



The Effect of Technology on Student Science Achievement

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ABSTRACT

Empirical data from the 2000 National Assessment of Education Progress (NAEP) in Science will be analyzed to determine the effects of technology on student science achievement.

Research has shown that technology has had little effect on raising student achievement. Little empirical evidence exists however, that examines the effects of technology as a tool to improve student achievement by developing higher order thinking skills. Prior studies have also not focused on the manner in which the technology is being used in the classroom to enhance teaching and learning.

The method of analysis for this study is a path analysis using the student's scaled score of twelfth grade students on the 2000 NAEP Science Assessment as the ultimate exogenous variable. Preliminary results indicate that the way in which technology is used in the classroom has significant direct and indirect effects on student achievement.

INTRODUCTION

The issue of technology implementation and its effect on student achievement has received much publicity. As schools are being held more accountable for meeting state and national standards through their performance on standardized tests, the focus on improving student achievement through technology becomes an even greater issue. The question arises, "What factors impact the effectiveness of technology as a tool to raise student achievement"? Archer (1998) believes, "Computers can raise student achievement and even improve a school's climate". Levinson (2000) agrees adding, "Many factors, such as staff development, infrastructure, and effective instructional materials, influence the effectiveness of technology". Simply put, if schools are to realize benefits from education technology, teachers and students must have adequate and equitable access to hardware and network connections; states and districts must give schools the capacity to use technology well by devising a thoughtful technology plan and offering adequate teacher training and technical support; and teachers and students must use technology in effective ways (Jerald 1998). The following paragraphs will address each factor with emphasis on effective use.

Accessibility to technology must be addressed when measuring technology's effect on student achievement. According to Skinner (2002), "Nationally, in 2001, there were just over four students to every instructional school computer, and the number of students per Internet-connected computer in schools dropped from 7.9 in 2000 to 6.8 in 2001". While these numbers are not uniform between students in high-poverty and low-poverty schools, the gap between the two is narrowing. Approximately 94 percent of the high poverty schools were wired compared to 98 percent of all public schools (Skinner, 2002). Besides accessibility and connectivity at school, students' accessibility to technology at home is noteworthy. According to Skinner (2002), "School is filling a void for kids whose families can't afford, or for other reasons don't have, the Internet at home".

A second important factor in evaluating the effectiveness of technology is both the availability and type of staff development. Trotter (1999) reports that nearly four out of every ten teachers who do not use software for instruction say they do not have enough time to try out software and do not have enough training on instructional software. K-12 experts agree that the biggest impediment to teachers' ability to learn and use technology integration strategies is time – often there are simply not enough hours in the day or days in the year for teachers to become techno-wizards (Sandham 2001). Skinner (2002) found that staff development is not as high a funding priority as hardware – accounting for only 14 percent of school technology spending in 2001 while hardware accounted for two-thirds of spending and software spending remained at 20 percent. Fatemi (1999) found that training on "integrating technology into the curriculum" was more helpful to teachers than training in "basic technology skills".

The third and most important factor to consider in studying the effects of technology on achievement is effective use. Disparities about how the computer is used for instruction are again lining up along ethnic, achievement, and language lines. The percentage of schools where a majority of teachers use computers daily for planning or teaching rose slightly across schools overall, but remained flat in schools where more than half the students are members of racial or ethnic minorities (Skinner 2002). "A NCES study last year found that 45 percent of teachers in schools that served predominantly minority students used computers or the Internet for instruction during class as compared with 56 percent of their colleagues in schools with few minority students. Schools targeted for poor performance are dealing with other issues. Technology is last on the totem pole" (Reid 2001). Smerdon, et al, (2000) concur with the following findings:

1. "Teachers in lower minority enrollment schools were generally more likely than teachers in the highest minority enrollment schools to assign students to use technologies for multi-media presentations and CD-ROM research.
2. Teachers in schools with smaller proportions of minority enrollments were more likely to use computers or the Internet for Internet research than those in schools with higher proportions of minority enrollments".

Equally disturbing is the evidence that teachers of students with different ability levels are also using the computer differently. Manzo (2001) reports that in most places the general application of technology with low-achieving students is for "drill and practice" in academic skills. Becker (2000) also states, "Teachers of low-achieving classes use substantially more skills-based software, while teachers of advanced students use a mix of more sophisticated programs". What effect this use or misuse of computers has on student achievement concerns educators. Wenglinsky (1998) found that for all the investment in educational technology, there is a surprising lack of hard data on its effects

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