

1:1 Computing

- * The Research
- * Classroom 2.0

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The Project RED Mission



- **Improving student achievement.**

Unlike other segments, public education has seen only isolated benefits attributable to technology. Project RED seeks to define technology models that lead to improved student achievement.

- **Evaluating the financial impact of technology on budgets.**

Little work has been done to show the positive financial impact of educational technology. Project RED identifies cost savings, cost avoidance, and revenue enhancements.

- **Assessing the impact of continuous access to a computing device by every student.**

Does continuous access increase education outcomes? What conditions are necessary to lead to increased academic achievement and financial benefits? What are best practices regarding technology?

Unprecedented Scope

- 997 schools, representative of the U.S. school universe
- 11 diverse Education Success Measures (ESMs)
- 136 independent variables in 22 categories
- Comparison of findings by student/computer ratios (1:1, 2:1, 3:1, 4:1, or more)
- Comprehensive demographic data correlated to survey results

Education Success Measures (ESMs)

What are the outcomes we wish to improve?

All Schools

1. *Fewer disciplinary actions*
2. *Lower dropout rates*
3. *Less paperwork*
4. *Lower paper and copying expenses*
5. *Higher teacher attendance*
6. *Higher test scores*

High Schools

7. *Higher AP course enrollment*
8. *Higher college attendance plans*
9. *Higher course completion rates*
10. *Higher dual/joint enrollment in college*
11. *Higher graduation rates*

Key Implementation Factors (KIFs)

Which practices improve learning the most?

- 1. *Technology-integrated intervention programs*:** Technology applications are used daily in special education, Title I, English Language Learners, and reading intervention classes.
- 2. *Principals lead 'change'*:** Leaders regularly schedule teacher professional learning and collaboration focused on technology use.
- 3. *Students' online collaboration*:** Students use technology daily for online collaboration (games/simulations and social media.)
- 4. *Technology use in core subjects*:** Teachers and students use technology weekly or more frequently in core content areas.

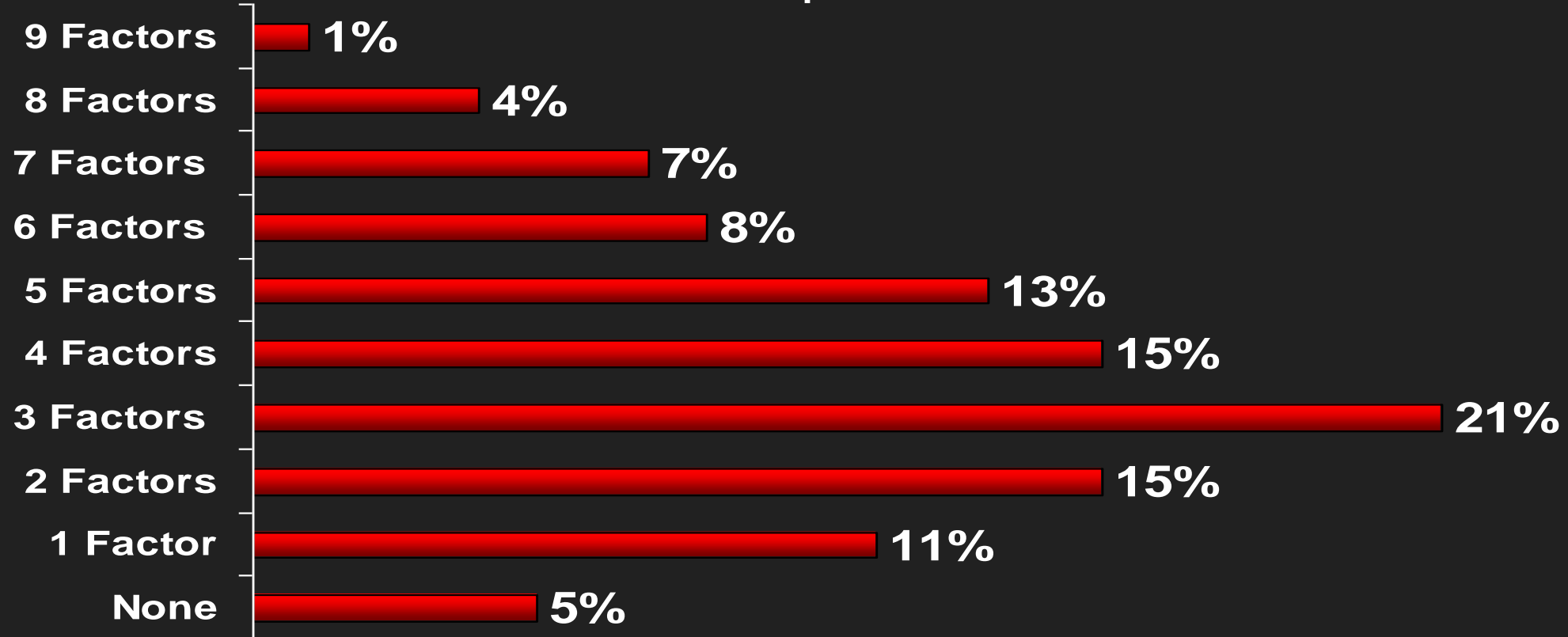
Key Implementation Factors (KIFs)

Which practices improve learning the most?

- 5. Student online formative assessments:** These assessments are used at least weekly in the instructional program.
- 6. Student/computer ratio:** Lower ratios improve outcomes.
- 7. Frequent use of virtual field trips for instruction:** Virtual field trips are a powerful teaching and learning strategy when used at least monthly.
- 8. Student use of search engines:** Daily use develops skill and personalization of learning.
- 9. Principals' professional development:** Principals are trained in teacher buy-in, best practices, and technology-transformed learning.

KIF - Few Schools Deploy Many

Pct. of Respondents



of KIFs in Use

Key Finding

Using Technology KIFs saves money

- Most discussions focus on the high costs of technology, not the potential for savings.
- Project RED shows that properly implemented technology can provide immediate short-term savings at all levels.
- For example, LMS features can reduce copy machine and bubble sheet expenses (through the switch to online formative assessment).
- To the extent that school systems are willing to change practices and states are willing to change policy, the savings can grow substantially over time.
- For example, longer-term state-level savings can come from reduced dropouts and dual/joint enrollment.

The projected savings in 13 areas average \$448/student/year.

Key Finding

1:1 schools employing KIFs outperform all schools

- All schools benefit from technology, with more benefits in 1:1 schools.
- A 1:1 student/computer ratio has a higher impact on student outcomes and financial benefits than other ratios, and the key implementation factors (KIFs) increase both benefits.
- In general, schools with a 1:1 student/computer ratio outperform non-1:1 schools on both academic and financial measures. The lower the student/computer ratio, the better the student outcomes.
- Performance of all schools can be improved by adherence to known best practices.
- Technology is deployed and incorporates the top four key implementation factors.

Key Finding

The principal's ability to lead change is critical

- The impact of a good principal has been widely documented. Project RED shows that **the principal** is the single **most important variable** across many of the 11 ESMs.
- Change leadership training for principals involved in large-scale technology implementations is of paramount importance.
- When principals receive specialized training and technology is properly implemented, the benefits increase even more.
- The goal is systemic change, not dependent on an individual, so collaboration at all levels from building level administration, supt. and school board to classrooms is key.

Key Finding

Technology-transformed Intervention improves learning

- Technology-transformed interventions (ELL, Title I, special ed and reading intervention) are the top-model predictor of improved high stakes test scores, dropout rate reduction, and improved discipline.
- The only other top-model predictor for more than one ESM is the student/computer ratio, with lower ratios (1:1) being preferable.
- A student-centric approach enabled by technology allows students to work at their own pace and teachers to spend more time with individual students and small groups.

Key Finding

Online collaboration increases student engagement

- Web 2.0 social media substantially enhance collaboration productivity, erasing the barriers of time, distance, and money.
- Collaboration can now extend beyond the immediate circle of friends to include mentors, tutors, and experts worldwide.
- Real-time collaboration increases student engagement, one of the critical factors for student success.
- One result of increased engagement and buy-in is a reduction in disciplinary actions.
- Online discussion boards and tutoring programs can extend the school day and connectivity among learners and teachers.

Key Finding

Daily use of technology delivers the best ROI

- The daily use of technology in core classes correlates highly to the ESMs.
- Daily technology use is one of the top five indicators of better discipline, better attendance, and increased college attendance.



Dropout Reduction Benefits

- Dropouts have the highest financial impact of any of the variables discussed in this report.
- The number of Project RED schools reporting a reduction in dropouts due to technology jumps to 89% when key implementation factors (KIFs) are employed.
- A student who graduates from high school generates \$166,000 to \$353,000 in increased tax revenues compared with a dropout over a career of 40 years.
- A student who graduates from high school and then graduates from college generates \$448,000 to \$874,000 in increased tax revenues compared with a dropout over a career of 40 years.

Why a 1:1

The demands of the world are changing. What students experience outside the classroom walls are very different from what you and I experienced. I am very fond of Dr. Mark Edward's quote that "we have to prepare the students for their future and not our past".

When students are outside of school they are constantly connected. If they want an answer to something they turn to Google or ask Siri. But we have traditionally taken those tools out of their hands when they walk into the school. Information is everywhere and is easily accessible. Instead of forcing our students to memorize specific pieces of information we need to teach our students how to find the information, analyze and process the information, and apply the information.

Is it important that our students know the exact date of the Battle of Gettysburg or is it more important that they understand the significance of the battle?

Three Competing Versions of Educational Technology

1. Using the computers to benefit the system
 - Data collection
 - Drill and Practice/Test-Prep
 - Computerizing traditional assessments
 - Monitoring Common Core Compliance

Three Competing Versions of Educational Technology

2. Using computers to benefit the teachers

- SMART Boards for presentation and whole class simulation
- Papers are written in a word processor making them easier to read and grade
- Students are taken to the computer lab while the teacher grades papers or does lesson prep
- Tests are graded electronically

Three Competing Versions of Educational Technology

3. The computer is used to “amplify human potential”
 - Using the computer as an “intellectual laboratory”
 - Using the computer to learn and do in ways that are not possible but in a 1:1
 - Putting the learner at the center of the educational experience and allowing him/her to learn in the way they are best suited
 - Moving “homework” to the classroom and the lesson outside of the classroom
 - Allowing for true collaboration anytime and anywhere

Which vision is the correct vision?



Which one is the correct vision?

- Number 3 with a sprinkling of 1 and 2
 - A 1:1 environment will change the system and if done correctly it will be a benefit to the system
 - A 1:1 environment can make it easier for the teacher to grade assessments and assignments
 - To have success that cannot be achieved in a traditional environment instruction has to change to leverage the 1:1
 - Depth and breadth of a topic
 - Student centered with instructors facilitating
 - Personalized and individualized learning
 - Project/Problem/Inquiry based learning
 - Applying the knowledge so connections to the content can be made by the learner

Pillars of a Successful 1:1 Initiative

- It is a learning initiative with broad support
 - The board and superintendent must be behind the initiative
 - The principal must be willing to act as a change agent
 - The parents and students need to be informed why it is an important initiative
 - Understand that there will be people on both sides of the issue and have responses ready for both sides
- An emphasis is placed on professional development
 - To respond to digital learners teachers must transform into digital teachers
 - PD on the laptop is important, but just the start
- A robust infrastructure is in place

Pillars of a Successful 1:1 Initiative

- Students are taught to be good digital citizens
- The 1:1 classrooms offer choices in how students learn a topic
 - Do not implement a 1:1 and then do things the exact same way you could with paper and pencil
 - Have a learning management system in place
- The district understands the changes will happen over time and has the patience to see it through
- Careful thought is given to sustainability
 - Do not low ball your cost estimate
 - Remember to include the costs of software and web applications

What the Research Says

- Students in a 1:1 environment consistently outperform non-laptop students in all subject areas on standardized state assessments. *(Suhr, K.A. et al, Journal of Technology, Learning, and Assessment, 9 (5), 2010)*
- The paradigm shift resulting from 1:1 computing fostered more higher-order reasoning and critical analysis skills among students and greater teacher-student collaboration around instructional tasks. *(Weston, M.E. & Bain, A., Journal of Technology, Learning, and Assessment, 9(6), 2010)*
- Teacher practices generally changed to accommodate the opportunities of increased technology access in a 1:1 computer setting, leading to more problem-based or project-based learning activities; but the change takes time—up to two years, typically. *(Shapley, K.S. et al, Journal of Technology, Learning, and Assessment, 9(4), 2010)*

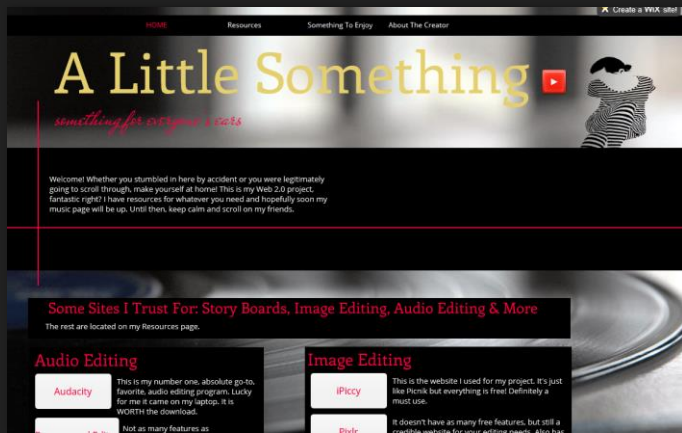
Research

- Teachers report students are "more engaged learners" as a result of 1:1 implementation and enjoy using multimedia applications, searching the Internet for instructional purposes, writing papers, and preparing presentations. *(Babell, D., & Kay, R., Journal of Technology; Learning, and Assessment, 9(2), 2010; Project RED Key Findings, ISTE Presentation, 2010)*
- Student access to and use of technology was consistently found to be a positive predictor of student reading and math scores on academic achievement tests. *(Shapley, K.S. et al, Journal of Technology, Learning, and Assessment, 9(4), 2010)*
- Students graduating from 1:1 high schools outperformed non-laptop students in terms of 21st-century skills needed to be successful in the workplace and post-secondary educational opportunities. *(Lemke, C. & Martin, C., One-to-One Computing in Maine: A State Profile, 2003; Partnership for 21st Century Skills and Citizen Schools, 2006)*

Tools to Use in a 1:1 Classroom

- LMS (MOODLE, Blackboard, Angel)
- LMS Plugins
- Turnitin.com
- Video Repositories
- Kahn Academy
- Presentation and Slideshow
- Digital Story Telling
- Collaboration
- Timelines
- Digital Portfolios
- Drawing and Painting
- Movie Makers
- Surveys and Polls
- Infographics
- Audio Tools
- File Sharing
- Screen Capture
- Website Creation (In any class)
- Bookmarking
- Organization Tools

Examples of Student Work



14. Slope of a curve at a point and tangent lines

How to find the tangent line
 $y(x) = x + 1$ (2,3)

Finding the Slope of a Graph

Example 1
 Determine the slope of the graph of $3(x^2 + y^2) = 100xy$ at (2,3)

Step 1. Find the derivative of the curve
 $y(x) = 2x$

Step 2. Evaluate the derivative at the point given
 $x = 2$
 $y'(2) = 4$
 $m = 4$

Step 3. Evaluate the derivative at the point given
 $y - 3 = 4(x - 2)$
 $y = 4x - 5$

$\frac{d}{dx}[3(x^2 + y^2)] = \frac{d}{dx}[100xy]$
 $3(2)(x^2 + y^2) + 2x + 2y \frac{dy}{dx} = 100[x \frac{dy}{dx} + y(1)]$
 $12y(x^2 + y^2) \frac{dy}{dx} - 100x \frac{dy}{dx} = 100y - 12x(x^2 + y^2)$



Classroom Management Tips

- MBWA – Management by walking around
- Anchor activities
- Classroom arrangement
- Differentiate
- 45 degree lids
- No such thing as free surfing time

Questions

