Project RED: A Global Toolkit for Education Transformation

A PROJECT COLLABORATION WITH:

Project RED

ONE-TO-ONE INSTITUTE
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Chapter 1
Introduction
What if you had exactly the right recipe to make your education technology/information communications technologies (ICT) program successful? What if you could transform learning in your school or state or country? What if you could build a sustainable, long-term budget to pay for technology? What if you could impact the future success of students and communities?

What if you could change the world?

There is a recipe for success—the Project RED Design™ This global toolkit will provide you with the research, ingredients, and resources to help you achieve groundbreaking results from your education technology/ICT program [Figure 1].

Let’s start with the background. Project RED: Revolutionizing Education is a national research and advocacy plan to investigate how technology can help re-engineer our education systems. Since 2009, this initiative has used a cost-benefit analysis to determine which education technology programs and devices have the most cost-effective impact on schools, students, parents, states, provinces, and countries. In 2010, Project RED conducted the first large-scale national study to identify and prioritize the factors that make some K-12 technology implementations perform dramatically better than others. While this research study was conducted in the United States, the outcomes are of a universal nature, and clearly apply to success in education transformation globally.

As a global society we face challenges of immense proportions in healthcare, education, the environment, clean water supply, and more. It is our challenge to prepare our students with the skills to succeed in the workforce and contribute to finding and inventing solutions to solve our world’s grand challenges. The process of transforming education leads to global prosperity and economic development locally. Learn more about the other global grand challenges here: United Nations Millennium Development Goals.

In this toolkit, we unveil the Project RED research key findings and offer ideas for how they can be applied to centralized and decentralized education systems around the world.

For the purposes of this document, we will use the terms “education technology” and “information and communications technology (ICT)” interchangeably. Technology is a cornerstone of education transformation, providing the tools to enhance learning and teaching, and support student-centered learning environments. Effective eLearning environments use powerful mobile PCs, relevant education software and content, broadband Internet access, and an infrastructure with robust servers.

Comparisons of national education systems are increasingly common. What does Sweden do differently than the U.S. or Singapore or Malaysia or Chile? Measures of success include not only test scores, but also students’ career and higher education preparedness, which drive innovation, entrepreneurship, and economic development. Governments are demanding greater return on education investments, and expectations for educational expediencies, efficiencies, and outcomes permeate the global landscape.
Today’s schools must prepare students with the skills to be lifelong learners and contributors to the global economy. As nations prepare students, it is essential to recognize the substantial amount of change that will happen in students’ lifetimes. Many of the fastest growing jobs today didn’t exist 10 years ago, and the McKinsey Institute estimates that by 2020 there will be a global shortage of 85 million skilled workers.

The above facts were top of mind for co-authors of Project RED as they pursued their research. The Project RED key findings are significant to fueling a nation’s knowledge and policies around 21st century teaching, learning, tools, and practices.

This toolkit was designed to provide quick access to the Project RED research, strategies, and tools so practitioners can successfully develop, design, and implement robust education ICT programs, and specifically 1:1 models (one computer per student). You can adopt this roadmap as a guide to student success and economic development as a whole, and use it as a reference guide to access specific tools and information as you move through the transformation process. Or you can adapt the individual elements and tools that you require to complement or enhance your current model for systemic school change.

A Holistic Model for Education Transformation

To be successful and sustainable, education transformation requires a comprehensive approach that brings together all the elements you see in this diagram. Intel developed this model based on educational research and more than a decade of work with governments, education systems, and NGOs around the world. It provides a systematic framework that considers all aspects of a national education system. It addresses the need for leadership, policy reform, curriculum, standards and assessment, sustained professional learning efforts, ICT, and ongoing research and evaluation to support continuous improvement.

Intel’s work with educators and governments to transform education is based on research and the belief that sustainable change requires more than just great devices. It requires a comprehensive, systemic approach that is focused on student success and economic development. Each element of the model plays a part in a successful transformation that prepares students for the challenges they will face today and in the future.

When these elements are successfully integrated and implemented, real education transformation can take place. You can deliver a 21st century education and achieve sustained educational excellence. You can also increase competitiveness, improve social cohesion, and support broader objectives, such as increasing school participation, reducing the gender gap, improving digital literacy, and preparing a higher-skilled workforce and entrepreneurs.

Click here for more information on Intel’s holistic model for transformation: Intel’s Education Transformation Model.

Intel is the top sponsor and advocate for the Project RED research and the second phase of Project RED: Research into Practice. Intel also sponsored the book, Revolutionizing Education through Technology, The Project RED Roadmap for Transformation, produced by International Society for Technology in Education (ISTE).

To buy the book from ISTE, click here.
Overview of Project RED: Turning Research into Practice

Through examining nearly 1,000 schools that were representative of most U.S. schools, from 49 states and the District of Columbia, Project RED found that schools employing a 1:1 student-to-computer ratio and Key Implementation Factors (KIFs) outperformed other schools. The project also revealed significant opportunities for improving education return on investment (ROI). These improvements in achievement and ROI, however, are only possible by transforming teaching, learning, and the learning environment.

As shown in the graphic, an analysis of the Project RED data revealed seven major findings for countries and schools embarking on or already administering a technology implementation.

Key Implementation Factors for Successful ICT Programs

Project RED identified nine Key Implementation Factors (KIFs)—as shown in the second graphic—that were linked most strongly to creating successful education technology programs: Click here for more details.

Integration of curriculum and instruction with technology is a pivotal concern for effective 21st century learning environments. The KIFs are substantive practices for assuring the success of any 1:1 implementation.

Technology tools are catalysts for powering up knowledge, skills and students’ demonstration of learning. Teachers’ abilities to meaningfully integrate technologies with the instructional program is crucial to student achievement and revenue positive results.
The Importance of Communication

Effective communications are the cornerstone for support and success when implementing education technologies. A communications plan must be in place that articulates goals, research, and the purpose for implementation. The plan should also include feedback loops so that stakeholders can contribute to discussions, provide observations and suggestions, and know that their voices (or the voices of their organizations) are heard. It is also crucial for stakeholders to receive consistent updates regarding program progress—successes and caveats. The feeling of inclusion in the process helps stakeholders commit to and feel part of the bigger program, which helps garner more support along the way from the people who matter the most in making the ICT program a success.

Stakeholder groups vary by region. Examples of groups to be included in communications processes are:
- School boards and boards of directors
- School directors, superintendents, principals, school leaders, and curriculum/instruction and technology leaders
- Parents/caregivers and students
- Teachers and all staff
- National, state, regional, and local media outlets
- Business and industry partners
- State, federal, regional, and local elected officials and education agencies
- Funding agencies
- Faith-based leaders and related organizations

Communication Strategies

It is imperative to develop key messaging for implementation. All those involved must be “on message” to ensure understanding and purpose among constituencies. Some practical recommendations to incorporate within the message:
- Embed supporting research—the reasons “why” you are implementing
- Develop clear communications channels that are:
  - Ongoing
  - Honest (successes, caveats, and adjustments)
  - Updated
  - Inclusive of feedback loops from key audiences
  - Engaging stakeholders in the planning and implementation process
Various communication means are available and unique to each nation, state, region, and local entity. Some examples include:

- National, state, regional, and local web sites (this is a critical source of information in today’s technology-based world)
- Newsletters
- National, state, regional, and local newspapers
- Media outlets
- Listserv or other virtual discussion areas
- School open houses and community forums
- Press releases
- Social networks
- Web 2.0 tools (online user groups, learning communities, wikis, collaborative documents, blogs, etc.) can become standard means of communicating and modeling the expectation that the education community will become adept in the use of technology and benefit from its efficiencies.

Overview of Centralized and Decentralized Education Systems

Nations vary in method of governance and how education decisions, resources, and directions are made and implemented. Centralized education systems have a standardized curriculum for all students, in all subject areas. Decentralized education systems rely on individual territories, states, regions, provinces, or districts to develop and implement curricula expectations. And sometimes it’s a combination of both.

The United States is a current example of mixed governance because they are implementing national Common Core State Standards within a decentralized decision-making model. Britain’s Programme of Study is another example of a country that has implemented national standards with localized implementation with great success.

Nations will benefit from strong, consistent communications regarding purpose, supporting research and overarching goals of a 1:1 national program. Most agree that a primary goal of such programs is to transform education to be relevant and robust, and assure that students are career and college ready. The overarching result is student success and contributions to global and local economies.

Example of Centralized Education System

Macedonia, a monarchy, is located in the northeastern part of the Greek peninsula. The country has a long-standing need to connect nationally and around the globe.

Macedonia’s Computer for Every Child initiative has sparked dramatic progress for their education, society and government systems. The initiative is empowering tomorrow’s leaders with the country’s bold vision of putting a PC into every primary student’s hands—110,000 in all—as computers are used in daily double shifts by students.

The primary impact of the initiative:

- Social inclusion includes digital literacy and universal computer access for the upcoming generation, with a bright future of technology leadership in the Balkan region.

The initiative’s secondary impact:

- Education transformation is lighting student imaginations with nearly 110,000 students who are collaborating with one another throughout the country in 1:1 eLearning. More than 7,000 teachers are now proficient with the technology.

“It is a great pleasure when the future of Macedonia from an early age commences to use computers in everyday life. Through this investment, the government invests in future of Macedonia.”

–Ivo Ivanovski, Minister of Information Society and Administration

To download this global toolkit, resources, and learn more about Intel’s support of the Project RED work, please visit intel.com/projectred
For the purpose of this document, we will define centralized and decentralized models of education programs in the following way.

**Centralized models** of education technology programs include key decisions driven by the government in the countries. They develop nation-wide implementation and procurement plans for education technologies. They have central authority to design and deliver project plans, resources, and support to effectively deploy a 1:1 program. Centralized oversight and support systems can ensure consistency of deployment to realize expectations, ensure a standardized curriculum, and provide professional growth opportunities. Many times it is up to the school to implement the directives of the national government.

School leaders and directors in centralized models must understand the national purpose and goals for technology programs. They need to know standards of success, have resources and guidance in getting it right, and have the ability to implement and manage for achievement of national goals. The KIFs will be tremendously helpful guides for this work.

**Decentralized models** distribute responsibilities among their variously organized areas such as districts, states, provinces, regions, municipalities, and government agencies. The government can establish, publish, and promote national policies, incentives, recommended curricula, and practices. These can be widely communicated, taught, and expected. However, important decisions along each of those fronts can be made and then executed within the local territory or school system.

States, regions, and provinces will choose their education technology paths. In all cases, the KIFs provide key practices that will ensure successful programs.

The benefits of Macedonia's centralized solution are many:

**Education:**
- Enhanced collaboration among students and teachers provides experiential learning, giving schoolwork a new immediacy.
- Increased access to computers and Internet connectivity helps prepare students for a technology driven world.
- Improved quality of education is provided by a standardized curriculum, helping give all students equal access to excellent learning materials.

**Society:**
- Computer literacy among a greater proportion of the population better prepares people to participate in the global economy.
- Future business growth may be encouraged by ICT infrastructure development that leads to technology leadership in the Balkan region.
- Local economic development is spurred as IT and other support industries become more necessary with the increase in computing.

**Government:**
- Increased visibility of government ministries as a whole helps assert the role of those organizations and individuals as eager promoters of socio-economic development.
- Intra-government collaboration fosters strong relationships between the agencies involved in the project as they work together toward success.
- Effective outreach to the public is provided for government agencies that gain a new means of providing effective educational and economic leadership.

Click here for more information on Macedonia’s 1:1 technology initiative.
Example of Decentralized Education System
Portugal is known as a decentralized education model. However, operationally, it is a highly centralized system with administrative divisions. Historically, Portugal performed at the bottom of European educational surveys and had a distinct economic divide in its population. In 2008, the government responded with the Magellan initiative, a national technology plan to “consolidate the role of ICT as a basic skill to learn and teach in this new era.” The results of their education technology focus are shown in Figure 4.

Turning Research Into Practice: First Steps
Real school transformation is at the heart of the Project RED Design and Intel’s holistic model for education transformation. Transformational change is a fundamental break with current practices that sparks an irreversible new system. It requires new knowledge and skills for successful implementation.

It does not mean doing traditional things in a new way, or new things within a traditional system; it is the inception of a whole new educational system. This takes time and focus, through a planning and implementation process.

Transformation Guidelines
The Project RED Design offers specific, research-based steps to bring transformational change to education. The image shown of Project RED’s Transformation Model [Figure 5] identifies key stakeholders that must be included in the change and communication processes of transformation. Project RED’s transformation model and Intel’s holistic model for transformation, both show students at the center of this process.

As with Intel’s Model of Education Transformation, student learning is at the center of the need for change. Children must be given the opportunity to learn through self-directed, inquiry-based methods. Transformational change occurs ONLY when all spokes of this wheel are in motion in support of this common vision. Each spoke is a structure that must be strong and complete for the wheel to move forward. Commitment to the common vision and collaboration among these spokes is essential to move the vision forward.
Chapter 2
Leadership Is Essential for Transformation
Leadership is a key to successful ICT programs. Key Implementation Factor #9 states that school-level leaders must be trained in facilitating second-order change. There must be a focus on the changes that will drive the continuous and sustained improvements expected from 1:1 programs, including increasing student learning and finding efficiency that leads to revenue-positive results. Inquiry and professional learning for leaders must be integral to the process.

Michael Fullan, a researcher and professor emeritus of the Ontario Institute for Studies in Education at the University of Toronto, is a recognized authority on educational reform, provides context around sustained improvement and the change process, and provides resources to facilitate development of leaders’ strategies to lead authentic transformations in schools. Read more here: 8 Forces for Leaders of Change.

### Transformational/Second-Order Change

Magnitude of change for education is an important consideration. A 1:1 program creates second-order changes in culture, learning and teaching, and national focus. The following table describes the qualities for first- and second-order change.

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<th>FIRST-ORDER CHANGE</th>
<th>SECOND-ORDER CHANGE</th>
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<tr>
<td>An extension of the past</td>
<td>A break with the past</td>
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<tr>
<td>Consistent with prevailing organizational norms</td>
<td>Inconsistent with prevailing organizational norms</td>
</tr>
<tr>
<td>Congruent with personal values</td>
<td>Incongruent with personal values</td>
</tr>
<tr>
<td>Easily learned using existing knowledge</td>
<td>Requires new knowledge and skills</td>
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*School Leadership That Works, McREL, 2005*

New Zealand’s Ministry of Education hosts a web site on first- and second-order change strategies. Click here for more details.

For first and second order change there is a direct correlation between the magnitude of change and the value of the investment. For example, first-order change drives nominal differences in results, such as students becoming more engaged in learning. While this is important, second-order change drives real differences in student outcomes, such as improved test scores and measurable return on investments.

### What does centralized leadership look like?

Centralized education systems rely on ministries of education to garner strategies and resources for development and deployment of a national technology and professional learning system for school directors. Developing leaders’ new skills in one region/territory can provide a foundation for expanding a train-the-trainer model across the nation (see upcoming section on Professional Learning).

### What does decentralized leadership look like?

In decentralized education systems, school directors work with local training organizations to develop practices that drive “change” models for embracing 1:1 learning and teaching. The Organization for Economic Cooperation and Development (OECD) provides a distributed model for school leadership in its Toolkit.

While there are many options for leadership training, two examples of effective school leader professional learning programs are:

- The Balanced Leadership Profile—an online feedback tool based on the leadership practices identified in School Leadership That Works: [http://blp.changetheodds.org/LearnMore](http://blp.changetheodds.org/LearnMore)
Strategic Visioning

To launch an ICT program, national leaders and stakeholders must craft a shared strategic education technology vision and define actionable steps to bring that vision to reality. The strategic vision defines where the nation or state or school wants to be in the future, and communicates purpose, research, and return on investment.

The vision lays the groundwork—defining the current education technology status in relationship to future goals. For example, a country’s education system may currently have a 10:1 student-to-computer ratio and define its “vision” as creating a 1:1 student-to-computer ratio in five or 10 years. Realistic action steps lie between the current status and the future expectation. Please see Intel’s Education Technology Adoption Model.

Resource: Raj Dhingra is a 20-year veteran of the technology industry with an extensive track record of building strong, sustainable and profitable industry leadership positions in new and emerging categories. His TEDxBend talk, “Can Technology Change Education? Yes!” provides stories and facts as resources for creating the vision for a 1:1 program, personalizing learning and enabling a globally competitive economy.

CASE STUDY:
Transforming Peru’s Main Port to the World Into a Digital City

RESULTS

Goal is to create a “digital city”

Program includes PCs and wireless infrastructure

The port city of Callao, Peru, has long been the key gateway between Peru and the rest of the world. Recognizing that future prosperity depends on technology, the regional government of Callao has embarked on an initiative to create a digital city. This effort draws its vision from the 1:1 eLearning program being built into the education system.

- The 1:1 eLearning environment is the foundation on which the digital vision is being built for the future of Callao.
- Computers are being deployed, including nearly 6,000 laptops for teachers and PCs for students.
- The EduCallao computing portal has been created as a central online hub for educational resources and activities.
- Wireless infrastructure is being built to interconnect schools and other municipal facilities.
- School administration is being modernized through the use of ICT.
- Teacher professional learning is underway, helping nearly 30,000 Peruvian educators get the most out of technology.

Download this Case Study

More than 30,000 educators trained on technology integration

Program includes PCs and wireless infrastructure

More than 30,000 educators trained on technology integration

RESULTS

Program includes

PCs

and

wireless infrastructure

More than 30,000 educators trained on technology integration
Project RED Global Implementation Tools for Leadership

To aid leaders in successful 1:1 implementations, Project RED developed tools, rooted in groundbreaking research, to guide success. Following are instruments that will guide global technology planning and deploying. They address readiness/needs assessment, budgeting-costs and planning, and timeline/task development.

READINESS RUBRIC >>
It is informative and foundational, and possibly eye-opening, to discover your current readiness to embark on a 1:1 implementation. Implementing a successful 1:1 program is a complex undertaking, involving numerous important components. Use the Project RED Readiness Rubric to discover local or national gaps and areas of readiness. The information gleaned from the rubric can help guide strategic visioning and the development of a formal implementation project plan.

IMPLEMENTATION COSTS COMPARISON TOOL >>
The costs of technology implementations vary widely. Reported costs for 1:1 implementations in the United States range from $250 per student per year to more than $1,000 per student per year.

1:1 COST SAVINGS CALCULATOR >>
There are many factors to consider when analyzing costs for a national education technology program. Project RED's research provides 14 specific areas where costs can be reduced to repurpose funds for other investments such as education technologies.

A planning team can use this tool to prioritize areas to reduce costs. The Calculator offers flexibility to enter a different number of students for each category to calculate results with maximum accuracy (this version shows U.S. dollars).

IMPLEMENTATION TIMELINE/TASK TOOL >>
Realistic, doable timelines will provide a crucial path for implementing a national education technology program. Elements of the timeline are also detailed in the Project RED Model Design and project plan. This complex work is not linear. However, accounting for each aspect, detail, and timeframe within dependencies will make it possible to deliver on goals.

RED DESIGN MODEL PROJECT PLAN >>
The RED Design Model Project Plan guides global leaders along the path of a thoughtful, detailed implementation. Using an online project management tool, SmartSheet*, the RED Design Model Project Plan is a powerful Gantt chart offering the ability to lead and manage a national and global protocol. Countries can customize the Model Project Plan to reflect the unique needs, culture, and organizational structures of government and education ecosystems.

Download the RED Design Model Project Plan for a real-time roadmap/plan template. It is essential to have a designated project manager/lead. Ensuring plan fidelity—timelines, budget, benchmarks, dependencies, roles, and responsibilities management—is complex, time-consuming work.

Project Management
A strategy is a solution for moving from current practice to a future desired outcome. Strategy relays WHAT is to be accomplished. A project plan is required to define HOW that strategy will be achieved. The project plan nails down a process for achieving desired results. It incorporates all significant tasks, dependencies, timelines, benchmarks, and quality assurances to achieve expected outcomes. The project plan requires consistent management and oversight. Departments and individuals responsible for tasks must regularly communicate progress to move the project forward. Key categories for inclusion in an ICT global project plan are:

- Leadership and management of the plan
- Budget – human and financial resources planning
- Infrastructure
- Curriculum and instruction
- Professional learning
- Evaluation and assessment
- Communications
Recommendations for Turning Research Into Practice: Leadership

Governments, ministries of education, policymakers, and school leaders have the opportunity to study and use the Project RED research. They can seek confirmation of the findings, and apply the information to create new kinds of technology-powered schools that will define and contribute to a thriving global economy and compete on a global scale for years to come.

In centralized and decentralized education systems, effective school directorship is essential to create successful education programs and enable greater student achievement. Professional learning, university-level preparation and on-the-job and/or intern experiences are required to develop high-quality leaders. Additionally, today’s school directors must be skilled in facilitating second-order change and helping each educator scaffold to new practices and expectations.

The communications systems among education leaders, centralized and decentralized, should be of consistent messaging around purpose, supporting research, and practices for the ICT program. Though all leaders may not agree on approach, all should understand the imperative for progress in the education system and have a voice in feedback and suggestions for effective application within their sites/organizations.

Mandates for high-quality school leader development will be helpful. University-level professional programs can incorporate theory into practice through internships, job coaching, and accreditation programs. A high level of instructional technology theory, research, and practice should be included in these preparatory programs. Understanding and utilization of technologies for operations and administrations is also very important for school leaders.

Additional areas requiring school leaders’ skill development are:

- Community and organizational communications.
- Understanding and framing research underpinnings for ICT programs.
- Identifying and engaging project managers for large-scale programs with complex tasks, dependencies, budgets, and timelines.
- Facilitating teachers’ professional growth for emerging practices and integration of instruction and technology.
- Observation skills in recognizing effective/ineffective ICT practices.
- Building communities of professional practice for creating human capacities for change and program success.

Leadership Recommendations for Centralized Education Systems

- Create and amplify a national education technology plan.
- Establish national professional learning standards (above focus areas) around ICT leadership.
- Incorporate change agency development within the above standards.
- Mandate higher education institutions to incorporate curriculum and online opportunities for school leaders to access programs anytime, anywhere.
- Identify leading organizations to establish communities of practice for school leaders to grow expertise through collaboration.
- Provide resources and incentives for school directors to participate in.
- Institute regional, national annual/bi-annual conferences for school leaders to hone their skills by working with ICT experts.
- Create a system of troubleshooting, solution generation, communications around school ICT matters.
- Adopt a national portal for leaders to collaborate, problem-solve, seek, and upload resources.

Leadership Recommendations for Decentralized Education Systems

- Create and amplify a national education technology plan.
- Hold regional meetings and question/answer sessions to disseminate and teach the plan.
- Incentivize higher education to incorporate change and ICT leadership curricula in education administration degree programs.
- Set expectations and provide incentives for local/regional/state/provincial systems to establish standards for school leaders around ICT implementation/sustainability.
- Establish regional organizations’ expectation to provide consistent professional growth opportunities for school leaders in ICT implementation and change agency.
- Establish and expect regional organizations to engage their local sites to participate in leaders’ collaborations and professional communities of practice around ICT.
- Research and recommend online portal and management systems for regional leaders to collaborate, problem-solve, seek, and upload resources; seek national government support and/or create a consortium of regional/local sites.
Chapter 3
Policy
Policies are principles or rules that drive education decision making and practice. Policies and procedures guide schools in carrying out plans. Technology policies specifically are important drivers of practice, expectations, and stakeholder behavior. Policies at every level—national, state, regional, local, and at the classroom level matter greatly regarding the efficacy of education technology implementation. Sound, consistent policies and practices can make a difference between success and failure of such programs.

The key question for governing bodies is not whether the benefits of technology outweigh the costs (research and best practices prove this), but rather how to implement policies and programs to ensure effectiveness and results.

Importance of Government Policies

While educators are central to the success of any program, effective national, state, municipality, regional, and local policies provide the broader context that shapes and drives instructional technology in schools. Policy provides the foundation that powers planning. Useful policies are flexible, reviewed regularly, and adjusted to bring about authentic transformation.

Governments, at all levels, determine policies regarding such matters as the mission of education, social and academic goals, instructional strategies, and student assessments. Policies should encourage the education system to:

- be clear about outcomes
- collaborate to redesign structures and processes for effectiveness, efficiencies and flexibility
- monitor and measure performance
- be accountable for progress and results.

Practical policies should protect students and maintain data privacy while optimizing the use of technology as a platform for learning and teaching.

Keys to Effective Policy

Education policies should ensure that all students obtain the skills to succeed in a knowledge-based economy and society. An effective policy framework, aligned with desired outcomes, creates the environment for transformation.

Effective policy is critical to establish the conditions for success and enable education transformation. Policy connects ICT-based innovations to other changes in curriculum and assessment, professional learning/development, learning and teaching, and to research and evaluation that can transform the entire educational system. For example, the governing body can redefine textbooks to include digital resources; or expand the definition of a course and seat time so students can take advantage of virtual learning and teachers can benefit from flexible, just-in-time, online courseware for professional learning.

Policymakers and policies must be nimble enough to reflect education transformations. Since the first large-scale educational-technology programs began in the 1990s, technology prices have dropped, low-cost device options have become universal, the Internet has become pervasive, e-operations have emerged as the increasingly standard form of service and communication, and digital resources have enhanced capacities.

Policy developers should apply a systematic approach to set clear, realistic expectations for sensible time frames, and focus on goals and evaluations that can help determine the effects of policies. The test of successful policies is examining a program’s accomplishments to determine whether intended beneficiaries are profiting, whether the results are fair, and what the effects are for all stakeholders.

Communication about policies is also crucial to success. Policymakers must ensure that the people affected by the policy understand the plan, expectations, and benefits. They should stress that the focus is education, not equipment, and incorporate training for administrators, teachers, students, parents/caregivers, and all those touched by the policy and the program. Leaders can create a strong marketing campaign to create awareness, ensure buy-in, and build a wide political consensus behind the program. Likewise, they can create a strong communication plan to quantify results and impact.

Resource: Intel has developed a high-quality ICT Policy Development Guidebook with extensive tools and activities to drive your policy development.
Project RED Keys to Policy Success

The Project RED research shows that well-implemented technology programs enable personalized instruction and the development of 21st century skills. This underscores the need for policies that mandate consistent, uninterrupted access to technology and related professional learning.

Policies that need to be examined include those that require “seat time” for course credit and those that require a teacher and a defined bricks-and-mortar space for learning to occur. The latter stands to obstruct the ability for blended, online and anytime, anywhere learning.

Government funding is needed for the purchase of technologies and software for high-need and high-risk students and their intervention classes. Intervention programs for struggling students have used technology more frequently than traditional subject areas—with successful results. The Project RED data indicates that Internet connectivity is correlated with socio-economic status and that students in less affluent schools are more likely to have less and slower connectivity. Government policies must serve to overcome this social justice matter in practical terms.

Project RED research further indicates that schools should integrate teacher use of technology with their overall performance evaluations to accelerate teacher adoption of technology as an integral part of learning and teaching. It is clear that school leaders must be able to lead reluctant teachers to a path of professional growth to ensure that technology and learning goals become seamless. Including expectations of teachers’ use of technology in school or state/municipality policy is important to establishing and driving technology use by teachers.

Acceptable Use Policies

At a school or user level, there are policies that are important to how technology will or will not be used by administration, staff, teachers, and students. It’s important to communicate these policies with all stakeholders so that expectations and consequences are clear.

User-level policies include acceptable use policies and computer software policies, such as content filtering, to allow access to good educational content and prevent access to harmful or inappropriate content. It is important to provide safe digital environments for learners and to instill safe digital citizenship among the learning community.

Key questions to guide development of policies and practice:
- What is appropriate for students and teachers to view, read, and write online?
- How does the school set and promote the above expectations through policy and practice?
- Is there a difference if students and teachers bring their own devices or use school-issued devices?
- What will be the parents'/caregivers’ roles in the filtering expectations?
- How does the policy get communicated and enforced?

Much has changed in the educational landscape since districts began writing acceptable use policies (AUPs), and policy revisions reflect these changes. According to David Warlick’s Landmark Project, School AUP 2.0, school technology-use policies should:
- Promote the most effective, productive, and instructionally sound uses of digital, networked, and abundant information in learning environments
- Provide safe digital environments for learners and to instill safe practices and habits among the learning community.

Many U.S. districts have renamed “Acceptable Use Policies” as “Responsible Use Policies.” As personal portable technologies permeate the education landscape, more and more responsibilities for following safe, expected computer-using practices are falling to students, their parents, and caregivers.

Resource: East Noble School Corporation (Indiana, U.S.) provides valuable models of Student Responsible Use Policy and Employee Responsible Use Policy.
In creating the AUPs and other user policies, it is helpful to do the following:

• Define and describe the reasons for providing your school access to digital, networked, and abundant content.

• Describe the instructional and managerial benefits and the reason the information infrastructure is mission critical.

• Describe the benefits-aligned practices and applications that are being provided for and encouraged, and who can use them.

• Describe conditions for experimenting and evaluating practices and applications not identified in the document.

• Define and describe broader information ethics issues within the context of the school/district’s information infrastructure, including but not limited to: copyright, information integration, and respect for the infrastructure.

• Describe the information infrastructure of the school or district, including hardware, software, and support staffing.

• Define and describe practices and applications that are prohibited and the consequences of using the information infrastructure in these ways.

• Define and describe technical and procedural practices that will be applied to the information infrastructure to monitor and restrict use and abuse.

• Provide support materials or access to support materials to assist faculty, staff, and students in learning to make appropriate, productive, and safe use of the information infrastructure.

The significance of policy goes beyond the initial development of the planned systemic change. Particularly at the district and school levels, strong leaders will see the necessity for a policy that addresses do’s and don’ts of technology use and creates acceptable use policies as a foundation for all members of the school community involved in using the technology.

Some believe that there should be a safety and security curriculum in addition to AUPs so that students and others understand not just what is important regarding Internet use and safety, but why it is important.

**Digital Citizenship Policies**

Digital citizenship is defined as responsible and appropriate behavior with the use of technologies and the Internet. It is critical to incorporate these learning goals with any education technology program and its policies.

A relationship among governing bodies, schools, educators, students, and parents/caregivers will be important to reaching digital citizenship goals. Following are resources to guide this work:

- Mark Ribbel’s Nine Themes of Digital Citizenship
- Edudemic’s Tips for Building Digital Citizenship
- Common Sense Media’s Digital Literacy and Citizenship Curriculum

Practical policies should protect students and maintain data privacy while optimizing the use of technology as a platform for learning and teaching. Sample policy elements may include:

• Definitions of digital citizenship to identify appropriate ethical and legal behavior when using technology

• Assistive technology policies that help people with disabilities perform tasks (or perform those tasks more easily) that they otherwise wouldn’t be able to accomplish

• Universal design for learning (UDL) Guidance to curriculum that reduces physical, cognitive, and other obstacles to learning

• Acceptable Use Policies (AUPs) for students, educators, and parents, reflecting the norms of the community while addressing the realities of the 21st century
Chapter 4
Curriculum and Assessment
Best-in-class digital curricula have the potential to be truly transformative and address differing learning styles across all subject areas. Digital curricula allow students to access valuable content anytime, anywhere, and in any way.

The curriculum provides a roadmap for learning, but access to digital content and resources lay the foundation for an instructional shift. This transformation of learning and teaching is essential for students to become successful in the digital global marketplace. However, this shift can only happen if students and teachers create and use content that matches instructional goals, provides real-time assessment data, elicits student creativity and critical thinking, and is adaptive to each student's level of understanding.

With dynamic digital curricula and content, information becomes vibrant, questioned, researched, and pertinent to learning. Students manipulate and explore until they create meaning from the content, or until the content provides answers to their questions. Students can access content at a level and in the mode that best meets their needs, opening the door for all students to be successful.

Project RED Education Success Measures

The success or failure of an educational system can be determined in numerous ways. High-stakes test scores are important, but they are only one measure of success. The Project RED team chose 11 education success measures (ESMs) [Figure 6] to study that provide a balanced view of a school’s success. Project RED hypothesized that properly implemented education technology can substantially improve student achievement, and be revenue positive at all levels: federal, state, and local.

Eleven ESMs were selected to elicit the most valuable information for our hypotheses with the fewest number of variables. This filter eliminated many “nice-to-know” variables, such as student attendance. The measures were divided into two groups: those that affect students in all grades and those that affect students in high schools.

All schools
1. Disciplinary action rate
2. Dropout rate
3. High-stakes test scores
4. Paper and copying expenses
5. Paperwork reduction
6. Teacher attendance

High schools
7. AP course enrollment
8. College attendance plans
9. Course completion rates
10. Dual/joint enrollment in college

Project RED found that the vast majority of factors that lead to improvements in the Education Success Measures are related to curriculum and instruction. These findings include:

- Technology-transformed interventions improve learning. These interventions include using technology for remediation, special education, second language learners, etc.
- Technology-transformed curriculum improves learning.
- Online collaboration increases learning productivity and student engagement.
- The use of ongoing formative assessments provides data to students and teachers that allows for individualization and personalization of learning, which ultimately leads to improvements in all the ESMs.
Both formative and summative assessments are an integral part of the learning process. Formative Assessments are part of the instructional process. When incorporated into classroom practice, formative assessments provide ongoing information to students and teachers needed to adjust learning and teaching while they are happening. In this sense, formative assessments inform both teachers and students about student understanding at a point when timely adjustments can be made. We do not hold students accountable in “grade book fashion” for skills and concepts they have just been introduced to. We must allow for practice. Formative assessment helps determine a student’s path throughout the learning process until a benchmark is reached and a summative assessment is administered.

Summative Assessments are given at the end of the learning process. Therefore, they are given periodically, and determine what students know and can do, and how they compare to other students. Many associate summative assessments with standardized tests such as state and national assessments, but they are also used at and are an important part of district and classroom programs. Summative assessment at the district/classroom level is an accountability measure that is generally used as part of the grading process. The list is long, but here are some examples of summative assessments:

- State or province or country assessments
- Benchmarks or interim assessments
- End-of-unit or chapter tests
- End-of-term or semester exams
- Scores that are used for accountability for schools (AYP) and students (report card grades).

CASE STUDY:
Ale, Sweden

RESULTS

Third grade language arts scores improved by 20%

Third grade math scores improved by 17%

Ale, Sweden, a municipality in western Sweden, decided to use technology in its schools to achieve both short- and long-range objectives. In the short term, the focus was on improving the reading and writing skills of younger students, which research shows improves performance in all other subjects and creates an attitude of success that impacts a student’s entire school career. In the long term, Ale’s goal is to increase the number of students who graduate from high school. Research shows that dropouts lead far less progressive and affluent lives and are a financial drain on society.

Ale focused on helping second-grade students “crack” the reading code. Schools used personal portable technology to implement the “writing yourself to reading” technique, with tremendous result. In 2010-2011, test scores showed that the students’ third-grade language arts scores improved by 20 percent and third-grade math scores increased 17 percent. The schools have also found that using technology helps focus active students (boys especially), calm classrooms, and give children with disabilities a more equal playing field. These results also clearly supporting Project RED’s findings that “technology is integrated into every intervention class” (Key Finding 1); and “technology integrated into core academic classes weekly or more frequently” (Key Finding 4) leads to improved student achievement.

Although still in the early stages of this long-range program, Ale believes that its strategy of grounding students solidly in reading and writing skills at a young age will have positive repercussions throughout the students’ school careers and lives—and positive impacts on society.

Download this Case Study
Embracing a Student-Centered Approach to Instruction

Technology is making individualization and personalization much more manageable. Teachers are now finding ways to individualize the curriculum for each student in ways that would be too cumbersome without technology.

In many centralized systems, traditional curricula are delivered to all students at the same time and in the same way, without regard for what a student already knows and can do. Some students find the content too challenging because they do not have the appropriate knowledge or skills to embrace this new learning. Other students find the content boring or superficial because they have already mastered it.

In the 1:1 environment, students can easily be assessed, start individualized instruction at their current level of understanding, and progress through their curriculum at a pace that is suited to their individual needs. In this way, the learning needs of all the students are met and they can maximize their learning potential.

Figure 7 illustrates Project RED’s findings regarding personalization. Teachers in 1:1 classrooms reported far greater student-centered pedagogy and activity. According to the findings, inquiry and personalization seem to meaningfully affect student achievement.

This video underscores the significance of Project RED research in informing successful education technology implementations: Intel and Project RED leaders talk transformation.

This transformation does not mean that direct instruction should be abandoned altogether. There will always be a place for direct instruction in the learning process, but with a student-centered pedagogy, the traditional model flips. As students grapple with curriculum, teachers can provide groups of students or the whole class with short, timely instruction that provides the conceptual framework they need to do their work.

Within the flipped classroom concept, top experts in the field can provide direct instruction to individual students through the use of recorded video. There is no doubt that technology allows teachers to efficiently apply multiple pedagogies at the same time, which simply would not be possible without it.

Formative and Summative Assessments

Digital content and the associated online formative and summative assessments are providing data that can be harnessed to achieve efficiencies in learning and teaching, help raise student achievement, and save money.

Project RED found that online formative assessments, when performed at least weekly, are directly related to improvements in the Education Success Measures (KIF #5). Just-in-time insight into student progress allows teachers to personalize and adjust instruction. This translates to time savings, increased time on task, and regulation of the learning experience. Infrequent assessment causes students to spend too much or too little time on each objective, with serious academic consequences.

Data from multiple formative assessments can now be used to make informed decisions, assign personalized content with instantaneous feedback, identify instructional interventions, and help educators create a personalized learning environment for all students. Similarly, periodic online summative assessments also allow students, teachers, and administrators to view results and use the data in a more timely fashion.
Online assessments use a computing system to create, store, deliver, and score test items, and can be housed on a local computer, a networked computer, or via cloud computing. These functions are frequently performed by a Learning Management System (LMS) or a more specialized testing system, or are built directly into the digital content. In most of these systems, teachers can select high-quality test items based on specific content standards and can quickly create an assessment.

Project RED also identified substantial cost savings when schools moved from print materials to the use of online assessments. The obvious savings comes from the reduction in paper and printing costs, but there are other savings as well.

The chart below [Figure 8] shows six possible cost savings categories demonstrated by Project RED.

The second chart [Figure 9] shows the paper and printing cost reductions.

There is a tremendous opportunity cost when test results are delayed and students are not maximizing their learning potential. There are also extensive labor costs involved with grading and providing feedback on paper tests and other assessments. If automated feedback and scoring systems are used, the cost of assessments can be half the cost of their paper equivalent per student, per year.

The bottom line is that if we simply use technologies (tablets, laptops, etc.) to replace traditional tools such as pencils and paper, we will not and cannot expect authentic transformation to occur. Only when we unleash the power of technology and allow students to take leadership of their learning while teachers engage new pedagogies will a real shift in education occur.
Today, most classrooms are based on teacher-centric models (left side). Students depend on the instructor to impart knowledge, often in a lecture-based format. Students then reiterate the information back to the instructor in the form of worksheets or tests. There may be technology in the class but often it is the teacher who uses it, or it is used to gather facts. This is the model of education that most of us grew up on, and it grew out of factory-era thinking. It takes a one-size-fits-all approach.

Many regions and schools today are in what we think of as a transitional environment (right side). It’s still teacher-centric, and students still depend predominantly on the instructor to impart knowledge. However, students make greater use of technology. They use technology to collaborate as they consume the knowledge, rather than everything being teacher-centric.
Technology has tremendous potential to transform learning and teaching, but merely adding technology doesn’t change classrooms into better learning environments. Meaningful change will only happen through systemic planning, the development of a rigorous digital curriculum and content, an ongoing digital assessment system, and ongoing professional learning to support these shifts in practice.
Turning Research Into Practice: Curriculum Recommendations

The most important role of centralized or decentralized education systems is to ensure that students are maximizing their learning potential.

**Curriculum Recommendations for Centralized Education Systems**

1. Mandate that every school use the same curriculum and instructional methods.
2. This highly centralized approach seems to be most effective in improving low-performing schools. This approach includes the creation of a mandated curriculum, and instruction that require teachers to follow an instructional “script.”
3. Mandate that technology-transformed interventions be used every day with struggling students.
4. Mandate that technology-transformed solutions be used in all classes throughout the curriculum.

It is also essential that the centralized models choose digital curricula and content that match the desired learning outcomes, provide real-time assessment data, and are adaptive to each student's level of understanding.

**Curriculum Recommendations for Decentralized Education Systems**

A decentralized approach has proven to be more effective for good schools that are looking to become great schools. In these cases, an approach with more responsibility and flexibility given to individual school leaders is more effective. The following are recommendations for decentralized educational systems:

1. Central government should provide all schools with a curriculum framework and instructional guidelines, but should create policies that allow school leaders and teachers to flexible and innovative in their implementation.
2. Provide school leaders with Project RED’s data about the importance of using technology-transformed interventions every day with struggling students and in all classes across the curriculum.
3. Provide school leaders with the following guidelines to use when they choose digital content and curriculum:
   - The curricula and content must match the desired learning outcomes.
   - The content platform must provide real-time assessment data that students and teachers can use to adjust instruction and learning activities.
   - The content should elicit student creativity and critical thinking, and be adaptive to each student's level of understanding.

The 2007 McKinsey report, *"How the World's Best-performing Schools Come out on Top"*, found that there is no “one-size-fits-all” solution to improving schools. There are similarities, however, in what failing schools do to become good, what good schools do to become great, and what great schools do to become excellent.

McKinsey found, that seven interventions were common to all performance stages. Project RED’s findings mirror the McKinsey research. Change management leadership by school leaders, school leader training, and online formative assessments are top factors of school success in both organizations’ research. Assessment and professional learning will be discussed in more detail in the sections that follow.

To download this global toolkit, resources, and learn more about Intel's support of the Project RED work, please visit intel.com/projectred
Chapter 5
Research and Evaluation
To address 21st century educational needs, it is important to research and evaluate your current environment. A number of tools can be used to evaluate the existing status. The Project RED Readiness Rubric can provide valuable information to inform your next steps.

A SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis can also help pinpoint areas that need attention. Strengths and weaknesses are internal to the district. Opportunities and threats are external factors. Your analysis should focus on successes and resources; note areas that need improvement; capitalize on new strategies that can come from changes in such things as technology, local policies, and funding sources and flexibility; and determine how to avoid pitfalls. An educational SWOT analysis can help planners decide where the organization stands and what it needs to do to reach its goals.

Another early step in planning a 1:1 program is to research the best practices that will lead to a successful implementation. One-to-One Institute, Project RED, and Intel’s Education website provide research, case studies, models, and tools that will be valuable for your planning and implementation. These sites also showcase successful 1:1 implementations where program leaders can see success in action. This initial investigation will provide the research-based foundation upon which your program can be designed.

The next step is to define your goals and the metrics that will be used to evaluate the program’s success. Key milestones need to be identified for each goal, and a process established to assess the effectiveness of your strategy in achieving the milestones. Finally, a tool to evaluate your success at each milestone also needs to be implemented.

Throughout the planning and implementation phases, you should continue to research the latest trends, technologies, curriculum, and digital content. Based on new developments in the field, it may be necessary to modify your original goals and/or create new metrics to measure success.

Program Assessment and Independent External Evaluation

To ensure that a technology implementation will be successful over the long-term, Project RED found it essential to institute internal assessments and an independent external evaluation. Just as formative assessments provide ongoing feedback that guides practice, internal program assessments provide program leaders with data they can use to make continuous improvements to the program. An independent external evaluation is similar to the summative assessments above, in that they provide a larger picture of the program as a whole and determine if the program is meeting its goals.

Program assessments and independent external evaluations are both key to the success of a technology implementation.

It is important during the budgeting process to include funds for evaluation work. In the United States, most grant programs require the recipient to allocate 5 to 10 percent of the total budget to an external evaluation. These metrics provide a good guideline when anticipating the total cost of evaluating the effectiveness of your program.

Turning Research into Practice Recommendations: Research and Evaluation

Research and Evaluation Recommendations for Centralized Education Systems

1. Create a national online assessment portal (formative and summative).
2. Move national high-stakes testing online.
3. Create and use common end-of-unit summative tests.

Research and Evaluation Recommendations for Decentralized Education Systems

1. Purchase an online assessment portal (formative and summative); consider partnering with the government or creating a consortium of schools that share the platform.
2. Create and use common end-of-unit summative tests.
3. Provide teachers with formative assessment resources.
4. Create and implement internal program assessments for each key implementation component.
5. Hire an independent researcher to conduct a program evaluation; consider partnering with the government or similar schools to reduce the burden on an individual school.
Chapter 6
Professional Development
Project RED Professional Learning Findings

School leaders and teachers will need a tremendous amount of support to transform their instructional practice. Professional learning for both teachers and school leaders, therefore, is one of the most essential elements to improving the quality of a school system.

Project RED ultimately found that creating successful 1:1 programs and raising achievement comes down to improving the learning experience of students in their classrooms. Using traditional textbooks and a direct instruction pedagogy (lecture and testing) is not a very effective method of maximizing the potential of every student.

“The quality of an educational system cannot exceed the quality of its teachers”
(McKinsey 2007).

Key Implementation Factor #2 states that school leaders must provide time for teacher professional learning and collaboration at least monthly. KIF #9 states that school level leaders must be trained in facilitating second-order change and the best practices that lead to technology-transformed learning.

Several models can guide teacher practice and help education leaders create metrics to measure the levels of transformation. These include:

- The LoTi* model is a conceptual framework that measures levels of technology implementation. The data gleaned from the LoTi assessments and walk-throughs can assist districts in restructuring their staff’s curricula to include concept/process-based instruction, authentic uses of technology, and qualitative assessment. More information can be found at www.loticonnection.com.
- Ruben R. Puente’s Substitution Augmentation Modification Redefinition (SAMR) Model offers a method of seeing how computer technology might affect teaching and learning. It also shows a progression that adopters of educational technology often follow as they progress through teaching and learning with technology. More information about the model can be found at SAMR Model Explained for Teachers.

East Noble School Corporation (Indiana, U.S.) incorporated the SAMR Model within their teacher evaluation process. Principals use the rubric shown on the next page to observe and provide support and feedback to teachers regarding their use of technology for learning and teaching.

The following quotes show principals in East Noble Schools find great value in employing the rubric for setting expectations and providing guidance regarding specific learning and teaching behaviors:

“The RISE rubric illustrates to teachers what’s important and how to improve their performance, much the same way as a classroom rubric helps students. Having technology standards as part of the teaching rubric demonstrates a high level of commitment, and sets a common expectation.”
—Steve Peterson, Principal, East Noble

“The technology indicators in RISE clearly define the level at which we wish for students … and teachers to be using technology. Teachers can use that information to help plan lessons that integrate technology at the higher levels of SAMR which in turn increases the rigor and relevance in what we ask students to do to demonstrate their learning.”
—Karen Gandy, Principal, East Noble

All of the stakeholders involved in the initiative should become members of the free online Project RED Community (www.projectred.org). The website provides resources around leadership, project planning, transformational change, inquiry-based instruction, as well as acting as a professional learning community through participation in RED Hub and the Project RED forums.
## Project RED: A Global Toolkit for Education Transformation

### East Noble School Corporation (Indiana, United States) RISE Rubric

<table>
<thead>
<tr>
<th>COMPETENCY</th>
<th>HIGHLY EFFECTIVE (4)</th>
<th>EFFECTIVE (3)</th>
<th>IMPROVEMENT NECESSARY (2)</th>
<th>INEFFECTIVE (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competency 2.10 Using Technology in Instruction</td>
<td>The teacher serves as a guide, mentor, and model in the use of technology. The teacher encourages and supports the active engagement of students with technology resources. The teacher facilitates lessons in which students are engaged in higher order learning activities that may not have been possible without the use of technology. The teacher helps students locate appropriate resources to support student choices. The teacher’s personal technology skills level exceeds the levels needed to support the grade level tech curriculum.</td>
<td>The teacher guides, informs, and provides a setting for student choice of technology activities and is flexible and open to student ideas. Lessons are structured so that students use of technology is self-directed. Teacher encourages students to use technology collaboratively. The teacher provides a context in which technology is seamlessly integrated into a lesson. The teacher’s personal technology skills level does support the grade level tech curriculum.</td>
<td>The use of technology is completely teacher driven. The teacher chooses which technology activities to use and when to use them. The teacher may be pacing the students through a project, making sure that they each complete each step in the same sequence with the same tool. The teacher may be the only one actively using technology. This may include using presentation software to support delivery of a lecture. The teacher may also have the students complete “drill and practice” activities on computers to practice basic skills, such as typing. The teacher directs students in a conventional use of technology for working with others. The teacher’s technology skills level does not support the grade level tech curriculum.</td>
<td>The teacher rarely or never uses technology to deliver information to students. The teacher’s technology skills level does not support the grade level tech curriculum.</td>
</tr>
</tbody>
</table>

| Competency 2.11 Technology Integrated into Learning Environment | Students are empowered to extend the use of technology and have greater ownership and responsibility for learning. Students regularly use technology activities to set goals, plan activities, monitor progress, and evaluate results. Students have the freedom to choose. Students regularly use technology for collaboration, to work with peers and experts irrespective of time zone or physical distances. Activities are at the redefinition level the computer allows for the creation of new tasks that would otherwise be inconceivable without the use of technology, i.e., collaborative writing. Students regularly use technology, and are comfortable in choosing and using the tool(s) in the most meaningful way for each activity. The students know how to use, and have access to, a variety of technology resources. Students are given guided choices in use. Technology use for collaboration by students is regular and normal in this setting. Activities are at the modification level the computer enables the redesign of significant portions of a task, i.e., a writing task is enhanced by sound, video, etc. | The setting allows for the possibility of group work, and at least some collaborative technology activities are available. Students are using technology in simple ways and the teacher is in control of its use. Activities are at the augmentation level the computer replaces another activity, with significant functionality increase, i.e., the assignment is not changed, but perhaps some of the built in tools such as the thesaurus, word count, or spell check might be used. | The setting is arranged for direct instruction and individual seat work. The students may have very limited and regulated access to the technology resources. Activities are at the substitution level—the computer stands in for another activity without a significant change in the activity, i.e., typing instead of handwriting. | The setting is arranged for direct instruction and individual seat work. The students may have very limited and regulated access to the technology resources. Activities are at the substitution level—the computer stands in for another activity without a significant change in the activity, i.e., typing instead of handwriting. |
Professional Learning vs. Training

The most effective professional learning is ongoing, collaborative, integrated with job-related practice, and provided in an environment of continued support. The collaborative aspect of this type of professional learning is based on peer communities of practice, where participants work from a shared vision and common goals, while still meeting their individual learning needs. Effective programs include a cycle of improvement in which school leaders and teachers have an opportunity to learn something new, discuss with colleagues effective ways to implement the new learning, try it in their school or classroom, collect data, and then review the experience with colleagues and make adjustments for further implementation. An ongoing cycle like this is one of the most effective ways to achieve continuous improvement.

This is very different from traditional, isolated training experiences. Most professional organizations now delineate between training and professional learning. Teacher training refers to one-time or short-term training that is intended to develop specific technical skills. It is important, for example, for the teachers in a 1:1 laptop program to understand how to use the technology. A teacher doesn’t need ongoing training to understand how to use the functions of the computer, but the fact that the training is short-term doesn’t diminish its importance.

Professional learning, or professional development, refers to a more systematized, continuous, coherent process of teacher development. The focus of these programs may vary depending on the needs of teachers and school leaders, but must be administered in the context of a shared vision and common goals. These professional learning experiences can take place face-to-face, be facilitated online, or be provided through an assortment of blended methods.

CASE STUDY

Connected Student Project: Pernambuco, Brazil

Get students excited about science

Enable even non-science-trained teachers to engage students in rigorous experiments

In 2012, the state of Pernambuco became the first in Brazil to implement 1:1 eLearning to enhance the knowledge and the performance of its students through the alignment of pedagogy and technology. Their Connected Student project is integrating technology into students’ daily school and home life, changing teachers’ attitudes and pedagogy, and creating a new student-centered dynamic in education across the state.

“In this joint effort with Intel, we are training teachers not only on how to use the tools, but also on the new methods that are already at work in other countries. Teachers make a major difference in the use of computers, and we are training them to use them better," said Ricardo Dantas, Pernambuco State Secretary of Education.

This is part of a bigger purpose, which is to improve the state of Pernambuco’s Basic Education Development Index (IDEB), which should reach 4.5 by 2020. Education leaders and policy makers took a centralized approach to professional learning. They realize that the education transformation they desire could not come about without transforming teacher practices.

“In this joint effort with Intel, we are training teachers not only on how to use the tools, but also on the new methods that are already at work in other countries,” said Dantas. The training mentioned by Dantas is seeing fast results. For the English teacher Klenie Synara Ramos da Silva, the technology constitutes a powerful teaching tool that allows for the constant use of interactive activities.

“We work on a certain topic and then we pass to an interactive activity in order to practice that topic. Students can then follow their scores in the activities they have just completed,” Ramos de Silva said. She believes that computers are becoming an important foothold for students to explore the world. As she puts it, the technology ‘represents the students’ insertion in a globalized world’.”
Regardless of the delivery method, quality professional learning must go beyond software and hardware training. Professional learning must provide ongoing opportunities to learn, experiment, and collaborate, as well as to collect and use data to make decisions. It is only when this approach is made systemic that incremental and continuous improvement to the educational system can be guaranteed.

Turning Research Into Practice Recommendations: Professional Development

Professional Development Recommendations for Centralized Education Systems

1. Create a national comprehensive professional learning project plan.
2. Train key Ministry of Education staff on the following items:
   - Project RED Design
   - Second-order change leadership
   - All hardware and software solutions that will be implemented
   - Individualized and personalized instruction
3. Map out a train-the-trainer model that develops enough regional trainers to train and support all the teachers.
4. Identify and train trainers well in advance of the technology implementation in schools. Continue to identify high-quality teachers that can be developed as trainers as the program expands.
5. Train school leaders in the Project RED Design, second-order change, transformational leadership, and the best practices surrounding 1:1 implementation.
6. Roll out devices to teachers and provide basic hardware and software training several months before the student technology rollout.
7. Begin ongoing professional learning for teachers that revolves around the creation of inquiry-based lesson plans that are based on the system's content standards and effectively integrate technology.
8. Provide training and professional learning opportunities for school leaders and teachers through a variety of face-to-face, online, and blended delivery methods.

Beyond the professional learning model outlined above, there are a few other policies and laws that centralized systems can enact for quality assurance purposes:

- Create teaching standards and associated accountability measures.
- Create teacher certification/accreditation, and mandate that all teachers must be certified.
- Mandate that a portion of a teacher's work time be used to collaborate in a professional learning community (See the Cycle of Improvement Figure 10).

Mandates for ongoing professional learning for teachers and school leaders are important. Expectations for continued growth and improvement of practice should be monitored, recorded, debriefed, and built upon each year.

Professional Development Recommendations for Decentralized Education Systems

1. Central government should provide school leaders with a professional learning model and recommendations that include the components of the Project RED Design.
2. Provide school leaders with Project RED's data about the importance of principal training and transformational leadership.
3. Provide conditional funding to schools for professional learning. These conditions should include recommendations 3-8 listed above for centralized systems.
4. Create a nationwide virtual network for the delivery of professional learning.
5. Create a national virtual library to house the curriculum, lesson plan samples, and other resources.

Professional Development Recommendations for Centralized and Decentralized Systems

- Use data and research to drive the design of professional learning programs, as well as to ascertain the effect of such programs on the system goals. Then, use that information to inform continuous improvement of the professional learning offerings.
- Provide time, resources, incentives, and requirements, which engage all educators/teachers in formal and informal professional learning that meets high-quality, established standards, and is aligned to system goals.
- Provide options in the type, duration, pedagogy, location, medium, and formality of professional learning, and differentiate within professional learning offerings to meet the participants' needs.
- Establish and support teacher engagement in both local and global professional learning communities.
Chapter 7
Information and Communication Technology
Education systems across the globe are beginning to reap the benefits of ICT. In Bangalore, India, students at the Indus International School are using technology to accelerate learning and develop critical thinking and problem solving skills. Students across the entire state of Pernambuco, Brazil, are preparing to participate in a global economy through technology transformed learning and teaching. And Peru is transforming the port city of Callao into a Digital City. These are but a few examples of how technology is being leveraged to transform society and spark economic growth.

Whether you are in a country with robust infrastructure and investment in technology, or if you are currently without Internet access or technology, there are steps you can take to move toward Project RED’s 1:1 model for academic and economic success.

Starting the ICT Journey

Many education systems are just beginning the ICT journey. In these situations, a good first step is to take an inventory of the technology, software, and infrastructure that is currently available, and maximize the potential of what you currently have.

The Importance of Basing Device Choice on Learning Goals

Budget-conscious schools and educational systems might be tempted to purchase inexpensive devices with fewer features than full-functioning computers, but such a move can actually cost more if the new devices do not meet all the needs of students or teacher.

In selecting a mobile device for classroom use, it is important to view it as a total learning platform and look for a device that supports the learning goals.

Value of Cloud Infrastructure

Uninterrupted access to the Internet is an important goal for a globally competitive education system. Within an education system, the main objectives are to leverage ICT to accelerate learning, and enable greater efficiencies that lead to cost savings.

In countries with universal access to the Internet, cloud-based management solutions can be used to provide better services to the schools while at the same time reducing ICT requirements and costs at the school and national level. As all the main administration and education applications are setup and managed in the cloud, minimal infrastructure and applications need to be installed at the school level. This reduces costs in installation and maintenance, school IT staff, as well as school electricity requirements. Furthermore, this model reduces risks of school/teacher/student data being lost or damaged. While many of these functions can happen in the cloud, privacy and security concerns may require this functionality on local school or district/municipality servers.

Auburn City Schools (Alabama, U.S.) engaged in a comprehensive approach to their 1:1 program. They focused on student and district goals to drive their practices, decisions, and related assessments. The administration tasked teachers and students with defining what success will look like at their schools and how the devices will be used. Then teachers and students were empowered to choose the device they preferred to meet their usage needs and that would help them achieve the success they envisioned.

See more about Auburn, Alabama's technology program

Resource: Transitioning from 20:1 to 1:1

Intel created the following Technology Adoption Model to guide strategy and planning for moving from a student computer ratio of 20:1 to 1:1.

Intel's Education Transformation Technology Adoption Model

The objective of introducing an education cloud is to provide a highly available and advanced service of software applications to:

- Accelerate students learning and development through personalized, adaptive, and active learning tools and methods.
- Provide up-to-date online curriculum content at lower cost than print materials.
- Enable teachers to create their own lessons, assign tasks/projects, and monitor progress.
- Enable online communication and collaboration among teachers, students, and parents.
- Allow safe student access to the Internet and content (prohibited sites and based time of day).
- Facilitate more efficient school administration and teacher productivity.
- Provide management information and analytics for monitoring the effectiveness of the school system and to make decisions for continuous improvement.
- Provide these applications in a cost-effective and optimized way with security and high availability.
Advantages of Standardized Platforms

There are numerous advantages to standardizing platforms and moving to the cloud, if possible. Standardized platforms create efficiencies, provide unique learning opportunities, provide avenues for better school management, create cost savings that can be moved to digital content budgets, and provide quality assurance across the entire system. The following are some of the platforms used to achieve these goals.

Learning Management System (LMS)/Personalized Learning Environment (PLE)

1. Enables teachers to:
   - Create lessons, quizzes, surveys, blogs.
   - Set up schedules/courses including creating lessons and quizzes.
   - Assign online/offline assignments to students and groups of students to track students' progress, completion, and results of lessons, quizzes, and assignments.
2. Enables students to:
   - Work through and manipulate content, anytime, anywhere.
   - Receive immediate feedback on formative and summative assessments.
   - Link to advanced eLearning applications.
   - Submit assignments.
   - Stay organized.
3. Enables parents to:
   - Communicate with teachers.
   - View curriculum and content.
   - Monitor child's real-time progress.
4. Common functions:
   - Facilitate communication between teachers, students, and parents.
   - Enable collaboration through blogs, wikis, and discussion forums.

School Administration Systems

1. Register students and teachers.
2. Provide address and contact information for students (parents' phone and e-mail addresses).
3. Allocate classes with a grade and weekly class schedule.
4. Allocate students and teachers to classes.
5. Support extramural activities (sports, chess, debating, music, etc.).
6. Provide an events calendar.
7. Send notification messages to teachers, students, and families.
8. Track and manage disciplinary action.
10. Design and generate student reports.
11. Keep track of student health records.
12. Provide student and teacher attendance register.

Management Information and Analytics System

1. Student history: schools attended, teachers, subjects, grades, achievements.
2. Teacher history: qualifications, schools, subjects, students taught, passes achieved.
3. Schools: students, teachers, pass rates and grade levels, facilities, and tools used.
4. Student data regarding access to learning resources, collaborative tools, etc.
5. Amount of investment per teacher in up-skilling.
6. Regional/country level—information, statistics, and analytics:
   a. Student information, grades, and comparison with peers in school and across schools.
   b. Grade comparison between classes at same grade level in same or across schools.
   c. Teacher: student grade levels and pass rate success for each subject taught.
   d. School: success rate.
7. Ratio of students/teacher, teachers/admin staff, students/teachers/admin/schools.
8. Percentage dropout rates/grade, student/teacher absenteeism per schools days.
9. Costs per student across different schools.
10. Comparison of all statistics from year to year to monitor trends.
Financial Management/Enterprise Resource Systems
1. Human resources (HR) and payroll management for teachers, admin, and other school staff.
2. Procurement and payment for contracted services.
3. Asset management and depreciation of facilities.
4. Financial management and reporting, budget versus expenses/operation costs.

Alternative Systems
If a robust infrastructure is not available, you can still reap the benefits of ICT on a smaller scale. Here are some things that can be achieved in a less robust technical environment that will help move you down the path to creating a 21st century education for students:
• Design student-centered learning environments.
• Create and deliver personalized learning experiences.
• Assess results.
• Increase productivity.
• Have students create and share knowledge within the classroom or school.
• If possible, use the available technology to do all of the above.

Turning Research Into Practice Recommendations: ICT
Moving a national education system to 1:1 is an immensely complicated mission. Depending on the current state of ICT in the country, the transition to 1:1 eLearning could be a very long process. If government leaders move strategically, however, and provide vision, leadership, and human and financial support, it can be achieved. Project RED recommends a few basic steps to begin moving toward universal access to technology.

ICT Recommendations for Centralized Education Systems
1. Assess what computer, storage, and network capacity is currently available in schools.
2. Assess what software solutions are currently available within the education system.
   - Cloud enablement (virtualization, automation, provisioning, single sign-on, metering etc.)
   - Digital content, instructional software, and other digital resources
   - Monitoring and management software for fault and performance monitoring, service management, and help desk
   - Security software
   - Data backup
3. Determine what is required to maximize the use of the existing ICT.
4. Develop a long-term strategic plan to move toward 1:1, with possible interim goals (10:1, 5:1, 2:1).
5. Build out the national technology infrastructure.
6. Stagger the implementation over several years. Start with a group of schools that are likely to be successful. Learn from them and build from their success. Carefully consider what students will be able to do, or not do, without the availability of the Internet or at least a closed network. Choose pilot schools that have the necessary electrical and ICT infrastructure to be successful.

Cloud computing will also drive many national policy discussions around cost, data security, functionality, and other important topics. Project RED recommends standardizing and integrating all the data systems describe in the section above. National policies and laws should be in place, however, before the implementation of these systems.

Depending on the current state of ICT in the country, the transition to 1:1 eLearning could be a very long process. If government leaders move strategically, however, and provide vision, leadership, and human and financial support, it can be achieved.
ICT Recommendations for Decentralized Education Systems

It will be difficult to implement the Project RED Design and see the achievement gains and cost savings identified in the Project RED research without substantial involvement of the national government. Providing the appropriate infrastructure for a digital learning environment is too much for most individual schools to take on.

Regardless of the level of involvement of the government, there are still positive things that can happen within an independent or decentralized system:

1. Assess what computer, storage, and network capacity is currently available in your school.
2. Assess what software solutions are currently available in your school:
   - Cloud enablement (virtualization, automation, provisioning, single sign-on, metering, etc.)
   - Digital content, instructional software, and other digital resources
   - Monitoring and management software for fault and performance monitoring, service management and help desk
   - Security software
   - Data backup
3. Determine what is required to maximize the use of the existing ICT.
4. Create a long-term strategic plan to move to 1:1:
   - Investigate Internet access options available to the school
   - Investigate the feasibility of a school-run network with the cloud housed on the school server
5. Possibly partner with the central government or a consortium of schools to build out the infrastructure, and implement a larger area network with standardized platforms.

CASE STUDY

Panama

On the cusp of the 100-year anniversary of creation of the Panama Canal in 2014, Panama is transforming digital literacy and economic development through a nationwide rollout of ICT in 728 schools.

Panama has a dynamic Minister of Education who is changing the landscape of their national education plan. And most importantly, students are so excited and engaged with the technology that they are not only reading significantly more but becoming authors themselves.

Panama’s Balboa Project began with the approval of the Technology Massification Program, an initiative led by the National Government through the Ministry of Education (MEDUCA), the Authority for Government Innovation (AIG), together with Intel. The program seeks to improve Panamanian education through the integration of ICT tools in the classrooms of Panamanian schools. The goals of the program include:

1. Contribute to greater educational equity among students.
2. Improve digital literacy.
3. Provide students with computers for daily use in the development of their schoolwork.
4. Give students the opportunity to access information and communication in different.
5. Contribute directly to local household economies.

Panama’s Balboa Project, includes implementation of a technology infrastructure that supports the teaching and learning process. Technology supports 162 early education centers, which are equipped with ICT that will meet current and future educational requirements. In addition, educational services have been created to enhance teacher training in their use of ICT in the classroom to transform teaching and learning. The program has also improved educational centers and expanded services for supporting students.

The program began in 2012, with an initial purchase of 93,500 Intel® classmate PCs deployed across 162 schools nationwide. In 2013, the project forged ahead, bringing technology and services to an additional 566 schools for a total of 728 schools with never-before access to technology, and a total of 179,000 PCs distributed nationwide to date.
San Luis, Argentina is one of the only ICT programs in the world with a 20-year plan to transform education from the most urban to the most rural corners of the province of San Luis. This program affects all aspects of society in San Luis and includes plans for all stakeholders—administrators, IT, teachers, students, parents, and the whole community. This transformation program is on a massive scale and is one that other countries across the world want to see and model themselves after.

As part of the ambitious 20-year technology plan, the province’s goals include exporting technology products, training more STEM (Science, Technology, Engineering and Math) students, and broadening its base of workers who have completed secondary education and have high-level skills in math, language arts, science, and ICT.

The plan included providing broadband access to every town, providing significant rebates for citizens to purchase computers, and an initiative called All Kids Online to bring 1:1 eLearning to all primary students.

The All Kids Online initiative provided teachers with a laptop and professional development through the Intel® Teach program. All students in primary grades received Intel classmate PCs with software to support the educational objectives. The program saw significant improvements in student achievement in math, language arts, and science. In addition the program helped level the playing field and created digital inclusion for students in rural area and with different abilities.

Digital inclusion also grew beyond the students to their families as the students brought the PCs home and taught ICT skills to parents and grandparents.

Download this Case Study
Chapter 8
Sustainable Resourcing
Education leaders and policymakers worldwide are looking for ways to improve the quality of schools while slowing the growth of expenditures. The positive financial impact of properly implemented educational technology can contribute substantially to the solution. In fact, Project RED found significant evidence that properly implemented educational technology can be revenue-positive at all levels—national, state, and local. These savings can be continually reinvested back into the program to enhance its success, such as increasing bandwidth, purchasing digital content, and enhancing professional development.

Financial Impact of 1:1 eLearning

Transformation requires much more than a one-time infusion of technology. To have your transformation initiatives be sustainable and deliver long-term value, you’ll need a solid understanding of the costs you’ll incur for technology, including professional learning, curriculum resources, program evaluation, and other aspects of transformation. You may also find potential sources of savings from using digital solutions that improve educational productivity. Then, you’ll need a comprehensive, long-range financial plan.

Project RED found that the closer the implementation is to 1:1 the more that technology contributes to cost reductions and productivity improvements. The financial impact findings include direct cost reductions at all levels as well as indirect revenue enhancements that are realizable at the state or national level. One example of state or national level cost savings would be a shift from paper-based to electronic high-stakes tests.

The table shows examples of other potential cost saving areas and an estimate of how much the item can save per student per year, based on U.S. dollars ($).

Many of the cost savings listed in the table cannot be achieved until students are 1:1. Until there is a digital conversion to 1:1, for example, printing and textbooks costs cannot be reduced. Individualizing instruction and using targeted interventions cannot happen without each student having ongoing access to a device.

Smart technology choices can help you set a path for long-term sustainability, including ongoing upgrades to student devices, infrastructure, educational software, tools, and professional learning.

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>PER STUDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student data mapping</td>
<td>$11</td>
</tr>
<tr>
<td>Online professional learning</td>
<td>$12</td>
</tr>
<tr>
<td>Teacher attendance increase</td>
<td>$13</td>
</tr>
<tr>
<td>Power savings</td>
<td>$16</td>
</tr>
<tr>
<td>Digital core curriculum savings</td>
<td>$17</td>
</tr>
<tr>
<td>Disciplinary action reduction</td>
<td>$20</td>
</tr>
<tr>
<td>Post-secondary remedial education</td>
<td>$30</td>
</tr>
<tr>
<td>Digital supplemental materials vs. print</td>
<td>$31</td>
</tr>
<tr>
<td>Copy machine cost calculations</td>
<td>$40</td>
</tr>
<tr>
<td>Online assessment savings</td>
<td>$44</td>
</tr>
<tr>
<td>AP/dual course enrollment</td>
<td>$58</td>
</tr>
<tr>
<td>Paperwork reduction</td>
<td>$60</td>
</tr>
<tr>
<td>End-of-course failure</td>
<td>$107</td>
</tr>
<tr>
<td><strong>Total Per Student excluding Dropout Savings</strong></td>
<td><strong>$448</strong></td>
</tr>
</tbody>
</table>

You can improve long-term cost effectiveness and sustainability by using digital curriculum, online testing and assessment, and classroom and learning management systems. Solutions such as these can improve resource and time management, enable better options for personalized learning, and help enhance student outcomes.

To begin estimating your costs and potential cost savings when implementing 1:1, view the Project RED Cost Savings Calculator. Although the calculator uses U.S. metrics and is calculated in dollars, you should still be able to get a sense of your potential savings by inputting your current per-student expenditures and number of students.
CASE STUDY

Terengganu, Malaysia

Terengganu is a Malaysian state with more than 1 million citizens. The government recognized the importance of a knowledge-based economy to its long-term economic success, and in 2009 Projek Buku Elektronik was launched to increase digital access and literacy among students and their families. Specific goals included reducing the digital divide between urban and rural and between high- and low-income households.

As part of a national initiative, teachers from each school participated in the Intel® Teach professional development program to learn how to integrate technology effectively in their teaching and develop 21st century skills in their students.

Students in grades 4, 5, and 6 received Intel classmate PCs and were allowed to take them home for family use, giving low-income families equal access to technology. The computers are loaded with digital textbooks, test preparation software, Intel® Education resources, and other content including the Koran, other religious resources, and a dictionary. Classrooms were outfitted with electronic whiteboards, Internet connectivity, Wi-Fi access points, a teacher workstation, and sufficient electrical outlets for children to charge their computers in class.

The Terengganu government also collaborated with Intel and a state-owned manufacturer to open a factory for assembling PCs and developing software. The factory will be able to supply 10,000 Intel classmate PCs a month and has provided hundreds of local high-tech jobs and training.

As a result of this program, a record 15.4 percent of students received grades of all As. Projek Buku Elektronik has successfully increased digital literacy among young students and bridged the digital divide by bringing technology into the homes of low-income and rural students. And as a boost to the local economy, the initiative also created 500 ICT jobs and 360 public-sector jobs.

Best Practices for Initial Investment and Long-Term Sustainability

Although large-scale 1:1 implementations can be revenue-neutral over the long term, it usually takes a significant initial investment. The initial investment is substantially increased if a country needs to build out a national wired and wireless infrastructure. Just as water supply, roads, and other traditional infrastructure are important to the growth of a nation’s economy, so too is the build-out of the national technology infrastructure. The World Bank Group’s ICT strategy for 2012-2015 emphasizes the transformative potential of ICT while focusing on innovation and infrastructure.

Project RED also found that for best results, investments need to be made in not only technology and infrastructure, but in a complete digital transformation of the schools. Students, teachers, and administrators need to use technology in appropriate ways on a daily basis in core academic classes (Key Finding #7), in targeted interventions (Key Implementation Factor #1), and in various ways to achieve efficiencies in the management of the school (Finding 2).

For more information on Project RED’s financial findings, reference The Positive Financial Impact of Technology-Transformed Schools or Chapter 9 of the full Project RED report.
Turning Research Into Practice Recommendations: Sustainable Resourcing

**Sustainable Resourcing Recommendations for Centralized Education Systems**

- Develop a long-term strategy for the creation and support of a state or national network that provides universal access to the Internet.
- Secure long-term funding sources.
- Mandated efficiency usage of the technology to enable funding reallocation.
- Incentivize local leaders to find cost savings and efficiencies through the use of technology.

- Provide equitable funding to schools to support their technology efforts.

**Sustainable Resourcing Recommendations for both Centralized and Decentralized Systems**

- Estimate costs and savings.
- Identify strategic allies and funding sources.
- Construct a plan to obtain and renew needed resources.
- Choose technologies to optimize effectiveness and costs over the long term.
- Generate savings through digital curriculum, online testing and assessment, and integrated data management systems (Learning Management System, Student Information System, etc.).

To download this global toolkit, resources, and learn more about Intel’s support of the Project RED work, please visit [intel.com/projectred](http://intel.com/projectred)
Conclusion
Student Success and Economic Development
Student Success and Economic Development is at the Core of Education Transformation

Our futures rely on students’ development and contributions locally, nationally, and globally. Students who participate in 21st century education systems, as fostered in this toolkit, learn how to innovate, create, become entrepreneurs, and thus stimulate economies. The latter is crucial for global competitiveness and to positively impact a national workforce.

The power of a guaranteed curriculum, effective implementation of ICT, and educators’ continued professional growth fuel the foundation for students’ abilities to achieve and excel.

Student success is at the heart of Intel’s model for Education Transformation. We find that deep transformation often results from a broad vision of success. Research indicates that technology-enabled education transformation can benefit students, teachers, families, societies, and economies. (See the Intel Education white paper, The Positive Impact of eLearning—2012 Update, for a review of studies).

Transformation starts with your vision of success. Success takes many forms beyond higher standardized test scores including:

- Higher rates of attendance
- Lower matriculation
- Higher graduation rates
- Increased enrollment of girls
- Higher levels of student engagement
- Decreases in behavior problems
- Development of entrepreneurial skills to stimulate local economies

CASE STUDY

Baccio da Montelupo Comprehensive School: School of the Future

The Baccio da Montelupo Comprehensive School near Florence, Italy, aimed to completely update its education system and progress through mobile computing for students and teachers. The school achieved a much more engaging and collaborative learning environment for the class, stimulated active learning in students, and is preparing students for the future with 21st century skills.

Teachers at Baccio are delighted with the advancements the mobile devices have facilitated. Enabling digital learning not only made tracking and sending homework simpler and quicker, but is a more fun and practical way of learning. It has the additional benefits of encouraging collaboration between groups and providing a data backup for safety and security.

The aim of the head teacher and her team is to gradually give students greater control of their learning experience. “The Baccio da Montelupo Comprehensive School is working toward a flatter structure for teaching and learning, which involves family, teachers, and children on a more equal footing, thanks to this technology,” said Gloria Bernardi, head teacher, Baccio da Monteluop Comprehensive School. “It helps the students to develop important skills for the modern world, such as communication, collaboration, creativity, problem solving, critical thinking, and digital literacy.”

Download this Case Study
Universal access to technology and the Internet is a major conduit for advancing economic growth and development. There is an international movement toward personalized and individualized learning through 1:1 programs. This leads to student-driven learning, which increases engagement, independence, and achievement—even beyond bricks-and-mortar classrooms. Students who learn in a properly implemented 1:1 program achieve at greater rates, are highly engaged, matriculate at higher rates, and are more prepared to compete in the global marketplace.

Moving toward 1:1 is not easy work. It may take partnerships between the central government, private industry, and schools. It will require that the nation build out a robust technology infrastructure and make substantial investments in education. It may require government to be direct with low-performing schools. It may require rigid government systems to be flexible and innovative when dealing with better-performing schools. It requires the development of transformative leadership at all levels.

An effort of this magnitude may take years. You will be faced with many challenges along the way. It will take tremendous time, effort, and resources, but Project RED and Intel believe it is absolutely necessary for social and economic development of every nation. We hope this global toolkit and recommendations based on Project RED’s research help you get started or continue transforming your educational system.

With the right leadership, policy, professional development, curriculum and assessment, research and evaluation, ICT, and sustainable resourcing, we can change the world, one student at a time.
For quick reference, here are checklists for each key implementation factor: leadership, curriculum and assessment, research and evaluation, professional learning, information communications technology, and sustainable resourcing.

Addendum

Project RED: Global Toolkit for Education Transformation Checklist
Leadership

In centralized and decentralized education systems, effective school directorship is essential to create successful education programs and enable greater student achievement. Professional learning and university-level preparation and, on-the-job and intern experiences are required to development high-quality leaders. Additionally, today’s school directors must be skilled in change agency to facilitate second-order changes and help each educator scaffold to new practices and expectations.

Governments are advised to mandate the following skill development for school directors.

- Community and organizational communications
- Knowledge of research around effective ICT programs
- Incorporation of project managers
- Designing and implementing teachers’ professional growth for effective ICT practice
- Targeted observation skills in recognizing effective/ineffective ICT practices
- Building communities of professional practice for building human capacities for change and program success
- Change agency

Leadership Recommendations for Centralized Education Systems

- National education technology plan
- Higher education incorporate effective ICT training for school directors
- National portal for leaders around ICT practices

Leadership Recommendations for Decentralized Education Systems

- Create, disseminate a national education technology plan
- Incentivize higher education to create ICT leadership curricula
- Incentivize local/regional/state/provincial systems to establish school leader ICT expertise standards
- Provide tools for regional organizations to provide professional growth opportunities for school leaders in ICT implementation and “change agency”
- Recommend online portals and management systems for leaders to access resources and collaborate around ICT
Policy

Policies are principles or rules that drive education decision making and practice. Policies and procedures enable and guide schools in carrying out plans. Technology policies are important drivers of practice, expectations, and stakeholders’ behavior. The key question for governing bodies is not whether the benefits of technology outweigh the costs (research and best practices prove this) but how to implement programs to ensure effectiveness and results. Policies at every level—national, state, regional, local, and at the classroom level matter greatly regarding the efficacy of education technology implementation. Sound, consistent policies and practices can make a difference between success and failure of such programs.

Local and School Level Policies

Key questions to guide development of filtering policies and practice:

What is appropriate for students and teachers to view, read, and write online?

How does the school set and promote the above expectations through policy and practice?

Is there a difference if students and teachers bring their own devices or use school-issued devices?

What will be the parents’/caregivers’ roles in the filtering expectations?

How does this get communicated and enforced?

Creating the Acceptable Use and Other User Policies

Define and describe the reasons for providing your school or school access to digital, networked, and abundant content.

Describe the instructional and management benefits and the reason why the information infrastructure is mission critical.

Describe the benefits—aligned practices and applications that are being provided for and encouraged, and who can utilize them.

Describe conditions for experimenting and evaluating practices and applications not identified in the document.
Policy – continued

Define and describe broader information—ethics issues within the context of the school's/district’s information infrastructure, including but not limited to: copyright, information integration, and respect for the infrastructure.

Describe the information infrastructure of the school or district, including hardware, software, and support staffing.

Define and describe practices and applications that are prohibited and the consequences of using the information infrastructure in these ways.

Define and describe technical and procedural practices that will be applied to the information infrastructure to monitor and restrict use and abuse.

Provide support materials or access to support materials to assist faculty, staff, and students in learning to make appropriate, productive, and safe use of the information infrastructure.
Curriculum and Assessment

The most important role of government is to create and enforce policies to ensure that students are maximizing their learning.

Recommendations for Centralized Education Systems

☐ Standardized curriculum and instruction
☐ Technology-transformed interventions to be used every day with struggling students
☐ Technology-transformed solutions are used in all classes
☐ Digital curricula and content is aligned with standards, provides real-time assessment and data, and adapts to individual students

Recommendations for Decentralized Education Systems

☐ Provide a curriculum framework and instructional guidelines, allow flexibility of implementation
☐ Provide school leaders with Project RED’s data around key implementation factors and a playbook for ICT strategizing and practice
☐ Provide schools guidelines for selecting digital resources:
  1. The curricula and content must match the desired learning outcomes
  2. The content platform must provide real-time assessment data that students and teachers can use to adjust instruction and learning activities
  3. The content should elicits student creativity and critical thinking, and be adaptive to each student’s level of understanding
Research and Evaluation

Recommendations for Centralized Education Systems
- National online assessment portal (formative and summative)
- National high-stakes testing online
- Use common end-of-unit summative tests and formative assessments
- Independent researchers to conduct a program evaluation

Recommendations for Decentralized Education Systems
- Purchase and/or partner with federal government to acquire an online assessment portal (formative and summative)
- Create and use common end-of-unit summative tests
- Provide teachers with formative assessment resources
- Create and implement internal program assessments for each key implementation components
- Hire and/or partner with federal government to bring in independent researchers to conduct a program evaluation

Professional Learning

Recommendations for Centralized Education Systems
- National professional learning project plan
- Ministry of Education skills in:
  1. Project RED Design
  2. Change leadership
  3. Hardware and software solutions
  4. Individualized and personalized instruction
- National train-the-trainer model
- National PD in advance of student device deployment
- National PD access through online, face-to-face, and blended models
- National teaching standards and accountability measures
- National standards for high quality teachers; certification/accreditation

Recommendations for Decentralized Education Systems
- Provide school leaders with a professional learning model that incorporates the Project RED Design
- Incentivize PD through conditional funding tied to program development and dissemination
- Nationwide virtual network for the delivery of professional learning
- National virtual repository for curriculum, lesson plan samples, and resources

Centralized and Decentralized Systems
- Professional learning programs are driven by data and research
- Time, resources, incentives, and requirements, based on standards, are available for all educators
- PD opportunities are accessible through blended models
- PD opportunities can be personalized
- Establish local, national and global professional learning communities
**Information and Communications Technology (ICT)**

**Recommendations for Centralized Education Systems**
- Direct the assessment of current ICT status with desired outcomes
  - 1. Software
  - 2. Cloud enablement (virtualization, automation, provisioning, single sign-on, metering, etc.)
  - 3. Digital content, instructional software, and other digital resources
  - 4. Monitoring and management software
  - 5. Security
  - 6. Data Backup
- Develop a 5-15 year term strategic plan to move toward 1:1, with interim goals (10:1, 5:1, 2:1)
- Build out the national technology infrastructure
- Project manage the strategic plan

**Recommendations for Decentralized Education Systems**
- Assess current ICT status with desired outcomes
  - 1. Software
  - 2. Cloud enablement (virtualization, automation, provisioning, single sign-on, metering, etc.)
  - 3. Digital content, instructional software, and other digital resources
  - 4. Monitoring and management software
  - 5. Security
  - 6. Data Backup
- Determine maximization of existing ICT
- Create a 5-15 year term strategic plan to move to 1:1
- Investigate and disseminate Internet access school options
- Investigate feasibility of school run network with the Cloud school servers
- Possibly partner with the central government or a consortium of schools to build out the infrastructure, and implement larger area network with standardized platforms

**Sustainable Resourcing**

**Recommendations for Centralized Education Systems**
- Develop a long-term strategy for the creation and support of a state or national network that provides universal access to the Internet
- Secure long-term funding sources
- Mandated efficiency usage of the technology to enable funding reallocation
- Incentivize local leaders to find cost savings and efficiencies through the use of technology
- Provide equitable funding to schools to support their technology efforts

**Centralized and Decentralized Systems**
- Construct a plan to obtain and renew needed resources
- Choose technologies to optimize effectiveness and costs over the long term
- Choose digital curriculum, online testing and assessment resources, and integrated data management systems (Learning Management System, Student Information System, etc.)