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Technology, Academic Preparation, and Equity: A Comparative Study

Mark Warschauer

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Mark Warschauer, UC Irvine

Schools in disadvantaged communities are moving closer to the ratio of computers per student in wealthier schools. However, simply comparing the numbers of computers and students does not tell the whole story. Children from poor schools face unique obstacles in using computers effectively for academic preparation. These challenges include the lack of a computer at home, inadequate technology training and support systems in their schools, and the difficulties of deploying technology well for large numbers of English language learners. Policy makers and educators need to address these factors if technology is to help overcome divides rather than deepen them. The following recommendations emerge from on our research on computer use in California schools.

Policy Recommendations:

Promote out-of-school computer access: Schools, districts, and agencies can help ensure that all students have opportunities for out-of-school access to computers so that they can engage in the kind of research-based homework that requires computer use. These steps include:

- Develop and support community technology centers where low-income youth can have access to computers and the Internet in a supportive environment.
- Organize information sessions, in diverse languages, for students and their families about community computer resources and low-cost hardware, software, and Internet options.
- Leverage school and district purchasing power with technology companies to help families buy hardware or software at discounted prices.
- Build alliances with community organizations to provide supervision and access to computer resources in order to meet students' academic and recreational technology needs.

Establish training and support networks: Human networks are the key to effective use of technology. These can be supported by agencies, districts, and schools as follows:

- Shift an increasing percentage of technology resources from hardware to personnel and training;
- Develop collegial support networks at schools to allow for mentoring and leadership in technology by those with excellent training and experience;
- Promote university-school partnerships to help develop these support networks both within and across schools;
- Make use of student assistants, who can receive course credit or wages for assisting with computer and network maintenance while developing job skills.

Address the needs of English language learners: Teaching large numbers of English learners requires new thinking and approaches to all aspects of schooling, and technology use is no exception. Steps that can be taken in this area include:

- Devoting state resources toward research, instructional and professional development support, and training on effective uses of new technologies with English language learners;
- Changing state funding mechanisms so that schools with large numbers of English language learners receive greater funding to address the myriad challenges;
- Providing salary incentives to attract the most highly qualified teachers, administrators, and staff and ensure their long-term commitments to working in schools with large numbers of English language learners and other at-risk students.

Our study included school-based research at eight high schools in Southern California over a six-month period. Five of the schools are located within underserved communities and three were in wealthy communities—(determined by socio-economic status [SES] and the Academic Performance Index) .We focused our research primarily in the subject areas of English, Mathematics, Science, and Social Studies, interviewing teachers of these subjects, observing their classes, and surveying and interviewing their students—all with the aim of better understanding how schools use technology to support academic preparation in diverse classrooms. In total, 64 teachers were included in the study, and more than 200 hours of instruction and interviews were recorded, transcribed, coded, and analyzed.

New Technologies, New Divides

Schools' increased use of technology can either narrow or widen the current gaps in opportunity and achievement among diverse groups. If technology is equally distributed and deployed equally well among diverse groups, it can help to overcome obstacles faced by poor students, English language learners, and others. On the other hand, if the distribution of technology follows distribution patterns of other school resources, such as textbooks, qualified teachers, well maintained facilities, and so on, with the greatest access and best uses found among those who already have the best resources—then the fusion of technology with learning will heighten inequality in our schools and society.

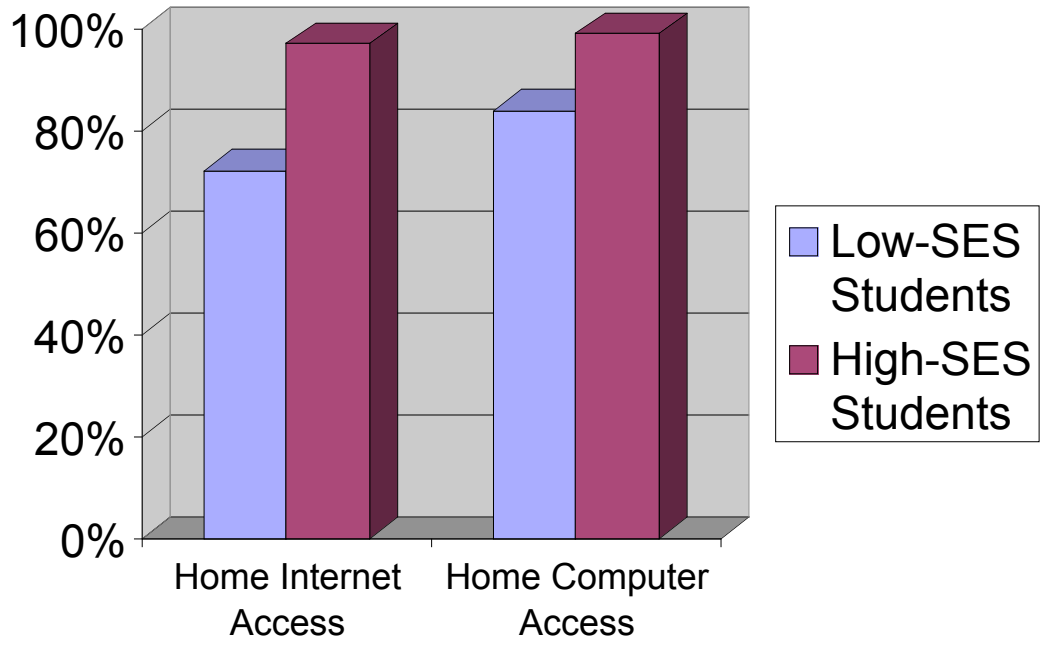
Most studies of this technology inequality have focused on the physical distribution of computers and internet access in diverse districts and schools. These studies have found that school districts in wealthier areas generally have more computers and internet access than do schools in poorer communities. For a variety of reasons, including the use of Title I and Digital High Schools funds to purchase computers, the student-computer ration appears to be narrowing, and some are now claiming that poor schools are catching up—closing the "digital divide."

However, there remains a great, and perhaps increasing, disparity in how computers are used in classrooms. As reported recently by *Education Week,* if computers are used to promote challenging curricula with one set of students, and remedial drills with another set of students, then technology can introduce new inequity in education attainment opportunities rather than reduce inequity.

Our study set out to better understand whether such a new set of divides actually exists, and, if so, what those divides are. We found that divides do indeed exist in three critical areas: 1) the lack of a computer at home; 2) inadequate technology training and support systems in their schools; and 3) the difficulties of deploying technology well for large numbers of English language learners.

Out-of-School Computer Access Makes a Difference

Our first finding is that when students have little out-of-school computer access, their teachers instruct them differently than students who have greater access. For example, teachers in our study's low-performing schools assigned little homework that involved computers because they did not want to penalize students without home computers. In general, these teachers devoted more time to teaching basic computer applications, assuming that their students did not learn these applications at home. In contrast, teachers in high-SES schools, confident that their students had home computer access, spent less time teaching specific computer applications such as how to use a Web browser, much more readily assigned homework that called for computer use. This allowed more ready use of technology-based assignments such as projects or research reports, since these often necessitate additional computer work outside of class.
In the three high-SES schools, an average of 99% of students we surveyed had home computers. In contrast, in the five low-SES schools, an average of 84% of students we surveyed had home computers.



This differential, and the effect that it had on classroom practices, highlights the value of alliances between schools and other organizations, such as libraries, churches, or Boys and Girls Clubs to provide out-of-school computer access in support of both academic work as well as 21st century life skills.

Computer Networks Depend on Human Networks

A second important finding was that teacher preparation and training, along with administrative direction, affected the quality of computer-based teaching and learning. Wealthier schools tended to invest more in professional development and full-time technical support staff. They also developed lines of communication among staff, media specialists, technical staff and administration that promoted robust digital networks, which in turn encouraged widespread teacher use of new technologies.

The difference between schools in wealthy and low-income communities is dramatic. For example, one school in a wealthy suburb (where 80% of the students are white and more than 93% of the teachers have full credentials) has a team of 12 highly trained technology facilitators (who are also part of the teaching staff) to provide detailed guidance to teachers. These facilitators worked in seamless cooperation with a full-time media specialist, a technology committee, and a team of specially trained students who also assisted with maintenance and installation. In contrast, at a low-SES neighborhood school in an urban area (where 97% of the students are Latino and 77% of the teachers have full credentials), the day-to-day management of computer laboratories is overseen by an adult volunteer. The internet was hooked up to the laboratories for more than five months before students were allowed to use it. The lack of a competent support structure led to some classrooms having computers but no internet access, while other classrooms were wired for the internet but had no computers. Even when appropriate hardware was in place, there were no facilitators to offer pedagogical support to teachers.

The Challenge of Teaching English Language Learners

One of the major challenges faced by the low-SES schools participating in our study was finding and/or using appropriate strategies to teach large numbers of English language learners. The five low-SES schools have an average of 31.4% English language learners among their students. In contrast, the three high-SES had an average of only 10.3% English learners. We found that this difference had a direct and far-reaching impact on how technology was used in the classroom.

For example, knowing how to find and critique information is an important internet-related skill taught in many schools. We observed, however, that in many of the classrooms in the low-SES schools students found it difficult to carry out internet searches due to spelling problems or difficulty reading Webpage summaries and online text. In these classrooms, internet search projects often resulted in students simply cutting and pasting into their documents selected text from each Webpage they visited. There was little evidence that teachers were trained to help English learners to achieve high-level research and information gathering skills. In the schools with fewer English language learners, students were better able to carry out successful internet-based research projects that involved finding, synthesizing, and summarizing information, rather than merely proceeding down a list and copying text.

Conclusion

At all eight schools in our study, we found dedicated and knowledgeable administrators, teachers, and staff. We also found examples of how technology was used well at all the schools, whether in poor or wealthy neighborhoods. However, teachers in the disadvantaged communities faced special challenges in making good use of technology. These included a lack of home computers by many of their students, a lack of well-developed support networks among faculty and staff, and the need for innovative practices and additional resources so that large numbers of English language learners are not left behind.

We believe that each of these challenges can be addressed if there is a commitment to do so on the part of policymakers and educators. By devoting resources to facilitate out-of-school computer access, promoting better training and support networks for teachers, and developing effective technology use for English language learners, we can help ensure that all students have access to enhanced academic preparation through effective use of technology.

For Further Reading

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UNIVERSITY OF CALIFORNIA

ALL CAMPUS CONSORTIUM ON

RESEARCH FOR DIVERSITY

Jeannie Oakes, Director

Daniel Solorzano, Associate Director

1041 Moore Hall
Box 951521
Los Angeles, CA 90095-1521

310-206-8725 Office
310-206-8770 Fax
ucaccord@ucla.edu

www.ucaccord.org