

Chapter 7 Information and Communications Technology: Platforms for Learning and Teaching



Chapter Introduction by Robert J. Gravina

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“Our goal is not just to engage students. We are building their fascination, excitement, and passion, and then getting out of the way.”

As Jim Collins states in his book, *Good to Great*, technology is an accelerator. If technology is implemented well, with the right vision and plan, you will get better results faster. However, if you implement technology poorly, with no vision, the opposite will happen and you will get worse faster. At Poway Unified School District (PUSD), our classes with one-to-one computing outperform those with less technology, because of the entire environment. Technology is never just about the device. It's about providing professional learning, in combination with other tools and content and support for the teachers to use technology to change the way they teach and the way students learn.

Our goal is not just to engage students. We are building their fascination, excitement, and passion, and then getting out of the way. We're always asking: Are we using all the capabilities that are at our disposal? Are we teaching differently? Professional learning will always be the most effective thing you can do to improve learning.

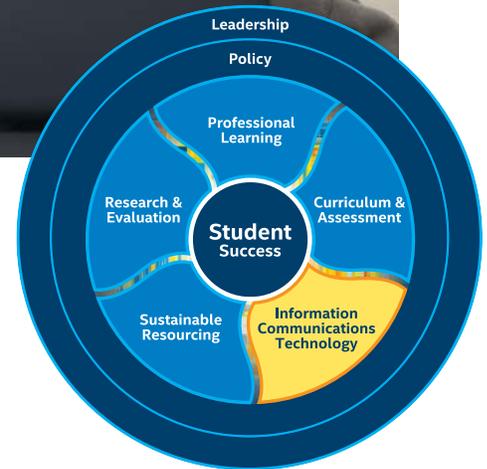
As technology becomes essential to teaching and learning, IT has to run more like a business. Schools can't afford to squander funds, so we need to build our project management expertise and increase the rate of success for technology projects. Because devices and networks must be completely reliable, IT teams need to use data to improve operations. We also need to think strategically about the mission of education—to look beyond running the hardware, and create new capabilities that help improve learning outcomes, ease of use, and collaboration.

I believe Big Data and its use for personalized learning is the next big technology on the horizon for school systems. Just as the private sector has embraced Big Data to increase profits, it is now time for education to do the same and to find ways to use all the data we collect on our students to develop personalized learning platforms. Teachers should always have the final input into what the student needs to learn and how they will learn it, but with the use of Big Data, we'll be able to provide teachers with much more information to help them guide each student's education. Educators will be able to do predictive analysis and if a student is developing problems, they can intervene to change the trajectory so that all students are college- and career-ready when they graduate.

Poway USD is preparing for this data era by building an adaptive learning platform—a recommendation engine that will suggest resources and tools based on the student's learning style, goals, and many different types of assessments. We're building a new school that will be organized around personalization and flexibility. Education is finally moving away from the 1925 model of learning.

Robert Gravina

Robert Gravina is a nationally acclaimed technology leader in the education field. At Poway USD, he is responsible for providing technology for 40,000 students and overseeing a user base of more than 100,000 students, teachers, parents, and administrators. He was named one of the Top 50 Innovative Educators by the Center for Digital Education, was a member of the California's Emerging Technology Council, and continues to represent educational technology on several other state and national advisory groups.



Essential Enablers

Information and communication technology (ICT) provides essential tools for educators to modernize learning, teaching, and assessment and increase student achievement. Effective eLearning environments combine mobile devices with high-quality education software, broadband Internet access, robust infrastructure, and secure cloud services to bring resources into the classroom and enable personalized learning experiences. Backed by appropriate infrastructure and guided by effective teachers, students use their mobile devices to:

- Work and learn within the school and throughout the community
- Access, use, and create a wide variety of media-rich content
- Read and interpret complex text, images, data, and media
- Collaborate with peers, local and global experts, and community members
- Conduct virtual experiments
- Demonstrate their learning through a variety of authentic methods in addition to exams

In addition to mobile technologies for students, ICT can improve educational results through:

- Productivity solutions that give teachers more time to work with students and allow schools to operate more efficiently
- Secure portals that extend the school day, improve communications between school and home, and empower parents to be active collaborators
- Collaboration technologies that help teachers reduce isolation and expand their expertise by participating in professional learning communities
- Advanced analytics tools that help decision-makers identify and extend evidence-based strategies
- Cost savings that can be applied to fund innovation

Investments in student devices deliver more value when students can use them throughout the school day and beyond, so a one-to-one ratio of students to devices is often recommended. Comparing schools with one-to-one computer deployment to those with a four-to-one ratio or higher, Project RED's research²³ found that the one-to-one schools were more likely to:

- Use a wide range of digital materials more (83 percent vs 46 percent)
- Use problem-based learning (75 percent vs 43 percent)
- Take control of their own learning (75 percent vs 40 percent)

As ICT becomes integral to everyday learning and teaching, school systems benefit from systematic approaches to selecting, deploying, and managing educational technologies and resources. This chapter covers:

- Choosing devices for learning and teaching, including tips for bring-your-own-device (BYOD) initiatives
- Securing and managing the environment
- Planning for the device life cycle
- Ensuring your infrastructure and data analytics solutions can meet rising demands
- Equipping ICT staff to support ICT's expanded role in 21st century learning and teaching

Choosing Devices for Learning, Teaching, and Assessment

Device choices for learning and teaching start from the desired outcomes and uses. Teachers need full-featured laptops to create lessons, design personalized learning experiences, assess student progress, collaborate with colleagues and experts, conduct their own professional learning, and evaluate new sources of data. Students can use a wider range of mobile devices depending on the grade level and the curricular and assessment requirements.

In addition to empowering learning and teaching, student devices must be managed efficiently and secured effectively. If they're not, large-scale device deployments can:

- Detract from learning and teaching by burdening students and teachers with management tasks, configuration details, and inconsistent performance
- Put the system's entire digital infrastructure at risk through virus attacks and other malicious activity
- Threaten the exposure of sensitive information, damaging the school system's reputation and risking legal penalties

To select devices that meet requirements for curriculum, assessment, management, and security, it's best to take a systematic, collaborative approach that builds on the school system's visioning and curriculum planning activities. A team that includes the school principal(s), students, teachers, ICT professionals, and other administrators can work together to:

- Develop device specifications that address the needs of all stakeholders
- Identify and evaluate devices that best meet the full range of requirements

If the budget supports it, a more saturated environment can enable students and teachers to use different devices depending on the tasks to be performed. In a mixed platform environment, schools can avoid chaos by selecting laptops, tablets, and other devices within a compatible architecture or operating system. For example, laptops, 2 in 1 devices, and tablets can serve as all-in-one learning platforms or in a compatible mix-and-match environment. The questions in Table 7-1 can help in device selection.

Practical Questions for Choosing Student Devices

Type of Requirements	Questions and Considerations
Performance	<ul style="list-style-type: none"> • Can students use the device for serious computing? Does it provide responsive performance for interactive learning, media-rich applications, content creation, video conferencing, multi-tasking, and assessment? Will it support future applications and emerging capabilities such as adaptive software and real-time formative assessments? • Can the device run virus scans, encryption software, and other security solutions without disrupting learning and teaching? • Is the device reliable enough for everyday learning and teaching? • Does the device meet global standards for energy consumption and environmentally sensitive materials?
Mobility	<ul style="list-style-type: none"> • Is the device lightweight and easy to carry? • Is it sturdy and rugged enough for student use? Does it come with a protective case? • How long is the battery life? How easy is it to recharge, dock the device, or swap batteries?
Software and other capabilities	<ul style="list-style-type: none"> • Does the platform support a wide range of student and teacher applications and resources, including open source solutions? • Is it supported by mature classroom management solutions that let teachers easily view and interact with student devices? • What educational software and equipment are included or available? How easy is it to integrate new capabilities—for example, to add devices such as digital microscopes for hands-on learning? • What devices such as a camera, microphone, and speakers are built in?
Usability	<ul style="list-style-type: none"> • Is the screen large enough and easily readable? Is it viewable in bright sunlight and dim lighting? Can students navigate through complex documents? • Is the keyboard practical for serious work? What other data entry methods are supported—touch screen, handwriting, voice? • Does the device meet assistive technology requirements? If not, how easily can it be modified?
Security, privacy, management, and the environment	<ul style="list-style-type: none"> • Is the device supported by mature, enterprise-tested security and management solutions? • How robust are the warranty, damage protection, and support arrangements? • Is there expertise to support the operating system, including remote management and security technologies? • Can you lock down the device for standardized tests (i.e., disable unrestricted Internet access, remote access, cameras, screen capture, Bluetooth connectivity, etc.)? • Does the device meet national or international standards for environmental impact, use of sensitive materials, etc.?
Communications	<ul style="list-style-type: none"> • What communication standards does the device support? Bluetooth, WiFi, 3G/4G, USB, etc? • Can students work offline and synchronize their data when they connect to the network?
Cost	<ul style="list-style-type: none"> • Will you need to buy equipment such as keyboards, headphones, and docking or recharging stations separately? • How long can you reasonably expect the device to remain in service? What mid-cycle upgrades, if any, will you need to do? • What is the total solution cost over the lifetime of the devices, including infrastructure impacts and software licensing costs?

Table 7-1

Bring Your Own Device (BYOD)

BYOD initiatives let students use personal laptops, tablets, and smartphones with educational software in the classrooms. By reducing or avoiding the school system's need to purchase mobile devices, BYOD can help stretch budget resources. However, a BYOD environment requires the same attention to policy, leadership, infrastructure support, curriculum development, assessment, professional learning, and evaluation as a school-led technology initiative. In addition, BYOD raises concerns about equity, and the diversity of a BYOD environment adds complexities beyond those of a more controlled environment with school-owned devices. Table 7-2 summarizes some issues and potential remedies if you're considering BYOD.

Issues and Answers for BYOD

Issues	Background	Potential Remedies
Device suitability for mobile learning	<ul style="list-style-type: none"> Students' mobile devices may be too small or underpowered to provide a good response when using education applications or taking online tests Devices may not support required applications, or may support only a limited subset of the applications' capabilities 	<ul style="list-style-type: none"> Establish minimum requirements for screen size, CPU performance, battery life, software availability, browser speed, and other important criteria
Security	<ul style="list-style-type: none"> Student devices may lack security features, making it more difficult to protect data and ensure compliance with national and state policies designed to protect children The range of devices can make it hard to deploy security updates quickly and consistently 	<ul style="list-style-type: none"> Create a segmented network that keeps student devices separate from the network teachers and staff use Implement strong authentication procedures to ensure only legitimate users access the network Identify virus software and other security solutions for the range of devices students will bring Require that devices used for assessment can be locked down
Classroom management	<ul style="list-style-type: none"> Teachers must handle a diverse and challenging device environment 	<ul style="list-style-type: none"> Identify effective classroom management solutions that will work across the range of devices Provide professional support to help teachers address the challenges of managing a classroom with diverse devices
Network capacity	<ul style="list-style-type: none"> The network must handle a large number of devices running bandwidth-intensive applications simultaneously 	<ul style="list-style-type: none"> Be prepared for the demand, including the bandwidth to handle multimedia applications and peak loads at the start of the school day Work with local vendors and network specialists to plan for cost-effective network build-out
IT staff impact	<ul style="list-style-type: none"> IT teams must support a wide variety of devices, operating systems, and applications 	<ul style="list-style-type: none"> Assess your IT team's ability to support a BYOD environment. Plan for additional training and staff as needed Establish a secure portal to distribute educational software to student devices Monitor distribution so you can accurately determine usage
Equity	<ul style="list-style-type: none"> Not all families will have a suitable mobile device for their students or be able to purchase one 	<ul style="list-style-type: none"> Survey parent and student attitudes to identify and address any concerns before you start Establish a budget and procedures so students who don't have devices at home can acquire them

Table 7-2

Securing and Managing the Environment

Mobile device management (MDM) and security technologies can help ensure that confidential data remains private and technology investments are available to support learning and teaching every day. MDM solutions can help ICT staff manage devices remotely and maintain accurate inventory data, and efficient device management can help keep devices in good working order. Effective management strengthens security by enabling ICT staff to keep operating systems and applications up to date and to quickly install the latest security patches.

Strong security results from vigilance at every level and layer of the technology environment. This includes not only devices and device management, but also networks, firewalls, virus scans, data encryption, applications, and other security software. Security is a function of device capabilities (such as whether a mobile device can run encryption software if that is required). It also results from sound management processes and thoughtful efforts to educate students, teachers, parents, and others on effective security practices. Vendor management becomes more important to ensure that all vendors conform with relevant regulatory and school system requirements regarding data privacy and the appropriate use of data.

Standards-based assessments bring additional security requirements to ensure that tests are not tampered with, students do not collaborate inappropriately, and results are delivered securely to the testing agency. A security plan for standards-based assessment should consider:

- Device lockdown
- Bluetooth* pairing
- Key loggers and spyware
- Network breaches
- Malware
- Denial of service attack
- Student authentication and identification

Life Cycle Management and End-of-Life Planning

Life cycle management is important for gaining the full educational value of educational technology investments. Both educational effectiveness and lifetime total cost of ownership (TCO) are affected by how long you keep computers in service. The key is to plan for a realistic life cycle that matches your budget and ensures that mobile devices and other ICT solutions will still be effective learning tools during the latter half of their life span. For aging devices, the important questions are:

- Can the platform still provide good performance for the applications, tools, web sites, and usages that are important to learning and teaching?
- Can it run well-supported modern operating systems, security, and management tools? If not, keeping the devices in service may expose the systems and the network to unacceptable levels of risk.

Rapid technology advances can make it more cost-effective, energy-efficient, and educationally sound to replace aging devices and infrastructure than to keep them in service. As computers and devices age, consider whether they are starting to:

- Require costly and time-consuming upgrades
- Consume more power than newer equipment, driving utility costs up and creating an environmental burden
- Reduce performance, causing frustration and lost productivity for users
- Require more repairs, further draining user productivity and reducing the time support staff can spend on more important tasks
- Raise the exposure to security risks if virus patches and other security software are not kept up to date

When it's time to retire your technology products, many PC vendors offer trade-in, recycling, or other end-of-life programs. Organizations such as EPEAT evaluate computers and other electronic equipment to highlight those that consume less energy, avoid environmentally sensitive components, and follow other best practices. Purchasing EPEAT-registered products can help reduce the environmental impact of your technologies and make them easier to recycle and dispose of at the end of their life cycle. If older equipment is still usable, consider wiping the hard drive and then waterfaling it within the organization, donating it, or otherwise getting value from it.

Infrastructure

Scalable, sustainable infrastructure provides critical back-end capabilities to support teaching and learning and achieve program goals. Infrastructure may include a secure private cloud for resources available within the school system, as well as local infrastructure linked to resources available through public cloud services. Infrastructure must:

- Support the activities and content required for learning, teaching, assessment, professional learning, and collaboration—from sophisticated simulation software to emerging data analytics solutions
- Be reliable and robust enough for school-wide, system-wide, or state-wide deployment
- Be flexible and scalable to accommodate rapid growth in the number and variety of devices and the use of new data sources, media-rich applications, advanced tools, online assessments, adaptive software, archival requirements, and other usages
- Provide performance and bandwidth for peak periods such as high-stakes tests and the start of day when all students may be getting onto the network

Networks

Bandwidth opens the world to students and teachers, and providing sufficient bandwidth is essential to gaining the full educational value of investments in mobile devices. If students and teachers have a poor experience accessing the network, or if you have to limit the use of media-rich applications because of inadequate bandwidth, you're also limiting the educational value of the devices and losing some of the potential return on investment.

Whether you issue school-provided devices or implement BYOD, you may need to make major upgrades to wired and wireless networks to ensure that students and teachers can connect from wherever they need to and accomplish what they need to. To strengthen security, implement a segmented network that helps protect the school system's internal resources from unauthorized access.

Servers, Storage, and Cloud Services

Modernizing and virtualizing the server and storage infrastructure is an important way to provide added capacity at an affordable cost. Virtualization makes it possible to dramatically consolidate older infrastructure, saving floor space, reducing energy costs, and increasing the efficiency, flexibility, and reliability of the ICT environment.

Cloud computing builds on virtualization's strengths, adding faster provisioning of services and enabling ICT to quickly meet changing educational requirements. Depending on available bandwidth and Internet connectivity, many school systems will want to follow the same route as businesses and government agencies, moving toward a secure private cloud for the school system or state, supplemented by public cloud resources and virtualized local servers.

Data Analytics: Holistic Information, Better Decisions

School systems, like other large enterprises, have vast quantities of data residing in a diverse set of databases and applications. These solutions can do an adequate job of collecting and reporting data, but because they exist in individual silos, they make it difficult to analyze patterns that emerge from a holistic view of the data. Often, they are difficult for anyone but experts to use easily.

A new generation of data solutions is helping turn data into valuable information for students, teachers, parents, and administrators. Data warehouse solutions can bring together data from diverse systems and present it in easy-to-understand dashboards. Newer, big data approaches use a distributed analytics framework with open source platforms such to reduce the costs and increase the flexibility and power of data analysis.

By offering stakeholders a secure, comprehensive, and role-appropriate view of relevant data, a well-designed data warehouse or distributed data analytics solution can facilitate more evidence-based decisions about student learning, school system performance, financial planning, and more.

Professional Learning for ICT

Large-scale educational technology initiatives often require new skills and expertise for ICT professionals. Professional learning for ICT personnel should address:

- Understanding ICT's role as an enabler for 21st century learning and teaching
- Working collaboratively with educators and other stakeholders to improve student outcomes
- Providing high levels of support so problems are remedied quickly and teachers can focus on teaching, not on configuring and managing devices
- Ensuring that devices, networks, and other infrastructure are robust enough to be an everyday, all-day part of the student learning environment
- Implementing and maintaining a secure environment, including robust security and privacy policies
- Working with vendors to ensure they comply with policies and procedures, particularly regarding data management and privacy
- Using performance data to improve ICT operations

ICT Implementation Checklist

Key Tasks

- Select and deploy mobile computing devices that meet education and institutional requirements.
- Modify infrastructure, security, management processes, and ICT staff training to support ICT's critical role in learning and teaching.

Steps to Success

Professional Learning for ICT

- Ensure that all ICT staff understand their role in supporting learning and improving student outcomes.
- Conduct a needs assessment to identify new roles and responsibilities for technology coordinators, system administrators, network administrators, and other ICT staff.
- Create a menu of professional learning activities so staff can develop needed skills. Aim for a blended environment of face-to-face and self-directed activities.

Device Selection

- Start with your learning and teaching objectives, and be systematic. Establish a team of students, teachers, administrators, and IT professionals to identify device requirements and evaluate available options.
- Develop device specifications that address curricular and assessment requirements for the grade level and subject matter, as well as the school system's security, privacy, and management requirements.
- Evaluate and rank a range of devices and operating systems to choose the best alignment with requirements. A small set of flexible device types will be easier for teachers to use and ICT teams to manage than an extremely diverse environment.
- Make sure devices will comfortably meet assessment requirements, but don't neglect the capabilities needed for learning and teaching.
- Work closely with the school system's financial experts to budget for technology costs, including TCO. For each device category, aim for a life span that aligns educational requirements with budget resources.
- Take a holistic look at total lifetime costs as you choose devices, since device choices can affect infrastructure and life cycle considerations. For example, tablets generally need to be replaced more frequently than enterprise-level laptops. Tablets may also bring additional expenditures for access points, software licenses, and accessories such as protective covers and keyboards.

Infrastructure

- Conduct a needs assessment to identify needed infrastructure upgrades and staffing impacts. Plan holistically for infrastructure expansion, keeping the focus on meeting educational requirements with the devices that have been chosen. Device strategies such as BYOD can require additional server and network capacity.
- Audit each building, including classrooms, hallways, and common areas, to ensure you have enough electrical capacity, charging or docking stations, printers, power supplies, and other elements in place. Upgrade as needed.
- Assess LAN, wireless network, and Internet connectivity to identify and eliminate potential bottlenecks. Make sure you understand the bandwidth requirements of standardized testing requirements for your state, province, country, or school system.
- Device categories vary in their wireless "reach," so plan your placement of access points carefully to ensure adequate coverage of classrooms, libraries, hallways, and other spaces.
- To strengthen security, establish separate or segmented networks for students and teachers.
- Develop a roadmap to transition the school system's infrastructure to a virtualized environment with secure, private cloud services. Supplement the infrastructure with public cloud services.
- Work with local businesses, nonprofits, and government organizations to extend broadband coverage across the community.

Security and Management

- Make sure you understand and educate stakeholders on state and national laws designed to protect children from inappropriate content, inappropriate disclosure or use of student data, and other matters related to security and privacy.
- Develop and implement security policies, technologies, and procedures, including network segmentation, firewalls, filtering software, and data encryption if necessary.
- Develop a plan for maintenance and support, including how you will handle software upgrades, security patches, and other device management tasks.
- To reduce security risks, avoid keeping devices and systems in service once the operating system is no longer supported.

Rollout

- Ensure that teachers have their equipment well ahead of students and know how they will use the technology to improve student outcomes.
- Think through the practical issues. Where will you store devices if students are not taking them home? How will you deal with theft, loss, and repairs?
- Train ICT staff on all aspects of the deployment. Do a practice run in advance.
- Have all available technical support staff and instructional technology specialists physically present and highly visible as the deployment begins.
- Do a phased rollout—by grades, classes, or schools, depending on the scale of your program.

Ongoing

- Stay abreast of new technologies and solutions.
- Be proactive. Look for ways ICT can add value to the learning environment and the school community.
- Identify the types of data stakeholders need in order to make better decisions about student learning, school system performance, budgeting, and other issues. Deploy next-generation data analytics solutions and dashboards to provide that information in secure, easy-to-understand formats. Use distributed analytics approaches to provide more flexible, cost-effective data analysis.

INSIGHT

Choosing Devices for K-12 Learning and Teaching

By Robert Moore, Founder and Chief Consultant, RJM Strategies, LLC
@BobMEdTech

When it comes to choosing devices for students, we need to be as systematic in our approach to technology as we are in planning curriculum instruction or facilities management. We can't just buy technology and plan to figure it out as we go.

The best place to start is with student outcomes. Get everyone talking about what student outcomes you're looking for and how you'll use the devices to help achieve them.

It's important to understand what students will do with the devices over the lifetime of the device and over the full range of courses students will take. What resources will students access in their research? How will they collaborate? What will they create? How will they demonstrate learning? What assessments will they take? And what new capabilities are coming that teachers will want to have them use?

These discussions should lead you to a list of requirements, and prepare you to evaluate devices and see what matches your criteria. These questions are important before you start doing any educational technology program, so you can make sure the devices are suitable for educational tasks.

Device decisions can have large and unintended impacts on learning and security. Before you purchase devices, develop a plan for how you will manage them, including tasks such as security and distributing software applications. Choose devices that can be managed by a central IT team, and help your team develop skills and procedures to manage them. You don't want device management tasks to fall on teachers and add to their workloads. Poor device choices can set the school system back 10 years in device management and create serious security risks.



“When it comes to choosing devices for students, we need to be as systematic in our approach to technology as we are in planning curriculum instruction or facilities management.”

Bob Moore has more than 25 years in education technology, including two decades as a CIO of K-12 schools. At RJM Strategies, he works with schools, education organizations, nonprofit associations, and businesses as a strategist, advisor, and subject matter expert.

CASE STUDY

Poway Unified School District (PUSD), San Diego County, California, U.S.A.

Located in southern California, PUSD operates 37 schools and serves approximately 35,000 students.

PUSD is committed to preparing every student for college or careers, and the district's leaders view ICT as essential to fulfilling that commitment. The district combines strong central and distributed leadership, and individual schools are taking varied approaches to educational technology. Several schools are piloting one-to-one models with a range of different devices, and others are experimenting with BYOD programs. Principals and teachers have taken the lead in many cases, deciding together what grades and curricular approaches to target, and choosing devices accordingly.

All programs share a focus on evidence-based planning and a holistic approach to implementation. "Our one-to-one classes outperform our non-one-to-one classes by leaps and bounds, but what we're doing is much more than just giving kids laptops or tablets," says Robert J. Gravina, PUSD's chief information and technology officer. "It's a whole one-to-one environment, with interactive technologies, digital tools, and media. We're always looking at whether we're using all the technology that's at the teachers' fingertips—using it effectively and using it to teach differently. We focus very heavily on professional learning, and on using the data we have available to better serve our students."

Learn more:

- PUSD Education Technology Plan, July 1, 2011 – June 30, 2016: https://www.powayusd.com/doc_library/it_PUSDTechPLan2011-2016.pdf
- *Getting a Great Head Start in Poway, CA*, by Ellen Ullman, August 13, 2013. <http://www.k12blueprint.com/content/getting-great-head-start-poway-ca>
- Watch a video about an educational technology initiative with kindergartners at PUSD: <http://www.intel.com/content/www/us/en/education/it-in-education/education-poway-unified-kindergarten-video.html>

The infographic is a dark blue rectangle divided into three vertical sections by dashed white lines. Each section contains a white icon and text. The first section shows a school building icon above the text '37 schools' and '35,000 students'. The second section shows an icon of a woman and a child holding hands, with two laptops on either side, above the text 'One-to-one environment, with interactive technologies'. The third section shows an icon of a woman wearing glasses above the text 'Focus on professional learning to better serve our students'.

Citations

- 23 T. Greaves, J. Hayes, L Wilson, M. Gielniak, and R. Peterson. *The Technology Factor: Nine Keys to Student Achievement and Cost-Effectiveness*, MDR 2010. <http://www.pearsonfoundation.org/great-learning/research-reports-and-surveys/project-red-the-technology-factor.html>.

Resources

- Intel® Education resources for ICT leaders: <http://www.intel.com/content/www/us/en/education/it-managers.html>
- EPEAT recommendations and ratings for K-12 education: http://www.epeat.net/wp-content/uploads/2013/10/EPEAT_K-12_One-Page.pdf.
- K-12 Blueprint's Bring Your Own Device Toolkit: <http://www.k12blueprint.com/byod>