Chapter 9 Research and Evaluation: Creating a Cycle of Improvement

Chapter Introduction by Saul Rockman

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Research and evaluation often start with a desire to get evidence that you're achieving great results, but the real need is often to understand which strategies led to success and which didn't. This is information you can use to improve the program and see the changes continue and grow over time.

Research begins with questions—it takes you back to your vision of success. What are you trying to do? What are the best ways to do it? If you do it, what difference will it make? How will you know if you've made a difference? Policymakers, administrators, teachers, and other stakeholders will have different research expectations depending on what decisions they are asked to make, so you'll want to shape the questions to meet the needs of each set of stakeholders.

Planning research should involve input from both stakeholders and participants. Teachers are critical to success and should be part of the planning effort. These research planning discussions not only can provide ideas for research questions and implementation strategies, but also help enable teachers to own the impact and start to see the opportunities in the new initiative. Parents and other stakeholders can also provide valuable input on criteria.

Once you have the questions, think about what data would be compelling and useful to answer them. Test scores are a safe way to judge program success, but they may not tell you anything useful. Look beyond test scores to identify criteria that are relevant to your goals and will give you a well-rounded portrayal of successes and challenges. Indicators of success might include student attendance, entries in the science fair, parent reports, and teacher satisfaction and retention. There are lots of ways of looking at important effects that provide meaningful insights into how a school works and how effective the program is.

How will you collect data if you're not already gathering it? Build on what you're already doing. Schools have a lot of information about disciplinary referrals, teacher turnover, grades, test scores, professional learning, etc. There's no single methodology or common metric for all educational technology initiatives. It will depend, again, on your goals and your stakeholders' objectives.

Use the results to drive further progress. Consider issuing your "final" report at the midpoint. Schedule review sessions or community meetings to discuss findings and plan next steps. This can involve everyone in interpreting the data, planning what to do next, and creating a cycle of improvement.

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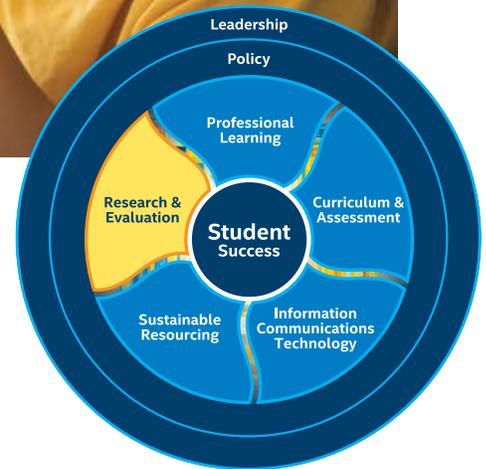
Measuring and Building on Success

How well is your educational technology initiative working? Are you achieving the results you expected? If not, do you have clear evidence of what changes can move the initiative closer to its objectives?

Evaluating your initiative and conducting specific research activities can help provide valid, credible answers to these and other questions. Just as next-generation learners must identify meaningful data, analyze it, and respond appropriately, so next-generation learning cultures must model these same abilities through a commitment to rigorous, reliable, and valid research and evaluation of education programs.

Research and evaluation provide a basis to address any weaknesses, achieve your program goals, and extend your success. These processes and the resulting evidence can help you:

- Celebrate successes and identify areas where further investments, policy modifications, or other changes may be needed
- Identify effective approaches and resources
- Create a cycle of continuous improvement by increasing accountability and enabling a positive feedback loop
- Build capacity and skills to enhance evidence-based decision-making, budget planning, and resource allocation
- Secure continued funding by demonstrating success

Research and evaluation ideally begin with the initiative's early planning and goal-setting. They include the following steps and stages:

- Develop measurable goals
- Agree on meaningful indicators of progress toward goals
- Gather evidence of progress
- Use the results to build further success

Early Planning

The critical question for an educational technology initiative is: Are we improving learning outcomes and achieving the other goals we established? Answering this question requires first establishing how fully and how well the program has been implemented, and then agreeing on effective indicators of success. This latter step can be one of the most challenging of an educational technology initiative, but also one of the most meaningful. It takes you to the central matter of what success looks like, and it ideally starts with the program's initial goal-setting activities. Setting clear, measurable objectives for the initiative early in the planning process helps stakeholders:

- Gain clarity and agreement about the vision of success
- Establish evaluation criteria and success indicators during the initial stages
- Collect relevant data as the program proceeds, rather than attempting to justify the impact after the fact

Stakeholder Involvement

Research and evaluation should answer real-world questions and provide practical value to a wide range of stakeholders. Since different stakeholder groups will have different sets of questions and concerns, it is wise to involve groups such as teachers, students, administrators, policymakers, parents, and community members in the research planning. Working together, stakeholders can identify what data will:

- Show that the program is meeting its goals
- Show which aspects of the program are working well and help identify any weaknesses
- Empower stakeholders to make more evidence-based decisions about the program's next steps

Broad participation can:

- Strengthen the research and evaluation by incorporating multiple viewpoints and areas of interest
- Build consensus on how to assess the initiative and its progress
- Help identify valid indicators of the initiative's impact
- Increase the likelihood that recommendations resulting from the research will be embraced and acted upon
- Increase data literacy and build expertise in planning a research project, analyzing data, and interpreting results

Scope and Timing

A typical educational technology initiative unfolds over three to seven years or longer depending on its scope and scale. While equipping students with mobile technologies can be accomplished fairly quickly, changes to teaching practice, curriculum, and assessment will unfold and deepen over a longer period. Even within a single school system, different schools and teachers will advance at varying rates, depending on matters such as effective leadership, support, and culture. The impact on student learning, equity, and other goals can take even longer to become apparent, and often continues to build over a more extensive period time.

Viewing research and evaluation as an ongoing process reflects this reality. Ongoing research and evaluation can map to the major tasks of an educational technology initiative and provide valuable feedback to build continued success. Effective research and evaluation aims for:

- Continuous monitoring and reporting over the lifetime of the initiative and beyond
- Periodic evaluation and reporting at major milestones and intermediate stages
- Summative review(s) and reporting at the end
- Follow-up studies to see if results are sustained

A phased approach also helps clarify what you're actually evaluating. Have you simply provided laptops and tablets, or have you significantly advanced your school system in a holistic fashion across all aspects of the Intel® Education Transformation Model? Have teachers been provided with organized, ongoing professional learning, resources, and time to advance their teaching practice, or expected to figure it out for themselves? The research results will reflect those differences.

Evidence and Indicators of Success

A phased approach to research and evaluation enables stakeholders to align the research questions with the schedule and objectives as the initiative moves forward. These generally occur in three stages:

- **Implementation.** How well are we implementing the program?
- **Results.** How are learning and teaching changing?
- **Impact.** What improvements are we seeing in areas that are relevant to the goals of the initiative?

Discussion of the tasks and goals of each stage leads to further questions that the research can be designed to answer. In effective initiatives, this involves stakeholders working together to:

- Identify useful research questions targeted to the goals of the initiative
- Develop a set of success indicators that, taken together, will provide valid, relevant, and credible answers to the research questions

The examples in Tables 9.1 and 9.2 can provide a starting point for stakeholder discussions. Table 9.1 addresses aspects of program implementation, including not only technology basics, but also broader elements such as policy, curriculum, and assessment. Table 9.2 deals with longer-term results and impacts. Both tables suggest possible indicators of success for an educational technology initiative depending on its scope, scale, and focus.

Program Implementation. Examples of Goals, Questions, and Indicators of Success

Goal/Vision	Questions	Indicators of Success
Students and teachers have ubiquitous access to effective devices and infrastructure for learning and teaching	How well are we implementing our technology plan?	• Project adherence to the implementation schedule • Number and types of devices deployed • Sustainable funding plan in place, including a plan for device refresh
	Are devices suitable for learning and teaching?	• Number of times students use their mobile devices for learning per day, week, or class • Numbers of students and teachers reporting that their devices let them do what they need to do (create multi-media content, connect to the Internet, engage in video conferences, etc.) • Number of applications, tools, and content resources deployed • Number of students and teachers reporting they have the appropriate applications and software to support the curriculum • Number of students using the devices in new ways, not a substitute for pencil and paper in dedicated computer time • Number of students finding and using new, free resources from the web
	Have we created a secure, robust environment for learning and teaching?	• Number of access points deployed • Percent of school grounds covered by high-speed broadband • Number of times per week network bandwidth exceeds an established percent of peak load • Number of students, teachers, and staff trained on security best practices • Speed at which security patches and virus updates are applied to all student and teacher devices • Number and seriousness of security breaches • Number of cloud services acquired or created
The school system aligns to support full and effective use of digital resources	To what extent have we aligned policies, professional learning, curriculum, assessment, and the school culture to enable next-generation learning and teaching?	• Time spent on professional learning by teachers and principals • Number of teachers and principals rating professional learning activities as valuable or extremely valuable • Extent to which professional learning focuses on integrating technology into the curriculum, not on technology itself • Number of teachers active in effective online learning communities • Number of high-quality curriculum frameworks, digital content, applications, tools, and other resources developed or made available • Number of new assessment tasks designed • Number of policies reviewed and updated • Compliance with new policies
Teachers incorporate ICT into next-generation learning experiences	To what extent are learning and teaching practices changing? Is ICT being used in second-order usage models such as collaborative learning and personalized learning?	• Number and frequency of teachers integrating technology into their curriculum and teaching in new ways • Percentage of teachers who are enthusiastic about the change process and working toward second-order change • Number, frequency, and types of applications, digital resources, and usages by students and teachers per week or month • Number and complexity of project-based and inquiry-driven assignments • Percent of time students work independently or in small groups • Number of collaborations with external experts or peers • Number of times per month teachers use formative assessments • Number of teachers reporting use of flipped learning or other next-generation learning models • Frequency with which teachers use adaptive software and other tools to deliver a more personalized learning experience • Frequency of students using new methods to demonstrate 21st century transversal skills

Table 9-1

Results and Impact. Examples of Goals, Questions, and Indicators of Success

Goal/Vision	Questions	Indicators of Success
Students gain the skills, attitudes, and abilities to thrive in schools, careers, and society and achieve their fullest potential	How is the school culture changing? Are we engaging students in an active learning community?	• Higher levels of student engagement • Higher rates of attendance and graduation • Fewer behavior problems • More frequent communication with parents • Greater parental involvement • Higher teacher satisfaction
	What changes are we seeing in student outcomes?	• Higher scores on tests of achievement in core academic subjects • Higher scores on tests of STEM skills and achievement • Higher scores on tests, artifacts, and project-based assessments demonstrating mastery of critical thinking, analysis, communication, and other 21st century transversal skills • Higher graduation rates • Fewer post-secondary students needing to take remedial courses
	Is our initiative helping to improve equity?	• High-quality resources provided to all students • Broadband extended to homes, libraries, community centers • More girls enrolled in school • More girls taking STEM classes • Higher levels of achievement among the lowest quartile of students • Smaller gaps in achievement between highest and lowest performing students • Smaller gaps in achievement between genders, particularly in STEM subjects • Higher graduation rates
	Are we having an impact on our economy and society?	• Higher graduation rates • More students, parents, employers, and professors saying graduates are well prepared • Higher rates of youth employment • Jobs growth in targeted segments

Table 9-2

Data Sources and Methods

Evaluation methods for an educational technology initiative should match the goals, objectives, and budget of the research and evaluation project. Most school systems are already producing a variety of data that can provide a starting point for data collection. This typically includes information such as:

- Grades
- Student results on standardized tests
- Enrollment and attendance
- Professional learning activities
- Equipment usage

The data produced by new management systems can provide additional insights. These include:

- Adaptive management software
- Learning management systems
- Classroom management software
- Human capital management systems
- School performance management systems

Additional data collection is important to supplement these systems and gain a fuller picture of an initiative's functioning, results, and impact. Quantitative survey of students, teachers, parents, and administrators are generally inexpensive, and the results are easy to analyze. Qualitative methods are often more difficult and time-consuming to analyze and draw conclusions from, but can provide valuable insights into how students and teachers are using digital resources and how student outcomes are changing as a result. Classroom observations and teacher reports can be especially useful in understanding changes in areas such as student engagement, collaboration, independent learning, and personalized learning. Qualitative methods can include:

- Interviews with students, teachers, and parents
- Surveys that elicit non-numerical responses
- Classrooms observations
- Analysis of sample lessons, student projects, and student artifacts
- Focus groups

Large-scale, long-term initiatives can gain a broader perspective through surveys of graduates, local employers, and post-secondary schools.

Action Research

In addition to formal evaluation, action research projects can provide evidence-based answers to real-world questions posed by teachers, curriculum specialists, and other education participants. In an action research project, teachers and other practitioners investigate elements of their own teaching practice or their students' learning. Action research projects can be valuable in understanding and furthering the impact of changes to learning and teaching. Action research also cultivates a "research mind," building analytic expertise and furthering the organization's ability to make evidence-based decisions.

Do You Need an Outside Evaluator?

For a large-scale initiative, a well-qualified external research partner can enhance objectivity and provide the benefit of experienced, independent viewpoints. An external collaborator can also contribute new perspectives and broader experiences. If your initiative is at all controversial or is occurring within a highly politicized environment, research conducted by an outside organization can give the results more credibility in the eyes of stakeholders. External evaluation may be required by some granting agencies or legislation. See *Case Study: Evaluating Progress and Furthering Success in Macedonia,* for a summary of a study conducted for the government of Macedonia by Intel® Education and SRI International.

If you decide to use an outside evaluator, look for consultants that take a customized approach designed for your goals and your stakeholders. Expect to stay closely involved, so the evaluation is collaborative and the results are meaningful to stakeholders.

Research and Evaluation Implementation Checklist

Key Tasks

- Develop a plan for evaluating the initiative's success and conducting research to establish evidence-based practices
- Use the results of your research and evaluation to improve your initiative, create a cycle of continuous improvement, and build capacity

Steps to Success

Planning the Research and Evaluation Project

- As soon as stakeholders have agreed upon goals for the overall initiative, establish a research and evaluation team and start to identify measurable metrics you can use to track progress. Establish your measurement and questioning strategies as you plan the initiative, not as an afterthought.
- To ensure the research and evaluation provides practical value, design research and evaluation activities to identify and answer the important questions and concerns of each stakeholder group. Use research and evaluation to:
  - Identify and celebrate successes
  - Identify areas for improvement and understand what changes are needed
  - Make funding decisions based on evidence of effective approaches
  - Build data literacy and a culture of improvement
- Invite all stakeholder groups, including students, into the research process. Participatory evaluation can produce a more robust study, develop consensus, and increase data literacy throughout the system.
- Plan an ongoing research project with periodic data collection, reporting, and discussion of results. Follow a logical path that ties back to your program objectives, and develop a roadmap of measurements that will be relevant as the program moves forward.
- Start with a zero-based budget for research and evaluation based on questions you want to answer.
- Consider working with an outside evaluation partner or research organization to gain an independent assessment of the initiative's results and impact. If you work with an evaluator, look for experienced, ethical, and collaborative organizations and individuals who are compatible with your school culture and attentive to your needs.

Creating a Measurement Plan and Collecting Data

- Build a measurement plan that will provide valid, relevant evidence to understand what aspects of the initiative are working well and design changes as needed.

- Match research evaluation methods to the intended purpose, and use a mix of data-gathering methods.

- As you create your measurement plan, determine what data you're already collecting and how you will gather data to support the new performance indicators. Use simpler, quantitative methods for most purposes, and save more expensive, qualitative methods for specific, narrowly defined purposes. If you use samples, make sure they are random.

- Use data from existing learning management, human resource management, and school performance management systems where possible. As you select these types of system, make sure they offer good data collection and reporting capabilities.

- To gauge long-term success at the state or national level, consider working with postsecondary schools and employers to gather data that can help you assess graduates' aggregate success.

- To reduce the costs of data gathering, consider training parent or student volunteers or university interns.

- Encourage interested educators to conduct action research projects.

Reporting and Using the Results

- Thoroughly review your findings with the planning team. Develop a roadmap and milestones to address any areas that need improvement.

- Communicate throughout the research and evaluation process with teachers, students, parents, community groups, funders, and other stakeholders. Engage in regular reviews and meetings, and create project newsletters, web sites, and other content to highlight ongoing activities and successes. Since different stakeholder groups have different research questions, modify your communications to match each group's interests and concerns.

- Use your research and evaluation to build support and secure continued funding. Demonstrate and communicate success, and enlist stakeholders in exploring and understanding results and planning for further advances.

- Build capacity by publishing and presenting at education conferences. This can reward and energize your own teachers and staff, and expand understanding of evidence-based instructional strategies.

CASE STUDY

Evaluating Progress and Furthering Success in Macedonia

In 2008, as part of its goal of creating a knowledge-based economy, the government of Macedonia committed to distribute Intel® Education solutions to all students in grades 1-3 and desktop computers to students in grades 4-8. The government specifically sought to increase the use of ICT in learning and teaching, and increase ICT literacy.

Macedonia faced numerous challenges in implementing its initiative, including lack of electrical and network infrastructure in many areas, and a low level of ICT readiness. Only slightly more than half of Macedonia's households possessed a computer, so many teachers were not familiar with using technology.

Intel was among the organizations serving as advisors to the program's planners, and Intel commissioned a study with local researchers to explore the initiative's successes and challenges. The researchers identified significant results after nearly three years:

- Macedonia's teachers are improving student outcomes by integrating ICT in primary school classrooms nationwide. All teachers interviewed for the research indicated that they use ICT in instruction at least once per week in all subjects.

- Professional learning for teachers has scaled over time, leading to much higher rates of ICT literacy and greater use of ICT in classrooms.

- After initial delays, wireless Internet and intranet have been made available in all classrooms, including every lower primary classroom in the country.

The research team also identified areas for improvement. These include:

- Greater outreach to parents to emphasize that mobile devices are important learning tools

- Establishment of clear lines of oversight

- Continued focus on professional learning

- Continued development of educational content, applications, testing software, and other tools in the local languages

Note: This report is based on original data collection and analysis by local researchers in collaboration with Intel and SRI International (SRI). Original research conducted by Petar Nikoloski and Olga Samardzic. See Nikoloski and Samardzic, *Examining the Computer for Every Child Program in Macedonia,* 2012. http://aare-apera2012.com.au/files/WERA-PAPER-Macedonia-Final.doc.

Read the research summary: http://www.intel.com/content/dam/www/program/education/us/en/documents/Intel%20Education%20Research%20Summary/intel-education-research-summary-macedonia-2012-eng-web.pdf

Learn more about Intel's research protocol: http://www.intel.com/content/www/us/en/education/evaluations/guide-to-monitoring-elearning-programs.html

Resources

- Intel® Education offers research and evaluation toolkits that include models, protocols, and instruments. See http://www.intel.com/content/www/us/en/education/education-transformation/research-and-evaluation.html and http://www.intel.com/content/www/us/en/education/evaluations/solutions-for-leaders.html

- Edutopia identifies resources for evaluating education research and includes reports summarizing the research evidence regarding integrated studies, project-based learning, and social and emotional learning: http://www.edutopia.org/research-resources

- Michael and Susan Dell Foundation provides resources relating to performance-driven education: http://www.msdf.org/programs/urban-education/initiatives/united-states/performance-driven-education/

- OECD brings together data on how countries are improving quality and equity in their education systems: http://gpseducation.oecd.org/Home

- US Department of Education's What Works Clearinghouse maintains a database of studies on the effectiveness of educational programs, practices, and policies. WWC also publishes practice and intervention guides and reviews of individual studies. See http://ies.ed.gov/ncee/wwc/.