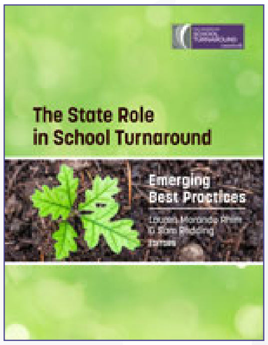

Leveraging Technology to Accelerate School Turnaround

from The State Role in School Turnaround: Emerging Best Practices

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About the Center on School Turnaround

The national Center on School Turnaround focuses on providing technical assistance to, as well as building the capacity of, states to support districts and schools in turning around their lowest-performing schools. The Center is led by WestEd in partnership with the Academic Development Institute, the National Implementation Research Network, and the Darden/Curry Partnership for Leaders in Education at the University of Virginia.

Focus Areas

- Developing SEA Staff Capacity and SEA Organizational Structures
- Building District Capacity
- Creating Policies, Incentives, and Partnerships to Ensure a Pipeline of Turnaround Leaders
- Promoting Cooperative Labor-Management Relations
- Promoting the Use of Expanded Learning Time
- Creating Systems and Processes to Ensure a Pool of High-Quality Turnaround Partners
- Ensuring the Availability and Use of Data Systems at the SEA Level
- Supporting Schools and Districts in Establishing a Positive School Climate
- Monitoring and Evaluating School Turnaround Efforts
- Improving Capacity of School Boards to Support Turnarounds
- Engaging Families and Communities
- Building Political Will for Dramatic Change

Leveraging Technology to Accelerate School Turnaround

Janet S. Twyman

Tremendous excitement and lofty expectations surround the use of technology in schools and its promise of increasing student achievement. As part of a comprehensive initiative to advance the transformation of American education, the Obama administration and the U.S. Department of Education are encouraging a culture of learning powered by technology (U.S. Department of Education, Office of Educational Technology, 2010). The use of technology is now as indelibly linked to the thought of schooling as the one-room schoolhouse of a century ago (i.e., the brick-and-mortar schoolhouse that online education could conceivably replace). When thinking about school turnaround in the 21st century, it is not a question of *whether* turnaround efforts should include technology but *how*.

Technology has the potential to improve schooling at all levels of the system, from the preschooler or kindergartner entering school on the first day of class, to the high school senior graduating with distance learning college credits already under his belt, to the state superintendent responsible for teaching, learning, and professional development across her state. But how do we leverage technology to reap these rewards? What is the best way for state education agencies (SEAs) to ensure each learner, each teacher, each administrator, each person involved in schooling is meaningfully included?

Let's start with what we mean by technology. Hardware, software, and digital tools and other devices are readily thought of as "technology"; however, the term actually refers to the application of knowledge and research to solve practical problems and includes the use of processes as well as tools (Clark & Salomon, 1986; Twyman, 2011). Beginning in the 1950s, the "new" computer-based educational technologies were thought to illuminate the path towards solving instructional problems (Reiser, 2012), and we have yet to give up that quest. Only recently does there seem to be more rigorous, empirical, consistent evidence that the integration of technology truly can have a meaningful, widespread impact on learning (Lemke, Coughlin, & Reifsneider, 2009; Flecknoe, 2002; Spector, 2010). Meta-analyses of existing research are increasingly finding positive effects for the instructional use of computers, game-like curricula, and interactive simulations (Blanchard & Stock, 1999; Niemiec, Samson, Weinstein, & Walberg, 1987; Vogel et al., 2006).

To accelerate learning, we need to view technology not as the answer to our instructional woes, but as a medium to obtain better student academic outcomes. Digital and computer-based technologies are a *means* to the solution; their use is not *the* solution. It is quite important for schools and districts to not simply acquire technology but also contemplate and clarify their goals for the use of technology, asking, "What do I want to achieve using this technology, and under what conditions will it have the most benefit to students?"

The barriers to as well as recommendations for effective, sustainable technology integration within a school or district has been described extensively (see Blumenfeld, Fishman, Krajcik, & Marx, 2000; Fabry & Higgs, 1997; Gülbahar, 2007). Researchers note the importance of considering both first-order barriers such as hardware, infrastructure, and technical support (i.e., variables that are "outside" a teacher's control) and second-order barriers such as attitudes about technology, pedagogical beliefs, or resistance to change (i.e., variables that are "internal" to the teacher; Ertmer & Ottenbreit-Leftwich, 2010; Lowther, Inan, Strahl, & Ross, 2008). Both forms of barriers must be addressed for technology to help accelerate student learning. There must be adequate infrastructure and appropriate resources. As the field of education is littered with failed initiatives, schools must focus not only on acquiring new technology but also on extensive professional development related to implementing and scaling up new technologies (Zorfass, 2001). A committed, involved leader, from the school level to the state level, must ensure that educators have the necessary resources and support and that technology-based content and tools are connected to teaching practice and the curriculum (Staples, Pugach, & Himes, 2005) and are meaningful to the school community and the community at large.

This chapter will focus on how technology—assuming adequate leadership, resources, and supports—can accelerate improved student outcomes in an SEA-driven school improvement or school turnaround endeavor. The use of technology across seven areas (i.e., learning and instruction, motivation, access, data, teacher training, systems and processes, and learning analytics) is described and supported by examples of research or exemplary programs.

The Use of Technology to Personalize Learning and Improve Instruction

Any attempt to improve student learning must be anchored in relevant, well-designed curricula and evidence-based instructional methods. Good instructional design requires a systematic process "that includes performing content, task, and learner analyses, clearly defining the learning objectives, determining the criterion tests to assess for understanding or mastery, establishing the entry repertoire needed by the student, building the instructional sequences, using performance data to continually adjust instruction, and ensuring student motivation by incorporating both program intrinsic and extrinsic consequences throughout the instructional sequence" (Twyman & Sota, in press; see also Dick & Carey, 1996; Smith & Raglan, 1999; Tiemann & Markle, 1990; Twyman, Layng, Stikeleather, & Hobbins, 2004). Worthwhile instruction (the delivery) requires frequent opportunities for the student to actively respond (Rosenshine & Berliner, 1978) with immediate, relevant feedback (Shute, 2008) that supports self-paced progress (Fox, 2004) with new material presented only after the student has demonstrated mastery of the current material (Bloom, 1968; Keller, 1968; Kulik, Kulik, & Bangert-Drowns, 1990). The progression of instruction and content must be tied to actual measures of student learning and not portioned by curriculum content chunks such as chapters or units or the passage of grading periods, semesters, or calendar years. Any viable "technology assist" (i.e., the use of technology to make the attainment of a goal more likely) in school turnaround must support, enhance, or provide these critical components. State education leaders can prime, develop, and support a culture of selecting curriculum materials known to be effective or even promising (i.e., based on evidence-based components), as well as quickly abandoning those shown, under reliable implementation conditions, to be ineffective. States can partner with vendors who directly link outcomes to purchase costs.

Research-informed, technology-enhanced instructional programs that analyze current skills, target student deficits, and deliver tailored instruction *automatically* are increasingly prevalent.[1] A blend of real-time, data-based recommendations and teacher insight into student needs and preferences may provide an ideal framework for personalized learning that actually improves student outcomes (Thropp, Friedman, & Elliott, 2011; Wayman, 2005).

There is an ever-growing cornucopia of visually rich, well-curated content from highly respected sources and digital and Internet-based technologies that all educators may access at little or no cost, such as those by NASA or the World Wildlife Fund. The opportunities to pull in rich content and personalize offerings to student interests seems infinite, yet may be both a boon and a bane for educators. Educators must sift through and evaluate the plethora of available content and technology tools to find those that meet their teaching or their students' learning needs. The number of apps, tools, and resource sites, as well as commercial or enterprise technology programs from established educational publishers, already enormous, continues to grow, thus requiring that teachers, curriculum

[1]Current examples include Burst®, Reading by Wireless Generation®, or "Groupinator" by Scholastic's Read 180®.

specialists, technology specialists, and administrators become "educated consumers" in the technology tools and content marketplace. Quality research on effectiveness is critical, yet may be insufficient given the fast pace of technology changes (see Technology in Education, 2011). In the interim, guidelines, rubrics, or checklists of necessary or notable characteristics can be helpful in determining what to use, when, and with whom (for a collection of such resources, see Appendices in Twyman & Sota, in press).

The Use of Technology to Increase Motivation

Students who historically have had difficulty in school are less likely to engage in learning and practice opportunities (Fuchs et al., 2008). Technology can aid motivation to participate and create opportunities for more interesting and engaging activities, structuring learning for mastery-based progression, and personalizing content to suit student interests. Personalized learning has surfaced as a potential instructional strategy to increase motivation and student success (Wolf, 2012). "Serious games" and games for learning seem different from "edutainment" programs of the past, may be especially effective in increasing motivation for struggling students (Burguillo, 2010), and may offer a learning environment where feedback is less threatening (Shute, 2008).

Motivators may be "extrinsic" to instruction, such as points or awards for mastery performance. Sites that purport to enhance student motivation through digital badges (e.g., Badgeville, Mozilla's Open Badges) or behavior management apps (e.g., Class Dojo) are just a few examples of motivational technology tools. Motivators may also be "intrinsic" to instruction, arising from learning and what mastery enables the student to do in other contexts (Layng, Twyman, & Stikeleather, 2004). When an instructional sequence begins with a challenging task that a student learns successfully, it may help the student more readily approach learning in the future (Fuchs et al., 2008).

The Use of Technology to Improve Access

Arguably one of the most outstanding benefits of new technologies, such as portable digital devices and Internet-based content delivery, is the increased access all students have to these technologies. This is especially important to SEAs as they have an obligation to provide equal access and meet the needs of all students within their states. These new technologies and ubiquitous Internet availability promote the delivery of high-quality content to students in a wide range of geographical areas, including those in remote areas who previously may have been cut off from such resources. Students who temporarily or permanently are unable to attend their brick-and-mortar classrooms can remotely or virtually participate in some or all classroom activities, even in real time, via the Internet. This includes instructional activities as well as more social activities—via social networking, chat, or other tools.

Access is increased not only geographically, but also temporally, with content and instruction available 24/7, including evenings, weekends, and summers. Research indicates that students are spending substantial amounts of time learning outside of school (Mallya, Mensah, Contento, Koch, & Barton, 2012), and teachers now have the ability to integrate those learning opportunities with what is happening during school hours. Two notable examples of the tremendous benefit of technology to increase access are 1:1 technology initiatives and blended learning.

The 1:1 model, which began over a decade ago and continues to grow across the country, promotes an approach where *all* students and teachers have access to at least one wireless device with up-to-date software and an Internet connection at school, and the devices are used to improve outcomes in teaching and learning (Muir, Manchester, & Moulton, 2005; Penuel, 2006). One-to-one initiatives support a personalized learning environment where teachers use and trust digital learning opportunities to give students access to activities tailored to their specific interests and needs, and the school or district actively supports and monitors the use of devices for digital learning. While research reveals mixed results overall, studies that involve carefully implemented 1:1 initiatives have been shown to increase general learning outcomes (Warschauer, 2006; Weston & Bain, 2010). Positive results seem to be tied to four crucial factors: access (to technology); emphasis on uses for learning; strong leadership; and professional development in context. A comprehensive report by Project RED (2010) provides greater detail on the essential components required in a successful 1:1 initiative.

The Khan Academy, and its access to an on-demand library of educational videos and learning management infrastructure (Khan Academy, 2013; Noer, 2012), is perhaps the most popular example of “blended learning” or “a formal education program in which a student learns at least in part through online delivery of content and instruction with some element of student control over time, place, path, and/or pace and at least in part at a supervised brick-and-mortar location away from home” (Staker & Horn, 2012, p. 3). For most K–12 classrooms, the “blend” of online and bricks-and-mortar typically falls into four models: rotation, flex, self-blend, and enriched virtual (for a full description of these models, as well as subtypes, see Staker, 2011; Staker & Horn, 2012). Blended learning exists within the continuum, from traditional full-time bricks-and-mortar instruction without key features of online instruction to the full-time access of all educational content via online resources and may have any combination of traditional and online learning. A critical feature, however, is that each form of instruction influences and impacts the other. Communication between teachers and students, or students and students, may be synchronous (i.e., occurring in real time) or asynchronous (i.e., interaction occurs intermittently online, with time between responses). Research indicates that models that promote communication and interaction between traditional instruction and online instruction produce better learning outcomes. In a meta-analysis of 51 studies and a review of literature, the U.S. Department of Education found that "blended instruction has been more effective, providing a rationale for the effort required to design and implement blended approaches (2009, p. xvii).[2]

The Use of Technology to Track, Measure, Analyze, Communicate, and Respond to Data

Research has consistently shown that the frequent measurement of student progress before, during, and after teaching is reliably associated with improved outcomes (Wayman, 2005; West, 2011). Measurement indicates where students are or where they are starting from, guides teaching along the way, and, finally, shows when students have arrived at the intended destination. Historically, persistent barriers to measurement have included the difficulty of simultaneously teaching and measuring, the knowledge or awareness of what to measure, and the ability to use measurement and data to make instructional decisions.

Technology tools can reduce many of these barriers by continuously tracking student performance in real-time and providing simultaneous feedback for both the student and the teacher. Student response systems that collect data (e.g., "clickers," digital devices, programs that use smart phones) have been found to improve student understanding and increase engagement (Kay & LeSage, 2009; Poole, 2012; West, 2011). Digital tools and applications such as computers, tablets, interactive video, and whiteboards have been shown to increase the ability to collect, manage, analyze, store, and communicate educational data (McIntire, 2002; Penuel, Boscardin, Masyn, & Crawford, 2007; Wayman, 2005). Course sequences may be offered online through course management systems (e.g., Blackboard, Moodle) or a learning platform (e.g., Knewton, DreamBox Learning). When these online learning systems use data to change in response to individual student performance, they are considered adaptive learning environments (Specht, 2013).

As noted previously, "smart" algorithms provide teachers with instantaneous guidance on where students are struggling and what to do next. When embedded within an instructional program, the recommended intervention or next course of action can be automatically served up to the student (Corbett & Anderson, 1992). The resulting picture or map of student learning can be shared online with other educators, administrators, or parents. This allows real-time data to truly direct continuous improvement. These data may also be used to help educators group students with similar needs for more intensive instruction or pair students up for peer tutoring or group review.

[2]Innosight Institute has produced two comprehensive reports, *The Rise of K–12 Blended Learning: Profiles of Emerging Models* (Staker, 2011) and *Classifying K–12 Blended Learning* (Staker & Horn, 2012), that detail the types of blended learning models and describe numerous K–12 blended learning implementations across the country. Schooling leaders and those interested in a better understanding of blended learning are encouraged to consult these resources.

The Use of Technology to Improve Teacher Training

Technology can aid professional development in at least two ways: flexibility and familiarity. This is true regardless of content or instructional effectiveness. With regard to flexibility, teacher training or professional development activities that are delivered via the computer, tablet, smart phone, or other device give educators and administrators greater leeway in determining when and where professional development activities occur. Webinars and other synchronous remote delivery of professional development allow training to occur across a district while minimizing costly travel expenses. This may be particularly valuable in states with rural districts spread over large geographic areas. Tutorials, modules, trainings, or presentations, delivered asynchronously, allow educators to access content at times most convenient for their schedules, either inside or outside of schools. This flexibility also applies to professional development content and level, allowing for a personalized education experience geared to each teacher and his or her own interests and needs.

The use of technology in teacher training also benefits teachers by increasing familiarity. As previously inexperienced or reluctant teachers increase contact time with new technologies such as tablets or new software and content delivery tools such as screen casting, electronic whiteboards, video creation, or even online polling, they in turn may become more comfortable using these technologies in their classrooms (Chism, 2004; Grasha & Yanbarger-Hicks, 2000). Therefore, it is essential for schools and districts to incorporate technology content delivery tools in their professional development efforts.

A section on teacher training and technology cannot close without also addressing the need for formal training on the actual use of technology for educators and potentially all school staff. Thought leaders have expressed the need for preservice teacher training efforts related to how to use new technologies; however, such efforts are in an early stage. Research indicates that teachers who receive professional development focused on integrating technology into teaching use technology more effectively (Robyler & Edwards, 2000; Watts & Hammons, 2002), especially when that training occurs in context (Chism, 2004). Schools, districts, and SEAs need to make a concerted effort to train their educators in the fluent use of technology tools by providing both inside and outside of class experiences, preferably with experienced mentors.

The Use of Technology to Streamline Systems and Processes

Technology can streamline processes by promoting a continual multi-way flow of information between students, teachers, curriculum, subject area or other specialists, administrators, and parents within a single school, across the district, or throughout the state (Kosakowski, 1998). Learning management systems, digital grade books, educational data systems, and the linking of online assessments allow for the digitization of records and information for easy access at a variety of levels. Information, such as student portfolios, can now be stored in the form of searchable documents, images, audio, or even digital files.

The Use of Technology to Understand Learning and Performance Analytics

As noted previously, technology greatly assists our ability to collect data and make data-driven instructional decisions (McIntire, 2002). The application of technology to the growing area of learning analytics is equally critical. Learning analytics focuses on the analysis of student interaction using online education tools and uses the information gleaned to predict outcomes and create a more integrated and customized learning experience (U.S. Department of Education, Office of Educational Technology, 2012). Using "intelligent data" on student performance, learning analytics dissect real-life data sets to find out how students learn and how to improve upon their experience. Analytics can help predict future student performance based upon patterns of learning across students, warn when students are struggling, and suggest unique feedback and intervention tailored to specific difficulties based upon collections of answers.

One of the features of learning analytics, in contrast to "typical" data collection and individualized data decision-making, is how analytics are designed to look at groups and patterns of responding in the aggregate to make bigger picture statements about how various students respond to particular instructional materials or at particular times. They can detect performance difficulties due to either instructional content (curriculum) or instructional delivery (e.g., analysis of time spent on problems or sections, patterns of corrects or errors to identify areas of concern, distinguish between guessing versus "knowing" answers; Hauger & Köck, 2007; Layng, Twyman, & Stikeleather, 2004). For example, learning analytics can identify common incorrect answers for a lesson, within or across students, and catalyze teachers to revisit the material for clarification during class or revise the material for use in future lessons. Predictive models of analytics are beginning to combine demographic information and student learning data to report progress and predict future outcomes. Adaptive engines can now customize content delivery for an individual student's performance or interest, further strengthening the personalization of learning.

The following guidelines may assist SEAs in their efforts to use technology to accelerate school turnaround efforts in their states.

Action Principles

Appoint an expert to serve in the role of "tech visionary"

- Identify an education leader with a solid, informed, and up-to-date opinion about where technology will be in the next few years to plan a roadmap for the state accordingly.

Use technology to personalize learning and improve instruction

- Leverage the clout (e.g., influence, buying power) inherent in SEAs to structure curriculum purchases directly tied to demonstrated learner outcomes (e.g., partial payment upfront with balance due upon agreed upon outcomes, partial or full refunds should expected outcomes not be attained).
- Assume a critical role in helping to identify content and instructional providers that align with the broader state curriculum and data systems.

Use technology to increase motivation

- Engender and encourage a statewide consideration of personalized learning, and support effective technology products that include higher levels of personalization.
- Establish a statewide culture of high performance expectations; leverage technology tools to provide appropriate level of performance reporting.

Use technology to improve access

- Reevaluate requirements and policies related to "seat time" to include consideration of both blended learning and fully online courses.
- Create opportunities for linkages across the state—and across states—to leverage exemplary online course content/providers for statewide access.
- Target rural and underserved areas for online access to unique content or specialized personnel.

Use technology to track, measure, analyze, communicate, and respond to data

- Identify measurement systems (tools or providers) that align with the statewide data systems and provide incentives for their use.
- Provide public access—at the parent, teacher, school, district, and state level—to socially valid educational data and provide a forum for public comment and feedback as well as a review system for performance improvement.

Use technology to improve teacher training

- Support the recruitment, retention, and development of educators who have solid educational technical expertise and experience across technical domains, implementation domains, and content domains.
- Develop statewide technology mentoring programs—at the preservice and in-service level.
- Reevaluate credentialing requirements to include training and demonstration of skills related to current technologies from creation to delivery to evaluation.
- Partner with institutes of higher education and teacher preparation programs to help them identify and include the necessary education technology knowledge and skills.

Use technology to streamline systems and processes

- Develop statewide guidelines, rules, standards, implementation protocols, training mechanisms and materials, and technology tool kits to aid districts and schools in implementing technology at both the statewide and local level.
- Provide statewide guidelines that help shape community (e.g., educator, administrator, parental) attitudes about technology, pedagogical beliefs, and potential resistance to change, while keeping the public informed of statewide technology initiatives.
- Develop state-level guidelines, rubrics, or checklists that evaluate necessary or notable characteristics of technology products, aligned to state standards, that districts, schools, and teachers can use in determining what, when, and with whom to use them.
- Designate an individual or team at the state level who is responsible for evaluating the efficiency and efficacy of technology implementations within the state, including a plan for limited tryouts in specific locations before systematic rollout across the state.

Use technology to understand learning and performance analytics

- Unify statewide student information systems that also take into account student learning, teacher performance, and the effectiveness of curriculum, as well as implementation fidelity.
- Adopt statewide, or make available at low cost to districts, data system infrastructures that standardize, collect, and track K–12 student data.

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