computing opportunities in the home by giving students from diverse backgrounds equal opportunity to use a computer and acquire key computing skills.

Several student characteristics are associated with the increased likelihood that a student acquired computing skills mostly at school, rather than outside school.⁶ Students who reported lower grade point averages (GPA), who live in rural areas, and whose parents do not have a college education were more likely to acquire computing skills at school (see Tables 2 and 3). Computing opportunities at home, on the other hand, reduced the likelihood that spreadsheet, word processing, and Internet use skills were mostly learned at school.⁷

These results bode well for Kentucky as the education technology dialogue expands from simple access issues to the effective use of limited public resources. Our analysis suggests that certain groups of students are more likely to be positively affected by computing opportunities at school. Particularly encouraging are of acquiring computing skills mostly in

TABLE 2
Increased Likelihood of Acquiring Computer Skills Mostly in High School, by Selected Factors

<i>I mostly learned how to use a spreadsheet to analyze data in high school</i>	No	Yes	Increased Likelihood
No home access to personal computer or the Internet	65%	74%	1.14
County of residence is classified as "rural"	63	69	1.10
Neither parent has a 4-year college degree or higher	62	70	1.13
<i>I mostly learned how to format documents with a word processor in high school</i>			
No home access to personal computer or the Internet	58	83	1.43
County of residence is classified as "rural"	55	68	1.24
Neither parent has a 4-year college degree or higher	55	68	1.24
<i>I mostly learned how to use the Internet to find information for a specific project in high school</i>			
No home access to a personal computer or the Internet	30	64	2.13

Hints on reading this table: Students without access to a computer or the Internet at home have a 74% probability of mostly learning how to use a spreadsheet to analyze data in high school (holding other factors constant), which is 1.14 times greater than those who do have access to a computer or the Internet at home.

ing is the higher likelihood that lower academic achievers high school, other things constant. A possible explanation may be that higher academic achievers are more able and more motivated to learn independently than lower achievers.

While our results are primarily positive, low levels of proficiency in spreadsheet use are potentially negative. Among these *mostly college-bound* students, fewer than half could use a spreadsheet to analyze data without help. A recent study found that *how* technology is used in the classroom can affect test scores in math.⁸ Students whose teachers utilize computers for such tasks as spreadsheet data analysis—generally associated with higher-order thinking—performed better on the math portion of the 1996 National Assessment of Educational Progress (NAEP) than those students mostly engaged in "drill-and-practice" computer uses.⁹

Overall, however, this analysis suggests that Kentucky's investment in education technology is having a positive impact on student computer literacy and likely narrowing the gap between the technology "haves" and "have nots" by providing access and learning opportunities to students who might otherwise be "at risk" of being left behind. Thus, the substantial investment in school computers made by the Commonwealth appears to be yielding significant and important returns.

TABLE 3
Likelihood of Learning Computer Skills Mostly in High School, By Grade Point Average (GPA)*

Computer Skill	GPA		
	3.37	2.37	1.37
Format documents using a word processor	62%	72%	80%
Use Internet to find information for a specific project	34	42	50

* The GPA sample mean was 3.37. The mean was reduced by one point each time to identify the incremental changes in probability as GPA declines.

Some studies have linked the use of spreadsheet data analysis to higher math scores.

Here, investments in education technology have led to enhanced computing skills.

¹ This applies only to the KETS program; local and federal funds have also been used to support and augment basic equipment installations. ² U.S. Bureau of the Census, "9-in-10 School-Age Children Have Computer Access: Internet Use Pervasive," *Census Bureau Reports* U.S. Department of Commerce, Washington, D.C., 2001. ³ National Telecommunications and Information Administration, Economics and Statistics Administration, U.S. Department of Commerce, Washington, D.C., 2000. ⁴ Further technical details on the survey are available at: www.kltprc.net/policynotes/pn7techinfo.htm. ⁵ Milken Exchange on Education Technology, Second Annual Public Opinion Survey, 1998. ⁶ All students were included in this analysis regardless of proficiency level of computing skills. ⁷ The model relating where a student learned how to use e-mail and the selected factors was not statistically significant in its explanatory power; therefore, these results were excluded from this presentation. See Technical Appendix for more details. ⁸ Harold Wenglinsky, "Does it Compute? The Relationship Between Educational Technology and Student Achievement in Mathematics," *Education Week* (1998). ⁹ Wenglinsky.