

REL PACIFIC ASK-A-REL RESPONSE

1:1 Computing Initiatives
March 2014

INQUIRY

How is student achievement measured in 1:1 computing initiatives?

In response to this inquiry, REL Pacific conducted a web-based search for informational resources. Reports and reviews relevant to each topic are provided.

Descriptions of the resources are quoted from the publication abstract (Abstract) or the publication itself (Introduction or Excerpt). An abstract is always provided (verbatim from the source) when available. However, if additional text in the resource provides important information not contained in the author's abstract, the additional information has also been excerpted.

SEARCH TERMS USED

One to one computing initiatives; student achievement; achievement measures; achievement measured; computer initiative

DATABASES SEARCHED

ERIC, ProQuest Education Journals, Google Scholar

Resources identified in the search are listed below. The hyperlink to each resource is provided. Descriptions of programs and articles have been reproduced verbatim from their respective websites or abstracts.

RESOURCE OVERVIEW

A REL Pacific researcher reviewed the initial search results, seeking literature on and examples of measures of achievement for one to one computing initiatives. Next, the researcher vetted results publications in peer-reviewed research journals. Criteria were then expanded to include reports, papers, guides, and reviews in non-peer reviewed sources to expand the list of available resources. Preference was given to sources published in the past 5 years. Resources included also had to be available online and in English.

RESULTING ARTICLES

1. Alberta. Alberta Education. School Technology Sector. (2010). *Emerge one-to-one laptop learning initiative: Final report*. Report prepared by the Metiri Group and the University of Calgary for Alberta Education, School Technology Branch. Retrieved from <http://education.alberta.ca/media/6343889/emerge%20final%20report%202010-10-17.pdf>

Source: Google Scholar

REL Pacific Ask-a-REL Response: 1:1 Computing Initiatives

Executive Summary (excerpted from pp. i & ii): The Emerge One-to-One Laptop Learning Project (Emerge) was established in 2006 by Alberta Education to investigate the efficacy of laptops for teaching and learning in the 21st Century. Alberta Education used a competitive process in 2007 to award three-year grants to 20 jurisdictions, involving 50 schools. Each of the 20 jurisdictional grantees selected a specific target population, or 21st Century Skill set, as a focus for their three-year grant award. Many of the Emerge jurisdictions focused on a common set of 21st Century Skills such as critical thinking, collaboration, global awareness, or information and communication technology (ICT).

The Emerge jurisdictions deployed one-to-one laptop learning at specific grade levels or with specific student populations within their targeted schools. None of the Emerge programs were school-wide deployments. While in some Emerge programs the laptops followed the students (for as long as those students were enrolled in the host school), other jurisdictions made the decision to keep the laptops at specific grade levels, which meant new groups of students in the program each year.

. . . the evaluation collected data from surveys of teachers, administrators and project lead from each jurisdiction; data from annual site observations in each of the 20 jurisdictions; and observations at Emerge events. Data were then analyzed, triangulated, and reported in the fall of 2007 as baseline, and repeated again in the spring of 2009 and 2010 for trends.

2. Bebell, D.; O'Dwyer, L. M. (2010). Educational outcomes and research from 1:1 computing settings. *Journal of Technology, Learning, and Assessment*; 9(1), 16. Retrieved from <http://www.eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=EJ873675>

Source: ERIC, ProQuest Education Journals

Abstract: Despite the growing interest in 1:1 computing initiatives, relatively little empirical research has focused on the outcomes of these investments. The current special edition of the *Journal of Technology and Assessment* presents four empirical studies of K–12 1:1 computing programs and one review of key themes in the conversation about 1:1 computing among advocates and critics. In this introduction to our 1:1 special edition, we synthesize across the studies and discuss the emergent themes. Looking specifically across these studies, we summarize evidence that participation in the 1:1 programs was associated with increased student and teacher technology use, increased student engagement and interest level, and modest increases in student achievement.

Excerpt (p. 7): Suhr et al. reported on a two-year study of upper elementary classrooms where 1:1 students outperformed non-laptop students on English Language Arts (ELA) assessments. Similarly, Shapley et al.'s study of Texas' 1:1 laptop pilot investigates the extent to which a sample of middle schools successfully implemented a 1:1 program as well as the relationship between the implementation strength at the school, teacher, and student levels and students' reading and mathematics achievement. Bebell and Kay's study also investigated the implementation of a state pilot 1:1 program using students ELA and math achievement as one of many outcome measures.

- Gulek, J. C., & Demirtas, H. (2005). Learning with technology: The impact of laptop use on student achievement. *The Journal of Technology, Learning, and Assessment*, 3(2), 1–38. Retrieved from <http://ejournals.bc.edu/ojs/index.php/jtla/article/view/1655>

Source: Google Scholar

Abstract: Rapid technological advances in the last decade have sparked educational practitioners' interest in utilizing laptops as an instructional tool to improve student learning. There is substantial evidence that using technology as an instructional tool enhances student learning and educational outcomes. Past research suggests that compared to their non-laptop counterparts, students in classrooms that provide all students with their own laptops spend more time involved in collaborative work, participate in more project-based instruction, produce writing of higher quality and greater length, gain increased access to information, improve research analysis skills, and spend more time doing homework on computers. Research has also shown that these students direct their own learning, report a greater reliance on active learning strategies, readily engage in problem solving and critical thinking, and consistently show deeper and more flexible uses of technology than students without individual laptops.

The study presented here examined the impact of participation in a laptop program on student achievement. A total of 259 middle school students were followed via cohorts. The data collection measures included students' overall cumulative grade point averages (GPAs), end-of-course grades, writing test scores, and state-mandated norm- and criterion-referenced standardized test scores. The baseline data for all measures showed that there was no statistically significant difference in English language arts, mathematics, writing, and overall grade point average achievement between laptop and non-laptop students prior to enrollment in the program. However, laptop students showed significantly higher achievement in nearly all measures after one year in the program. Cross-sectional analyses in Year 2 and Year 3 concurred with the results from the Year 1. Longitudinal analysis also proved to be an independent verification of the substantial impact of laptop use on student learning outcomes.

- Hanover Research Council. (2010, March). The effectiveness of one-to-one laptop initiatives in increasing student achievement. *District Administration Practice*. Washington, DC: The Hanover Research Council. Retrieved from <https://techsvcweb.madison.k12.wi.us/files/techsvc/The%20Effectiveness%20of%20One-to-One%20Laptop%20Initiatives%20in%20Increasing%20Student%20Achievement.pdf>

Source: ERIC, ProQuest Education Journals

Abstract: In this report, the Hanover Research Council provides a review of seven major studies designed to measure the impact of one-to-one laptop initiatives on student achievement, with particular emphasis placed on the areas of reading and writing. Throughout the report, we pay particular attention to evidence that suggests that participation in such programs also increases achievement for students of low socioeconomic backgrounds.

5. Penuel, W. R. (2006). Implementation and effects of one-to-one computing initiatives: A research synthesis. *Journal of Research on Technology in Education*, 38(3). Retrieved from https://www.chatsworth.com.sg/uploaded/PDF_Forms/PDF_Images/implement-PBL.pdf.

Source: ERIC, ProQuest Education Journals

Abstract: There are now a large number of initiatives designed to make laptops with wireless connectivity available to all students in schools. This paper synthesizes findings from research and evaluation studies that analyzed implementation and effects of one-to-one initiatives from a range of countries. Factors related to successful implementation reported in the research include extensive teacher professional development, access to technical support, and positive teacher attitudes toward student technology use. Outcome studies with rigorous designs are few, but those studies that did measure outcomes consistently reported positive effects on technology use, technology literacy, and writing skills.

Excerpt (p. 330): In this paper, we provide a definition of one-to-one computing initiatives and a theoretical framework that elaborates on their potential for improving teaching and learning, as well as likely conditions for successful implementation. We then describe the methodology synthesizing findings from 30 separate studies of one-to-one initiatives. In the results section, we discuss the goals and scale of different initiatives included in the review, describe particular design features and factors that may influence teachers and overall implementation most strongly, and consider evidence of effects shown by the limited number of rigorously designed studies in the field and follow with an analysis of the untapped potential of most one-to-one studies to date. Finally, we consider in the conclusion section what is not yet known but needs to be explored in future studies of one-to-one initiatives.

6. Shapley, K., Sheehan, D., Maloney, C., & Caranikas-Walker, F. (2009). *Evaluation of the Texas technology immersion pilot: Final outcomes for a four-year study (2004–05 to 2007–08)*. Texas Center for Educational Research. Austin, TX. Retrieved from http://etcjournal.files.wordpress.com/2010/07/etxtip_final.pdf

Source: ERIC, ProQuest Education Journals

Excerpt (p. i–ii): The Technology Immersion Pilot (TIP), created by the Texas Legislature in 2003, was based on the assumption that the use of technology in Texas public schools could be achieved more effectively by “immersing” schools in technology rather than by introducing technology resources, such as hardware, software, digital content, and educator training, in a cyclical fashion over time. The Texas Education Agency (TEA) invested more than \$20 million in federal Title II, Part D monies to fund Technology Immersion projects at high-need middle schools through a competitive grant process. Concurrently, a research study partially funded by a federal Evaluating State Educational Technology Programs grant has investigated whether student achievement improved over time through exposure to Technology Immersion. The Texas Center for Educational Research (TCER) was TEA’s partner for a four-

year evaluation of the implementation and effectiveness of the Technology Immersion model. The study addressed five major research questions:

- What was the effect of Technology Immersion on teachers and teaching?
- What was the effect of Technology Immersion on students and learning?
- What was the effect of Technology Immersion on students' academic achievement?
- How well was Technology Immersion implemented, and
- What was the relationship between implementation and student academic outcomes?

... Data came from qualitative and quantitative sources. Researchers conducted site visits at each of the middle schools in fall 2004 and again in spring 2005 through 2008. For this report, we concentrated on data gathered through observations in a sample of Grades 6, 7, and 8 classrooms (English language arts, mathematics, social studies, and science). Additional measures included annual online teacher surveys and student paper-and-pencil surveys. We also gathered school and student data on a yearly basis from the Texas Public Education Information Management System (PEIMS) and the Academic Excellence Indicator System (AEIS), as well as data on student disciplinary actions from individual schools. We used three-level hierarchical linear models (HLM) to analyze immersion effects on teachers' and students' perceptions of their technical proficiencies and technology use, and the effects of immersion on students' Texas Assessment of Knowledge and Skills (TAKS) scores. HLM growth modeling estimated the effects of immersion on rates of growth for dependent variables across time (2004, 2005, 2006, 2007, and 2008). Two-level HLM models were used to analyze associations between the strength of implementation and students' TAKS achievement.

Excerpt about Effects on Academic Achievement (p. vi–vii):

Technology Immersion had no statistically significant effect on TAKS reading achievement for Cohort 2 (eighth graders) or Cohort 3 (seventh graders)—however, for Cohort 1 (ninth graders), there was a marginally significant and positive sustaining effect of Technology Immersion on students' TAK reading scores. . .

Technology Immersion had a statistically significant effect on TAKS mathematics achievement for Cohort 2 (eighth graders) and Cohort 3 (seventh graders). For Cohort 1 (ninth graders), the sustaining effect of immersion on TAKS mathematics scores was positive but not by a statistically significant margin. . .

Similar to the previous year, students' use of their laptops for Home Learning—a measure of the extent to which a student used a laptop outside of school for homework in the four core-subject areas or for learning games—was the strongest implementation predictor of students' TAKS reading and mathematics scores. . .

Conclusions about the effects of Technology Immersion on TAKS social studies and science scores remain in doubt. However, outcomes for TAKS writing, which involved the administration of the TAKS assessment in traditional paper-and-pencil format, have consistently favored control students although not by statistically significant margins. . .

7. Zheng, B., Warschauer, M., & Farkas, G. (2013). Digital writing and diversity: The effects of school laptop programs on literacy processes and outcomes. *Journal of Educational Computing Research*, 48(3), 267-299. Retrieved from http://www.gse.uci.edu/person/warschauer_m/docs/dwd.pdf

Source: Google Scholar

Abstract: Over the last decade, the number of one-to-one laptop programs in U.S. schools has steadily increased. Though technology advocates believe that such programs can assist student writing, there has been little systematic evidence for this claim, and even less focused on technology use by at-risk learners. This study examined the effect of daily access to laptops on the writing outcomes and processes of 2,158 upper elementary students in two school districts, and the effect among diverse students. In a California district, students showed improved English language arts achievement in both a partial laptop program year and a full laptop program year. In a Colorado district, overall writing test score gains were not statistically significant; however in both districts, at-risk student groups (i.e., Hispanics and low-income learners) showed significant gains. In addition, survey results, interviews, and observations indicate that at-risk learners used the laptops more frequently than their counterparts at school for a variety of learning purposes. This study suggests that well-planned use of laptops and digital media can help diverse learners improve their literacy processes and outcomes.

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