The Trifecta for Transforming Education: Making big dreams possible with small budgets using virtualization technologies

Research provided by **CENTER FOR DIGITAL EDUCATION**

Introduction

Technology is at its best when it facilitates communication, engagement, interaction and understanding. This was brought to life by Karen Cator, director of the Federal Office of Education Technology, when she toured the Mooresville Graded School District in Mooresville, N.C., in 2011. Cator explains that she was blown away by how the district has achieved a balance between technological advancement and academic goals:

"In several classrooms, I couldn't tell where the front of the classroom was. On one side of the room was an interactive whiteboard; on another side, a regular whiteboard; and the teacher's desk was on a third side. The whole space was a learning environment, and the technology was just part of the infrastructure. In a high school class, students had chosen books and were presenting to classmates their digital visual representation of the theme of the book. As they watched one another's presentations, they were entertained, yet the meaning of 'theme' was completely clear, and they were being exposed to a variety of literature. Although the subject wasn't related to technology, technology facilitated communication, engagement, interaction and understanding."[1]

Across the nation, districts strive to achieve this type of balance. However, finding the path to this balance is difficult. Increasing complexity and external demands in the world of academia also interfere.

In many districts, administrators, officials and parents often see technology as a panacea: "Invest in the latest and greatest solutions and all of the challenges will disappear." Most of the time, however, technology alone doesn't save the day.

That's because technology isn't a magic elixir. Instead, most districts must balance technology needs with academic goals — two demands that are all-too-frequently at odds with each other: budget limitations on the one hand, and meeting performance standards and state and federal mandates on the other. This constant push-and-pull can be exhausting even for districts with the resources (and wherewithal) to get creative with solutions.

But there is at least one path toward a coherent approach — an approach that addresses the complexities in the world of academic technology and, at the same time, highlights some of the best trends in computing today. The strategy takes into account curricular and technology limits, yet strives to achieve more with less. It's flexible, scalable and eminently replicable in districts and schools of every size. The solution has three parts. We call it the trifecta.

Explaining the Trifecta

Good things come in threes. The Holy Trinity. The Three Stooges. The three Great Pyramids at Giza. Academic technology is no different. In order to transform education with technology, in order to deliver a more compelling and cost-effective approach to academic IT, schools and school

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districts must embrace a tripartite strategy — a trifecta, if you will. These three calls to action empower technologists to overcome some of the challenges facing academic computing today. They are:

- Blending forms of learning
- Looking for small wins that can blaze a path forward
- Facilitating interactions and collaboration

In today's world, the trifecta is about putting technology to its best use. This paper will describe the trifecta in more detail and provide a few examples where this is already happening. It will also explain how districts can take advantage of advances in virtualization technology to achieve this three-part strategy and make big dreams happen on small budgets.

The Role of Technology in Blended Learning

For the better part of the last decade, instruction at the K-12 level (and, in many cases, beyond) has come in two major flavors: face-to-face and online. Over the last few years, however, a new model has emerged — a model that combines both traditional flavors into a new format that comprises both. This model, appropriately dubbed "blended learning," incorporates in-person lessons, online lessons, chat and Web-enhanced lectures — extending the boundaries of the classroom into the Internet environment and beyond. Administrators are able to offer more and varied resources, teachers are able to reach students with different experiences and engagement levels, and students are given more ways to learn and explore.

Achieving true blended learning is more challenging than it seems and requires thoughtful and careful application of technology in order to work. One of the challenges is finding the right balance. Often, district administrators mistake "blended" for simply moving learning online. It's more nuanced than that. District leaders should ask themselves how much they want technology to facilitate learning, in what subjects, and what percentage of the curriculum online learning should represent.

Furthermore, an ideal blended learning environment stems from a 1:1 computing environment where each student has access to a personal device for self-paced, personalized instruction to supplement classroom learning. Unfortunately, many students still lack access to computing at home and according to Broadband.gov, approximately 100 million Americans (teachers and students included) still do not have broadband at home, making access to digital content difficult.

MYTH

Tablets Are the Ultimate PC Today

Perception: Tablet computers, with their sleek form-factors and lightning-fast computing power, are the ultimate PC for the K-12 environment.

Reality: The reality of tablet computing is more measured and balanced. Tablets are new and exciting, they capture the imagination of both students and teachers, and enable new use cases and collaboration than were previously possible. The flip side is that there are limitations. The emphasis on the touch screen and the lack of peripherals make them better for consuming information rather than creating content. Other issues are the limited curriculum and applications built specifically for tablet computing, application compatibility for existing needs, and two that are often overlooked: a lack of sufficient network infrastructure and a limited ability to centrally manage. At best, these issues create hidden (or not so hidden) costs that can severely undermine deployments. At worst, these limitations can completely derail technology initiatives. The bottom line: Tablets aren't the sole solution to learning challenges. For some districts and schools, the high acquisition cost and the inability to leverage existing PCs and equipment may limit tablet computing for quite some time.

A successful blended learning approach is facilitated by technology, but technology does not define blended learning. An appropriate balance must be found to seamlessly blend technology into daily curriculum. Professional development for teachers must also be included to encourage adoption and build commitment and confidence. When districts properly balance these initiatives, however, the learning benefits follow as studies have shown this type of blended approach achieves the best academic results.[2]
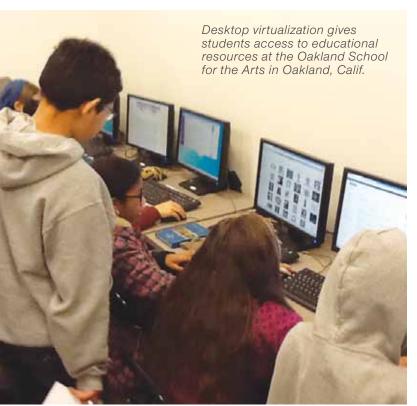
Desktop virtualization gives students access to educational resources at the Oakland School for the Arts in Oakland, Calif.

IMAGE SOURCE: OAKLAND SCHOOL FOR THE ARTS

Look for Small Wins that Can Scale Later

In a perfect world, every school district across the country would have limitless financial resources to procure all of the latest and greatest technology and achieve access equity overnight. In reality, however, IT departments struggle to operate within budgetary constraints and restrictions, making it difficult to leverage technology to re-engineer the infrastructure with any degree of consistency or urgency. Limited IT staffing also makes large deployments and upgrade cycles extremely challenging. The fact is that budgets are and likely always will be tight. Put simply, the current climate generally prohibits the notion of transforming everything all at once.

Instead, encourage small wins that can align with broader rollouts later. Since attempting wholesale adoption runs headfirst into budget constraints — as well as the usual problems associated with any large-scale and long transformation — small wins can be the basis of accelerating honest-to-goodness change. Small wins provide the opportunity to "prove the point" and help focus efforts and identify the strongest long-term directions. They can also help districts and schools develop more entrepreneurial approaches and spirit; publicizing the results of these efforts can encourage faster progress overall.

MYTH

Consumerization Transforms Everything Easily

Perception: The quicker your IT department overhauls the infrastructure with the latest and greatest tool from Vendor X, the better off your district's IT department will be.

Reality: Don't believe the hype; just because Vendor X says its new tool is great, it doesn't mean it is or that it will have the promised impact within your environment — in the timeframe and with the budget available. Especially in a tight budgetary climate, the best strategy for technology adoption is looking for technologies where you can demonstrate the value quickly and where there is short-term value and immediate cost-effectiveness. At the end of the day, it's important to invest in technology that advances the curriculum and student performance, not technology that might satisfy a long-term vision or for technology's sake itself. In short, districts shouldn't succumb to political pressure for a complete fix-all — the best choices will demonstrate innovative uses of the technology, not just showcase innovative technologies.

The key to technology adoption in the current environment is cost-effective decision-making and looking for short-term successes. Identify and support small wins that advance sustained benefits for users and IT staff. Most importantly, look for the wins that can scale to benefit more of your constituents now and in the future. If choices don't deliver more computing seats per budget dollar, they're not choices a district should be making in the first place.

Facilitating Interactions and Collaboration

For the first time in the history of computing, young people are interacting predominantly through technology. They Facebook. They Tweet. They text. And they expect to use these tools not just with classmates, but with teachers and even their parents. In order for academic technologies to stay relevant among the most critical user

base, technologies should be social in nature and facilitate interactions and collaboration. Student-facing technologies need to establish an environment that students themselves are going to use and an environment in which teachers, aides, tutors and even administrators can participate as well.

This can be a double-edged sword. At its best, technology that facilitates interactions and collaboration leads to more teamwork, group learning and interactive understanding of big-picture concepts and themes. At its worst, such technology can make it easier for students to cheat and exacerbate the differences between the haves and have-nots and between those with expertise and those without.

Ubiquity is paramount when it comes to collaborative technologies; students will not embrace them as routine unless the technologies are everywhere. This, of course, comes back to the issue of access; the more prevalent and accessible the technologies are, the more likely it is that students will use them and actually interact with each other. Teachers can't facilitate collaboration in the classroom and beyond when their students don't have convenient and consistent access to computing.

Because of this, delivering access should have priority over having the latest and greatest technology when it comes to learning. When access is widespread, it facilitates collaborations such as students in New York and California teaming up with students in India and China. It is also common for several schools in a district to collaborate on a project together, or for a student who is excelling in a particular subject to assist students at neighborhood schools that may be struggling with the material. Unlike in the past, the appropriate technology makes this possible regardless of the distance.

How Districts Can Achieve the Trifecta

On paper, the trifecta might seem like a tall order. Blended learning! Small wins in the face of challenging constraints! Embracing technologies that facilitate collaboration! Many academic technologists would be satisfied accomplishing even a part of one of these goals in a fiscal year, much less all three. That's why virtualization is such a revolutionary concept.

Virtualization, a shared computing strategy that maximizes efficiency by centralizing computing on higher performance servers that are easier to manage, is one way to fulfill all three requirements of the trifecta. It achieves more with less. It simplifies management. It provides an environment for blended learning and collaborative

MYTH

Education and Learning is Primarily Done in the Classroom

Perception: Because students traditionally have done most of their learning in classrooms and teachers have been trained in a lecture-centric model, even with blended learning, classrooms are where most learning should occur.

Reality: Interactive, collaborative technologies enable education to transcend traditional brick-and-mortar classrooms and exist just about anywhere students (and educators) can work together. These encounters can occur in the cloud, in a course management system or via chat. They also can cross state and national boundaries, linking students from different cultures and parts of the world. Moreover, courses can be shared more easily when there aren't local resources available — even just across town. A school could expand its curriculum or at least supplement classes with those being offered nearby without requiring buses or other transport. This allows districts to supplement classroom learning with rich and varied experiences. When this works well, the teacher is still the leader and coach, but the learning takes place on a broader playing field.

technology. It also facilitates small wins with a technology that can evolve and scale. Most important, virtualization enables big dreams with much lower budgets than otherwise possible. Put simply, it is a critical strategy for transforming education with technology.

The effort to transform a district's technology infrastructure through virtualization can come from an individual school or a district — with the critical mass, other requisite elements such as next-generation blended learning and teacher and administrator training will follow quickly.

Following are examples of a district and school that have utilized desktop virtualization to transform education for the better for their students.

St. Johns County School District Goes Virtual

Three years ago, technologists at St. Johns County School District in Florida were stumped. New state mandates required computer-based assessments, and the district needed to invest in new equipment quickly and effortlessly to make sure they could comply.

This time around, however, Chris Petrello, assistant director of technology support, didn't want to purchase traditional PCs. He wanted something different. The solution: virtual machines.

Overnight, this technology transformed St. Johns' computing infrastructure, re-creating computer labs and practically tripling the number of machines available for end user use.

This lecture style undoubtedly played a role in St. Johns' distinction as the top-performing school district (by assessment scores, of course) in Florida for 2011.

Still, the technologist warns that virtualization, much like technology itself, isn't a cure-all. While the new technology has made management easier, it also has required St. Johns to retrain IT staff to support a host of new programs on the virtualized machines.

Although virtualized machines lack the same computing power that traditional PCs do, they are cheaper, require less energy to operate, and provide more than enough power for student learning and experimentation.[3]

IMAGE SOURCE: NCOMPUTING

Donn Harris, executive and artistic director, describes the impact of desktop virtualization for the Oakland School for the Arts.

Staying Flexible at the Oakland School for the Arts

In 2009, Director of Technology David Smith — the sole overseer of the IT operation for the Oakland School for the Arts — decided the school needed a different approach to its 1:1 laptop program that it had embraced for years.

He completed an extensive academic computing needs assessment and compiled a set of technology requirements. Once he had determined the requirements, he examined the technology landscape and evaluated the options which were in line with expected budgetary constraints. "Very quickly I determined that the technology underlining virtual desktop infrastructure (VDI) had matured to the point that I believed it was sufficient to handle our short and longer-term academic student technology requirements," Smith says.

The purchase also saved quite a bit of money; instead of paying between $600 and $1,000 per unit, the district nabbed the virtual units for about $375 a piece.

"Our goal was to get the most out of the technology," he says. "I think we managed that well."

Petrello notes that the technology has facilitated a unique form of blended learning called "flipped" lectures. Instead of lecturing and then giving students homework to complete at home, educators are requesting (through the CMS) that students complete assignments before class and are then teaching to those assignments during the face-to-face classes.

Smith selected the virtual solution for four basic reasons:
• It was fiscally viable and responsible.
• It could be supported with a staff of one.
• It would enhance what the school already did educationally.
• It was operationally effective.

Now that the technology has been implemented and faculty members have been trained on how to use it, Smith says for the most part, he just sits back and lets educators do their thing.

The world of academic technology is becoming increasingly more complex. Virtualization can be the cornerstone of a strategy to counteract this trend by simplifying the delivery and ongoing management of a simple, powerful and highly affordable computing environment — allowing you and your users to do more, for and with less. And it's precisely what NComputing does best. **NComputing can deliver a complete, modern computing experience to users at less than a third of the cost of either individual PCs or other virtualization approaches.** NComputing solutions also allow districts and schools to turn desktops, laptops, netbooks and even older PCs into high-performance virtual desktops — in minutes. It's a solution that's purpose-built to meet the constraints faced in today's schools: deploy and manage computing centrally, but provide highly reliable and fast access where it's needed.

This technology reclaims and leverages the computing power of under-utilized PCs with either high-performance thin client devices or by adding software clients. Virtualization has been used for many years to simplify server infrastructures and to reduce both capital and operating expenses in the corporate world. NComputing applies the same concept to academic computing by virtualizing the power of individual PCs into a single manageable resource that empowers students, staff and faculty with access to a quality computing experience. Depending on the configuration, a single operating system on a standard PC running NComputing's virtualization software can support up to 100 simultaneous users, each with their own independent and high-performance desktop session. Schools and districts can:

- Leverage a single Windows or Linux-based PC or server to power up to 100 end users, thereby reducing the number of separate PCs or laptops to maintain by up to 97 percent
- Install a software client on existing PCs, laptops, netbooks or tablets to provide remote access to central resources from any location; this capability allows a district or school to support bring-your-own-device initiatives and to repurpose legacy equipment while managing applications and desktops centrally
- Deploy fixed thin clients to outfit classrooms, computer labs or administrative offices where a low-cost and low-power device makes more sense

- Reduce the per-seat cost of a PC by more than 75 percent
- Centrally manage all software on fewer computers, including operating systems, virus protection updates, backup and Internet filtering software that delivers a consistent and safe Internet experience
- Deploy a variety of classroom management solutions, online testing vehicles and content and curriculum solutions
- Free up valuable physical workspace in classrooms and labs, and provide a much quieter environment more conducive to learning
- Utilize less energy (as little as 5 watts per thin client device) and fewer servers

Most importantly, NComputing solutions are compatible with the leading classroom management, curriculum and even automated testing offerings, ensuring that educators, students and IT staff are highly productive. NComputing has a long history in serving educational institutions around the globe ranging from individual schools to providing the computing infrastructure for entire states and countries. Why? The company provides a simpler, more powerful and more affordable solution for a complex world. It's about time.

View video at www.ncomputing.com/solutions/education.

NComputing has a long history in serving educational institutions around the globe and its desktop virtualization technology is helping to provide 1.5 million children with access to technology and computer literacy skills throughout Turkey.

"I just make sure that the technology is flexible enough to support whatever it is the teachers want to do," he says, noting that some educators alternate between in-class and online sessions, while others stick mostly to one format for the duration of the year.

One challenge Smith recently discovered was the continual demand: "I can rarely get maintenance done during school hours because I can't get them out of student hands."

Smith hails the technology for its ease of use and ease of deployment, as well as its flexibility. Management — of the devices and of the content on them — has also been easy.

He adds that introducing new software in response to student demand is another area in which the system has exceeded expectations, over and over again.

"Deploying new features is another area in which the technology has served me well," he explains. "At the end of [2011], a student requested software for photo-editing, by that afternoon we had installed an open source solution."

Currently, as part of an ongoing pilot program, Smith says the school has 50 thin clients in a series of rooms that the faculty can reserve for the students. Ultimately, he says, he hopes to have 10 to 15 machines in every academic classroom, which is now much more within reach with the new economics afforded by the virtual desktop solution.[4]

Conclusion

As the world of academic computing gets more complex, academic technologists and district administrators need a coherent and comprehensive approach to reconciling dwindling budgets and skyrocketing needs. The answer is a three-part strategy of blended learning, incremental technology adoption and collaborative solutions.

Together, this approach helps districts achieve more with less, prioritizing curricular requirements and access equity over hype and a quick fix. It's about achieving big dreams with small budgets. And it works.

Resources
NComputing Education
www.ncomputing.com/education

"Transforming Education with Technology"
www.ascd.org/publications/educational-leadership/feb11/vol68/num05/Transforming-Education-with-Technology.aspx

"The Educator's Technology Dilemma: Providing more students with greater access to leading-edge technology under declining budgets"
http://marketing.ncomputing.com/EducationWhitepaper.html

"Technology Counts 2012," Education Week special section
www.edweek.org/ew/toc/2012/03/15/index.html

Keeping Pace with K-12 Online Learning
http://kpk12.com

Endnotes:
1. Scherer, Marge. "Transforming Education with Technology: A Conversation with Karen Cator." Educational Leadership Feb. 2011:16-21.
2. www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf
3. Center for Digital Education interview with Chris Petrello conducted on April 10, 2012.
4. Center for Digital Education interview with David Smith conducted on March 29, 2012

Acknowledgements

Matt Villano is a writer and editor based in Healdsburg, Calif. He has served as senior contributing editor for *Campus Technology* magazine since 2005. He also covers a variety of other subjects – including travel, parenting and business — for publications such as *The New York Times, The Wall Street Journal, Parenting* and *Entrepreneur.*