Educators engage digital natives and learn from their experiences with technology

Integrating technology engages students in their learning.

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Advocates of the middle school concept have long espoused the importance of being developmentally responsive to the unique nature and needs of young adolescents (National Middle School Association, 2010). While these efforts have resulted in numerous successes over the years, too many schools have not kept pace with the growing needs of students in one particular area: technology. Middle grades students are drawn to 21st century technologies more than any other age group; 11- to 14-year-olds spend 230% more time on non-school computer use than do 8- to 10-year-olds. The largest share of this time is spent on social networking sites such as Facebook (Rideout, Foehr, & Roberts, 2010).

Middle grades students are drawn to these technologies precisely because they meet many young adolescent needs. The use of Facebook, for example, responds directly to students' need for affiliation. The immediate and autonomous access to information available on the Web responds to their desire for both competence and awareness. Opportunities for social activism through various Web 2.0 tools offer many ways to meet young adolescents' need for an ethical sense of self; and being entrusted to interact with a world-wide authentic audience and to oversee expensive hardware responds directly to their desire for responsibility.

As middle level schools strive to respond to the developmental needs of young adolescents, they should view students' technologies as an effective means to meet these needs. What happens when educators embrace and learn from young adolescents' preferred technologies as a way of engaging students? How and to what extent are middle grades students engaged in technology-rich classrooms?

The purpose of this article is to provide a glimpse of our six-year journey into middle grades students' engagement in student-centered, technology-rich classrooms. We begin by describing the engagement needs and expectations of "digital native" students (Prensky, 2001, 2010). We then describe the schools with which we have worked and the strategies we applied. Next we share student, teacher, principal, and parent perspectives, derived from interviews and ongoing participant observation. In particular, we highlight the attributes of technology integration that students find most engaging. Finally, we consider the challenges and opportunities that arise when implementing this kind of school change.

The 21st century young adolescent

The challenge of engaging young adolescents in classroom learning has never been greater. Today's digital natives expect more from their teachers than did students in decades past. Students in this "net generation" (Tapscott, 1998, 2008) learn best through trial and error, process information quickly, connect with graphics before text, and require relevance in their learning (Deubel, 2006; Glasser, 1998; Prensky, 2001). They have grown accustomed to flashy, high-definition graphics, constant multitasking, and the excitement of

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gaming. Eighty percent of middle grades students own iPods or MP3 players, 69% have their own cell phones, 69% possess handheld video game players, and 27% own personal laptops (Rideout et al., 2010).

When faced with questions, students today find answers within seconds using Google or other search engines. When they want to acquire a new skill, they watch a YouTube video to learn it. When requiring further consultation, they tap into an electronic forum or social network that provides them access to myriad others who share their interests. Familiar young adolescent patterns of learning have been transformed by readily accessible technologies. Kids "hang out" daily with dozens of friends through Facebook, texting, and online games; "mess around" by making digital videos for YouTube and exploring endless collections of music; and "geek out" by "modding" (modifying) games or pursuing their favorite hobbies online with avid youth and adults far from home (Ito et al., 2009).

Students' spontaneous learning with technology in many ways reflects the 21st century skills of critical thinking, communication, collaboration, and creativity (Partnership for 21st Century Skills, 2009) and contrasts starkly with learning in traditional school settings, which is characterized by predetermined curricula, prominence of textbooks, and emphasis on test scores. Prensky (2001) asserted that there is an increasing and worrisome mismatch between the natural capacities and interests of digital natives and the forms of literacy taught in schools. Although many students rely daily on technology that connects them swiftly to any information they may require, most schools do not permit the use of these tools in the classroom (Bushweller, 2006). Whereas nearly 60% of students go online at home in a typical day, barely 20% go online at school (Rideout et al., 2010).

It is little wonder, then, that today's teachers struggle to engage young adolescents in their classrooms.

> The reason America's schoolchildren are not learning what we want them to learn is that in too many instances they are being asked to do things they do not see as worth doing in order to learn things adults want them to learn. (Schlechty, 2001, p. 10)

What does authentic engagement look like? Schlechty (2005) described engaged students as being attracted to their work, persisting despite challenges and obstacles, and taking visible delight in accomplishing that work. As such, traditional measures of engagement should be stretched to include the "meaning and significance the student attaches to the tasks he or she is assigned" (Schlechty, 2001, p. 68). Even the best educators sometimes feel at a loss to help students see the meaning, excitement, and authenticity in what they are learning. Many assert that the key to engaging learners is to bridge the gap between students' in-school and out-of-school lives (Buckingham, 2007) by integrating more technology into the classroom.

Integrating technology can help teachers leverage the interests and abilities of digital natives. photo by Ken Clutsam

Technology in the middle grades

Integrating technology in middle level schools is far from new. In fact, some of the largest educational technology reform initiatives in the United States have been based in the middle grades. Michigan's Freedom-to-Learn program provided tens of thousands of middle grades students with wireless laptops (Lowther, Strahl, Inan, & Bates, 2007); the Texas Technology Immersion Pilot equipped middle grades students in high-risk, high-need areas with laptops (Texas Center for Educational Research, 2009); and the Maine Learning Technology Initiative (Silvernail & Lane, 2004) has provided middle grades students with one-to-one laptop opportunities for almost a decade.

While there certainly have been effective attempts at educational technology integration, school reformers too often expect educators to know instinctively how to incorporate technology into their teaching. Norris and Soloway (2010) pointed out the danger of not attending to the role of the teacher in this work.

> Boston College researchers found that the impact of a one-to-one computing implementation is largely a function of the classroom teacher. Some teachers know how to make good use of a one-to-one situation, and some don't. If extracting value from an innovation is dependent on the teacher, then the value added by the innovation per se is limited. (n.p.)

In other words, "know[ing] how to make good use of a one-to-one [laptop] situation" doesn't come easily to all teachers and does not happen without thoughtful and sustained professional development. Critics such as Cuban (2003) have rightly charged that poorly implemented technology integration is unlikely to benefit learners and, in fact, can detract from proven, less expensive, and more readily applied education reforms. But what happens when schools are serious about preparing their teachers for this work? What benefits can be realized when teachers do, in fact, know how to capitalize on not only a one-to-one laptop situation but also on the integration of adolescents' preferred technologies?

Our journey

For the past six years, we have sought to better understand the use of technology as a way to engage young adolescents in learning. We were inspired by Gee's (2007) premise that educators can learn new principles of effective pedagogy from the technologies youth use regularly outside school. Video games, in particular, can be "pleasantly frustrating" (p. 3), motivating players to puzzle through novel challenges for hours on end—an enviable dynamic for teachers and students imagining better schools. We also were encouraged by Prensky's (2010) suggestion that partnering with students holds the key to teaching digital natives. The idea that students can help us chart a path to powerful and purposeful pedagogy is not new to middle level education (Beane, 1993, 2005; Jackson & Davis, 2000), but their participation is indispensable to making schools relevant to their technology-rich lives.

We collaborated with teachers, principals, and students at three schools in Vermont to explore what engaging learners through technology might look like in different middle grades settings. Given that young adolescents in Vermont are educated in nine different types of schools (Vermont Middle Grades Task Force, 2009), we selected school sites that varied in grade and building configuration. One was a 7–8 middle school in a 7–12 building, another was a 5–8 middle school in a pre-K–8 building, and the third was a 6–8 stand-alone middle school. The three communities in which the schools were located included a small town of 4,200, a medium-sized town of 10,000, and a small city with 39,000 residents. The student populations at two of the schools were racially and culturally homogenous, which is not unusual given Vermont's predominantly white population. The highest rate of English language learners within a school was 14%. Socioeconomic diversity was more evident, with the median household incomes ranging from $33,000 to $49,000. Free and reduced-price lunch participants, as a proxy for poverty, ranged from 28% to 44% of the populations. Common to all schools, however, was the presence of young adolescent learners and an interest on the part of teachers and administrators in heightening student engagement.

We applied three main strategies to promote technology-rich, student-centered learning. First, we expanded student access to technology in these schools through a grant that provided one-to-one laptops for students and educators, audio-video hardware and software, interactive white boards, and other technologies. Second, we concomitantly provided ongoing professional development on technology integration and the middle school concept. Third, we partnered with students (e.g., Prensky, 2010) to better understand their needs and interests related to learning and technology. Consulting with students happened through Google forms and interviews, among other tools. This work has come to be known as I-Leap, a name that represents the risk taking and extraordinary personal growth that new models of education require of students and educators alike.

Engaging digital natives

Although our three sites varied in many aspects, several themes were remarkably consistent across the three schools. Perhaps the most compelling theme was the

way in which students, teachers, and parents alike noted the deep engagement that results from bringing contemporary technologies into the classroom. Echoing Buckingham's (2007) assertion that effective technology integration bridges the gap between students' two worlds, one student explained:

> The general idea of having technology in school is really a good thing. … [It] makes kids engaged because nowadays kids are more using technology at home, like video games, going on Facebook. So bringing technology to the school where they're doing it at home all the time, it's, like, really helpful and engaging, and it's, like, fun. It's what they do during the day when they're not at school, so I think bringing the technology to school makes them more engaged.

When asked to describe what learning was like in his I-Leap classroom, this student emphasized how bringing familiar technologies into the classroom eased learning and made it more engaging for him and his peers.

> I'm more engaged, but also a lot of people are engaged because we have all this new technology, and we want to learn and explore, and, at same time, we're used to it so it's not a different thing. So, for me, it's more engaging. You're learning things, but, at the same time, you're used to it and know what to do with it.

Teachers tended to validate this students' assertion. One educator described his observations from math class.

> I am seeing kids that never engaged in class discussion chime in. I was teaching the concept of slope, and students were able to manipulate the line on the graph and watch the coordinates change. Every student wanted to come up to the SMART Board.

Other students asserted, "Me, personally, I'm more engaged," and, "We definitely do more things." One young adolescent described the engagement through his classmates' newly found focus: "They're all, like, focused on the MacBook instead of looking up at the board and seeing everybody up in the class. They're just focused on their MacBook, and they're not noticing things and laughing at them."

Parents also reported increased engagement as a result of their children's participation in the technology-rich setting. One parent of a seventh grader declared, "This is the first time he ever wanted to come to school." Another explained,

> My daughter's grades have improved since being involved in this program. She has always had a problem with focusing, but now, with the laptop, I have seen her sit, focused, completing her work. I really see the advantages of bringing our teaching methods current with technology. It is making a difference, engaging my child into learning again. School is fun again and interesting. If this can bring my daughter to that conclusion, then you know that it has major potential to be successful.

What was it about the I-Leap approach that so engaged the students? Why did they find learning so different in this mode? What developmental needs were addressed that might otherwise have been missed? Students reported that learning in a technology-rich environment was engaging because, in addition to allowing them to use familiar technologies in new ways, learning this way was fun and collaborative, afforded them opportunities for creativity, enabled efficient use of their time, and provided them with helpful organizational tools.

"Just more fun."

Although "fun" does not always equal learning, students in our study were quick to point out that they felt engaged in their learning in the I-Leap sites because the technology made things more fun and enjoyable. As one eighth grade boy explained, "It's interesting. It's a very immersive experience, and it's more fun, in a way, but we still learn a lot, and I think we actually even learn maybe more." Another stated, "It's fun because it's a whole lot easier." For others, the Internet simply trumped paper. As one boy described, "If it was on a piece of paper and you had to read it, it wouldn't be more engaging 'cause it's boring. The Internet has fun explanations and stuff."

A seventh grade girl described how her teacher integrated technology in an enjoyable way in her language arts classroom. "For literature and writing groups, we find books online, read them, and evaluate them. We read them online. That's really fun." Teachers observed a similar phenomenon in their students' engagement level.

> It's 4:30 now, and I know my kids are over there working on their PhotoStories. We're reaching kids. It's not just the top of the class who is staying after school to work on their PhotoStories. It's fun for them.

Collaboration

These young adolescents also valued learning in a technology-rich environment when collaborative learning was encouraged—consistent with one of the principles of effective technology integration. As one middle grades student explained, "We work on SMART Boards and break down into groups, and we can learn more." Another student appreciated the way her teacher relied on technology for collaborative literacy tasks.

> Yesterday our language arts teacher … we were doing something with the books that we're reading right now. And he shares this document with everyone, and it's also up on the projector, and we can see what he's typing, and it's also on our screens, so we can also share our ideas with that same document at the same time. The same document is shared to everyone, so everything that someone is typing is also showing up on your document.

This collaboration was not limited to the language arts classroom. Students expressed appreciation for this type of work across subject areas. A student described what he found engaging about using the multiple interactive whiteboards in his math classroom.

> What I really like about math class, the SMART Boards are really helpful because … he gives us work on the SMART Boards, and he breaks us up into groups, and we try to solve that problem and you talk about it as a group. We end up being able to learn from the discussion and learn from the group, and the technology helps with that.

Working together—through collaborative problem solving and sharing ideas—was an important element of engagement and learning for these young learners.

These students also appreciated the opportunity to share their work with others, as indicated by one student's comment: "One thing is that (before) you couldn't really share that easily. Now we have student commons on the Macs, and you can put anything there and anyone can open it up. It's optional." Students' disposition toward sharing was reflected, as well, in the growth of a "participatory culture" in their out-of-school technology lives. This included new and exciting opportunities for affiliation, expression, collaborative problem solving, and circulation (Jenkins, Purushotma, Clinton, Weigel, & Robison, 2006). This interest in sharing is also reflective of students' need for belonging, so often identified as critical to students' sense of acceptance within a school community (Osterman, 2000; Stevenson, 2001).

Perhaps most important for education, the lines between socializing, creative play, and focused learning—between hanging out, messing around, and geeking out—are blurred in this participatory culture (Ito et al., 2009). Young adolescents readily share their experiments with video and music on Facebook and YouTube, for instance, and socialize on interest-driven sites such as deviantART and FanFiction. Not surprisingly, then, students at I-Leap sites also valued the opportunities for construction and expression that the technology afforded.

Creative construction

Bruce and Levin (1997) offered a typology of ways in which technology can support learning that remains relevant and helpful to schools today. They suggested classroom technology can be applied with four different foci: (1) inquiry, (2) communication, (3) construction, and (4) expression. While students in our schools appreciated the efficiency of using technology for inquiry and communication, the times they identified as engaging were most often when they applied technology for construction and expression.

One seventh grader described a project involving construction and expression: "For social studies we're doing a simulation of the Revolutionary War, and we had to do a Glogster, and we could go online and find pictures." Another student echoed his interest in constructing via the computer.

> For my language arts class we are starting this new unit … we choose one of our favorite books, and we do a book podcast on it using Garage Band, and we say all the information, why we liked it, summaries, and what's really cool is [my teacher] is having us put those sound jingles in them to make them interesting, and then we're posting them up.

For these students and others, using tools such as Glogster and podcasting capitalized on both their desire to create and their interest in using the latest technology.

Engagement beyond the school day

The middle grades students in our project were also quick to point out that their engagement in learning did not necessarily end with the school day. They felt the technology made it easier to continue their learning at home, either after school or if they were absent that day. A sixth grader explained, "We use Google docs pretty

much throughout the school, so you can also pretty much attend classes at home. There's no excuse." Another commented on the various tools his teacher provided that enabled them to work anywhere.

> My math teacher, he finds websites to go to for practice or games, and my algebra teacher shares documents about lesson plans and his slide shows have everything from his class on it. … So, um, he just posts that up on the school website, so if we're absent, we can view it, and if we just need help or a refresher of what the homework was, we can always look at that.

This kind of ubiquitous learning (Cope & Kalantzis, 2010), whereby technologies make "anytime, anywhere learning" possible, helped the students extend their opportunities well beyond the classroom walls.

Organization

When asked about their engagement in a technology-rich setting, the middle grades students in our sites also identified the ease with which they were now able to manage their many tasks. They felt they were more easily engaged because they could find and do things more quickly. Although not as exciting to them as the creative construction or collaboration, the organization offered by technology was a huge asset in these students' eyes. One explained, "One of the pros is that you're more organized, and you know where everything is." Another student elaborated on this enhanced organization.

> Last year we had these papers that we just write things on, and I don't know how many things I lost in my locker and my backpack, but with the computers, everything is just there, and it never really goes away.

A classmate concurred, "It's a lot easier to lose homework with the actual copy than when it's online. There are a few things that could go wrong, but, otherwise, it's a lot easier."

Keeping track of due dates and schedules was also seen as easier, as one girl reported, "We have, like, a calendar on the MacBook. It's really helpful." Another elaborated, "I see a lot of people sending e-mails to themselves about their plan for the day and what they're going to do during the day." Teachers agreed and, in fact, reported that the turn-in rate for homework had increased considerably since changing to an essentially paper-free environment.

Efficiency

In addition to being more organized, students appreciated the increased ease and efficiency with which they were able to accomplish tasks due to the powerful technology at their fingertips. "It's easier 'cause if you're at home, you can search what you need for help, or in class you can search. I find it much quicker than reading in a textbook." One young adolescent provided an example from earlier in the day.

> This morning I was on Facebook, and I was quoting someone off the news, and they were saying, "Hallelujah." And after I spelled it wrong, it came up. I could just highlight it, left click it, and right click it.

Technology can help middle grades students become more organized and manage academic tasks more effectively. photo by Ken Clutsam

This ease was also voiced by a teacher who saw growth in a student struggling with fine motor skills in general and handwriting in particular. She contrasted his accomplishments with and without the computer.

> I had them hand write some things because I wanted them to practice some just responding to others. And everybody else had three pages done and he got two sentences done in a 45-minute period. … But when I saw him today (on the laptop), he was far surpassing his two sentences.

Responsibility

Stevenson (2001) noted the important role responsibility plays in young adolescents' sense of personal efficacy, and this was directly addressed through the one-to-one aspect of the I-Leap classrooms. Students spoke of the pride they felt in being responsible for their laptops and the care they took to ensure nothing happened to them. One student explained, "It's your responsibility. A lot of kids are safe and careful about it. You don't let other kids use it. It's your responsibility." Another echoed this sentiment, "Everybody's pretty mature about it. They know it's a big responsibility to take on. If you want to use the laptops, you have to be careful with them, and most people are."

Teachers and principals also noticed the students' sense of pride in this responsibility. One teacher observed,

> It is a big deal when they leave. Every day we say goodbye to them when they leave. And they have their computer around their shoulder. … They feel like big shots. They are very proud to be part of that whole thing.

> "For the first time in the history of my teaching career, every student's hand was raised."
> –an I-Leap teacher

Her principal laughingly elaborated on students' capacity for self-monitoring this responsibility, "If there's an infraction, we know it within seconds … and they can tell us how many infractions there have been in the last week!"

In sum, students, teachers, and parents felt the new technology-rich approach offered many improvements to traditional schooling. Shortly after the start of the year, one veteran teacher observed, "For the first time in the history of my teaching career, every student's hand was raised." From collaboration to creativity, organization to efficiency, this way of teaching and learning seemed to be working.

Further considerations

Although the vast majority of stakeholders were clear that students were more engaged in the I-Leap settings than in more traditional settings, certain challenges were inevitable, as with any school reform. Issues warranting further consideration include pragmatic issues of technology access and issues of disequilibrium and dissonance between stakeholders' expectations and experiences with technology integration.

Pragmatics of technology

When teaching with technology, it is easy to envision the challenges one might confront. What happens if the server goes down? If the site you intended to use that day in math class is suddenly unavailable? If the LCD projector stops working? If the laptops are not charged? Although we had these same kinds of questions when we began this project, we were surprised by how few problems students and teachers reported regarding the reliability of the hardware. Even at one site that experienced a wholesale hardware failure requiring the return of all 250 netbooks just two months into the initiative, our participants did not describe the reliability of the technology as a problem when interviewed. Rather than reliability, general issues of access emerged as important considerations.

Internet access. Although conversations about the digital divide continue on a national scale, as of 2010, 93% of 8- to 18-year-olds had a computer at home (Rideout et al., 2010). Of these students, 84% had home access to the Internet. While this fact does not dismiss the importance of attending to access for all students, it does shift the focus of the issue from hardware (Who has a computer at home?) to Internet access (Who can get online at home?). For a variety of reasons, approximately 16% of our nation's students lack home access to the Internet. For some, it is logistically unavailable, as may be the case in remote rural regions; for others, it is unaffordable, as may be the case for needy families; and for others, it may simply be a personal decision not to have Internet access.

Students in our project schools were the first to identify access as a potential issue, particularly when they relied on web-based "cloud computing" for storage. Two of our sites used Google Documents, and the other used the online learning management system EDU 2.0. One middle grades student acknowledged, "In order to

make this work, you have to have Internet, so when it's down, you can't get anything. That's a con." However, learners without Internet access at home described their various strategies for continuing their learning. A student explained, "Most of us have desktops at home. If you don't have Internet access you can load your stuff onto the desktop."

Others spoke of using public spaces, such as public libraries and other local establishments with free Wi-Fi, to solve the problem of access. As one student observed, "Connecting to Wi-Fi and stuff … if I was using my computer and I was near the post office, it just comes up automatically if you want to connect to the [Internet]." Another solution was to extend access to the Internet after school. Students were encouraged to stay after school to complete their work. One community brainstormed a unique solution when it realized that the majority of its students without Internet access resided in one small neighborhood. By arranging to install a wireless access point on the back of an adjacent public building, they could ensure the neighborhood was connected.

Affordability. Although the schools in our study were fortunate to receive grant monies, finding ways to fund technology in schools remains a conundrum for most school leaders. To address this, we offer several thoughts. We are encouraged by the continual drop in technology prices. When our project began six years ago, we could not even conceive of the technology we are able to purchase for schools today. The cost of the $1,200 laptops provided for a one-to-one program at our first site contrasts starkly with the $500 netbooks available to our third site. Further, a shift to Web 2.0 tools, such as Google Documents and open source applications such as Open Office, has dramatically reduced the need for expensive software licensing. Similarly, costly textbooks routinely comprise a substantial line item in school budgets even though, depending on the subject, much of what is printed quickly becomes dated or obsolete, given the exponential growth of information today. Conversations about what constitutes knowledge, what constitutes a valid source, and how knowledge and skills are learned can dramatically change purchasing decisions.

Finally, although the levels of student engagement we report here occurred in a program that had a 1:1 student-to-computer ratio, we are not convinced that a program requires a 1:1 ratio to be effective. We believe teachers in programs with 2:1 or even 3:1 student-to-computer ratios can still achieve many of the approaches identified as engaging by the students in our study. The two most important pieces are (1) teachers who are willing and (2) leaders who are committed to finding funds for the endeavor and making time for ongoing and embedded professional development.

Disequilibrium and dissonance

Although many young adolescents use 21st century technologies routinely outside school, schools have been slow to embrace these potential learning tools. Over the course of our project, we realized that we could not learn from the gap between students' in-school and out-of-school lives unless we dove into it. This realization resulted in a certain degree of disequilibrium or discomfort on the part of some stakeholders.

Most teachers clearly understood that this new approach required risk-taking—much more than was previously expected of them. One sixth grade teacher admitted,

> I think that the assumption is always that we have all the answers, and we know everything, and that this year has been really different and maybe uncomfortable because we have to say, "I don't know," a lot. "I don't know. I don't know if that'll work. But that's what we're going to try."

Another teacher contrasted his practice five years ago with the risks he now takes daily.

> All of a sudden just tossing in new things for teachers and kids; that's a hard thing to do. That's a huge risk to take. And it's those types of things you're doing, you know … as teachers five years ago, we did those things once or twice a year. But now it's, like, every day.

Teachers were most willing to take this leap 'into the gap' when their school culture embodied trust and collaboration. As one teacher explained,

> I think, for me, it was that permission to just try, and it's okay to fail. … Knowing that that was okay. That that might happen, that you might not be successful with the first thing you try; but that's okay. We'll work through it. … I think it's a cultural thing. Where we're doing this together, we're embarking on it together. It was sort of a whole-school climate.

This willingness to take risks was a key disposition for teachers in this work. Educators' sense of success in

teaching in I-Leap classrooms appeared to be more about their capacity to endure cognitive dissonance than about their age or previous technology experience.

Parents were another stakeholder group affected by this disequilibrium. School programs can be disconcerting for parents when they seem different from what is familiar to them. In fact, change in educational practices often concern parents more than they concern students; in particular, affluent parents may be uncomfortable with disruptions to the status quo (Kohn, 1998). Schools in our project were intentional in their efforts to engage and inform parents. One principal said, "We're really challenging the status quo. We've leveled the playing field. We've given excellent tools to all kids." Our project sites learned early on that parents can be their best advocates. Parent advisory groups ensured that concerns were aired in a proactive way and helped to capitalize on the many good ideas that resulted from collaborating with the community.

Concluding thoughts

Technology, like any educational innovation, is not a panacea for issues and challenges in middle grades education. Students' quest for identity and struggle for peer acceptance sometimes hinder their ability to learn, even in the best of classrooms. As one student explained honestly, "There are some days when we're really focused and other days when we are not." Further, we share others' concerns that exposure to video game violence has been linked to increased aggressive behavior, cognition, and affect and to decreases in helping behavior (Anderson, 2004). At the same time, we know that many video games offer students complex cognitive tasks and teach students how to make discerning, evidence-based decisions (Johnson, 2005; Tapscott, 1998, 2008). As educators, we are committed to capitalizing on the best of what technology has to offer while helping students make good choices in myriad aspects of their lives.

Educators in our three schools were clear that integrating technology into their teaching was very hard work. At the same time, they felt the outcomes were worth it. One teacher summarized, "I think it's made us better teachers. The kids are much more engaged." One math teacher elaborated,

> I love my job. I was happy anyway. This is a challenge for sure. My battery [was] much more drained at the end of the past couple years, in a good way. I think it is ultimately making me a better teacher. I'm definitely connecting with the kids better.

Students noticed this change in their teachers as well. One student offered, "They seem more confident in, like, what they're teaching because they can back it up so much easier."

We also were heartened to hear educators talk about the growing confidence they saw in students and their students' potential to effect change as a result of this work.

> They'll probably be the change agents of the secondary level because in a few years … they'll demand it. They demand stuff from us right now. They feel like they can. And I think they'll demand it, and I think that's great. I think that's where it should come from.

As they looked forward, many teachers felt their students would be the source of greater educational innovation and change, revolutionizing high schools as well.

We have learned that preparing schools for 21st century learning is less about designing engaging activities for students and more about unleashing the learning potential of students and the technologies with which they are familiar. The infusion of technology in schools is merely an extension of the extraordinary expansion of technology available to students in their lives. Their spontaneous use of technologies in their out-of-school lives reflects, to a remarkable degree, young adolescents' applications of 21st-century skills in pursuit of personal efficacy. One of our I-Leap teachers said it best: "The shift isn't in the students. The shift is in the teachers. We don't have to convince the students that this is the way to learn."

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Extensions

Assess the extent to which your school integrates technology throughout the curriculum and identify gaps and inconsistencies between your students' experiences with technology outside school and their opportunities to use technology in school.

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