An urban school district's 21st century teaching vision: Integration and readiness to incorporate technology

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ABSTRACT:
This case study centered on understanding the perceptions and acceptance of 21st century learning skills and emerging technologies for education by teachers and administrators in an urban school district. Data were collected at three different strata within the district: superintendent, principals, and teachers. The study elaborates on these findings that emerged from the data: a) a consistent vision for 21st century learning and teaching was shared among stakeholders; b) a discrepancy between the district’s vision and its schools' capacity to implement that vision existed; and c) conflicting accounts of infrastructure reliability were evident. From the data it was recommended that the district: 1) Stratify professional development by teacher skill level; 2) Embed time for curriculum design into professional development; 3) Ensure the adequate provision of mobile technology resources; and 4) reassess the reliability of wireless infrastructure.

Key Words: urban education, mobile learning technology, 21st century teaching skills,

1. Introduction

1.1 What are 21st century skills?

According to the partnership for 21st century skills (2013), for K--12 students to succeed in a career, college or life, they must not only learn core academic subject matter, they must also be supported developing proficiency in critical thinking, problem solving, communicating, collaborating, innovation and creativity, globally competency, financially literacy and information and technology literacy. This is because the current employment market demands fewer people with basic skill sets and more employees with complex thinking and communication skills (Levy & Murnane, 2005). Colleges are looking for individuals with skills to work collaboratively with others representing diverse cultures, religions, and lifestyles in a spirit of mutual respect and open dialogue. And, the U.S. is expecting high school graduates capable of participating effectively in government by exercising the rights and obligations of citizenship and understanding the local and global implication of civic decisions. An urban school district in southern California is aware of these 21st century pressures and has launched an initiative to enact 21st century learning skills via mobile learning technology in its elementary, middle and high schools.

1.2 School district’s vision for 21st century learning

Stakeholders believe 21st Century learning can only happen with 21st Century teaching. Effective and efficient teaching (not the technology) was the focal point of the district’s vision. Teachers and administrators noted that teacher practice needed to change in order to better prepare students for life beyond the classroom. The district was hoping to shift pedagogical practice and enhance the students’ learning experience through implementing such things as: data-- driven curriculum, a Bring Your Own Device (BYOD program), and individual learning plans. The district believes that a personalized education is the right next step, not only for the district, but also for their students. The shared belief is that through a more personalized education program students are more engaged, thus more likely to take ownership of their learning process.

2. Theoretical Framework

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2.1 Partnership for 21st Century Skills

The Partnership for 21st Century Skills (P21) provided a foundation for the district’s vision. District administrators have aimed to align their goals and vision to the P21 framework. This framework provided points of reference and common language for researchers to note the similarities and differences between the district’s and P21’s definition and vision of 21st learning and teaching. Researchers also used the language and vocabulary provided by P21’s framework to code and analyze the transcribed interviews (see Figure 1). Because of this, P21 language is prevalent in the findings that follow.

2.2 21st Century skills (AACTE, 2010)

According to AACTE (2010), 21st century skills can be divided into four categories: Interdisciplinary themes, learning and innovation skills, information, media and technology skills, and life and career skills (see Figure 2). Within these categories, learners develop ways of thinking such as creativity, critical thinking, communication, collaboration and problem-solving skills. Mobile learning technology contributes to the establishment of social networks and contributes to the development of social and intellectual capital.

![Figure 2: 21st century skills (AACTE, 2010)](image-url)

<table>
<thead>
<tr>
<th>CORE SUBJECTS</th>
<th>English, reading or language arts, world languages, arts, mathematics, economics, science, geography, history, government and civics</th>
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<tbody>
<tr>
<td>INTERDISCIPLINARY THEMES</td>
<td><strong>Global awareness</strong>: global issues, other nations and other cultures</td>
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<tr>
<td></td>
<td><strong>Financial, economic, business and entrepreneurial literacy</strong>: knowing how to make economic choices, the role of the economy in society</td>
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<td></td>
<td><strong>Civic literacy</strong>: learning how to participate effectively in civic life, exercising the rights and obligations of citizenship</td>
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<td></td>
<td><strong>Health literacy</strong>: obtaining, interpreting and understanding basic health information and services including preventive physical and mental health measures</td>
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<tr>
<td></td>
<td><strong>Environmental literacy</strong>: demonstrating knowledge and understanding of the environment and the circumstances and conditions affecting it</td>
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</tbody>
</table>
| LEARNING & INNOVATION SKILLS                                      | **Critical Thinking and Problem Solving:** effectively analyse and evaluate evidence, arguments, claims, and beliefs  
| Hold conviction and evaluate evidence, arguments, claims, and beliefs effectively. |
| **Communication:** articulate thoughts and ideas effectively using oral and written communication skills in a variety of forms and contexts |
| **Collaboration:** demonstrate ability to work effectively and respectfully with diverse teams |
| **Creativity and innovation:** use a wide range of idea creation techniques to create new and worthwhile ideas |
| INFORMATION, MEDIA & TECHNOLOGY SKILLS                            | **Information literacy:** access and evaluate information critically and competently; manage the flow of information from a wide variety of sources. |
| Hold conviction and evaluate information critically and competently; manage the flow of information from a wide variety of sources. |
| **Media literacy:** understand both how and why media messages are constructed; create media products by understanding and utilizing the most appropriate media creation tools, characteristics and conventions |
| **ICT (Information, Communications, and Technology) literacy:** use technology as a tool to research, organize, evaluate and communicate information |
| LIFE AND CAREER SKILLS                                            | **Flexibility and adaptability** |
| Hold conviction and adaptability |
| **Initiative and Self-direction** |
| Hold conviction and self-direction |
| **Social and Cross-cultural Skills** |
| Hold conviction and social and cross-cultural skills |
| **Productivity and accountability** |
| Hold conviction and productivity and accountability |
| **Leadership and Responsibility** |
| Hold conviction and leadership and responsibility |
3. Literature Review

3.1 Mobile Learning Technology: SAMR model

A mobile learning environment is about access to content, peers, experts, portfolio content, credible resources no matter the time of day or location. Mobile learning technology encompasses cell phones, cameras, music players, tablets, iPads, and laptop or any device, which is used in conjunction with wireless 4G/3G connectivity. Cloud technology is the enabler of “smart” mobility. With access to the cloud, all files are housed on the Internet rather than being stored either on classroom computers or individual hard drives. This allows accessibility to project materials and all data sources for revision and collaboration without regard to time or place. As a matter of fact, this is one of the most powerful aspects of mobile learning technology. It unlocks the school door and opens the learning experience to a wider domain. With asynchronous access to content comes potential for self-actuation, spontaneous and/or recursive learning. The teacher acts as a facilitator of resources and assessment while the learners plan topic, sequence, audience, and application. This has been shown to remove some of the formality from the learning experience and better engage reluctant learners. However for this to happen, mobile learning technology cannot just be used as a substitute for what is already being done in classrooms, it needs to facilitate a transformative learning.

In 2011, R. Puentedura developed a technology integration matrix that provides a framework for defining and evaluating technology integration with effective teaching. His SAMR (substitution, augmentation, modification, redefinition) model offers a progress of technology integration that helps teachers consider how to use technology to transform learning rather than as a direct tool substitute (the activity could be accomplished without technology but using technology makes it faster or more convenient).

![The SAMR Model](http://digitallearningteam.org/2012/06/07/the-samr-model-enhancingtechnology-integration/)

In the SAMR model, at the first two levels technology functions as a direct tool substitute with or without functional change to accomplish traditional tasks. When technology is integrated into instruction at the higher levels is when the real learning gains result. At the highest levels students are engaged in learning experiences that could not be accomplished without the aid of technology.

3.2 Mobile Learning Technology: Web 2.0

The technologies of Web 2.0 open up a new realm of user-generated and interactive content. Web 2.0 transformed the Internet from users just reading or retrieving what was posted to the Internet by website authors (Web 1.0’s read-only browser) to users generating information that can be included on the web and interacting with others. Wikis, social networks (Facebook, Twitter), public blogs, and posting of student work to a world-wide audience for comment and input highlight Web 2.0’s capabilities. Richardson (2010) refers to Web 2.0 as the
1. Creativity and innovation: Applying existing knowledge to generate new ideas, products, or processes.

2. Communication and collaboration: Interact, work together and publish with peers, experts in an authentic manner employing a variety of digital environments and media.

3. Research and information fluency: Evaluate and select information sources and digital tools based on the appropriateness to specific tasks.

4. Critical thinking, problem-solving, and decision-making: Collect and analyze data to identify solutions and/or make informed decisions.

5. Digital citizenship: Demonstrate personal responsibility for the safe, legal, and ethical use of information and technology.

6. Technology operations and concepts: Troubleshoot systems and applications and transfer current knowledge to learning of new technologies.

In 2013, the federal No Child Left Behind legislation required that school ensured students were technologically literate by the end of eight grade. As a result, today’s secondary students have the skills to use technology and manage their own productivity.

New pedagogies are also emerging with new technologies. Figure 4 illustrates the emergent roles of teachers and students as technology is integrated into instruction (adapted from Fullan & Langworthy, 2014): Figure 4: Emergent roles of teachers and students in a technology enhanced classroom.

<table>
<thead>
<tr>
<th>Teachers pedagogical capacity</th>
<th>Students interaction with technology</th>
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<tbody>
<tr>
<td>Provide the time and infrastructure that would allow students to find and build on their interests</td>
<td>Explore own interests and aspirations in learning goals and tasks</td>
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<tr>
<td>Model a proactive disposition toward problem solving and the constructivist nature of feedback</td>
<td>Develop capacity for reflections and perseverance in the face of challenges; provide high quality feedback and encouragement to others.</td>
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<tr>
<td>Create a learning environment that challenges students to drive their own learning process and explore new content, concepts, information, and ideas.</td>
<td>Continuously discover and create digital learning tools and resources to explore new content, concepts, information, and ideas. Use these tools to create new knowledge, connect with peers and experts throughout the world.</td>
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</table>
3.4 Goal & research questions

This study was designed to gather the perspectives of an urban districts leaders and teachers on their district’s 21st century learning initiative. The study is built around three guiding questions:

- How do teachers and school leaders define 21st century teaching/teachers?
- How do teachers and school leaders define 21st century learning/learners?
- How do teachers and school leaders define 21st century assessment/evaluation?

Further, the study investigated:

- How do teachers and school leaders feel about implementing this vision?
- What might the barriers be to the effective implementation of this vision in the district?
- How might those barriers be overcome?

4. Methodology

4.1 Qualitative Study

A case study approach was taken as primarily exploratory research. Qualitative methods were used to gain an understanding of the underlying reasons, opinions, and motivations of the district’s stakeholders. The case study provides insights into the district’s move toward implementing 21st century learning skills and helps to guide the district in the future.

Five interviews were conducted for this project; they included interviews of two key central office administrators and all four principals: The superintendent and the director of curriculum and development were interviewed together following a semi-structured protocol; the principals were interviewed individually following a semi-structured protocol.

Interview and focus groups transcripts were analyzed using a process that included multiple rounds of readings by the research team. Through repeated readings, themes emerged as the data was analyzed to increasingly deeper degrees. The data from each group of stakeholders was comparatively analyzed to help researchers understand their perspectives concerning 21st century learning in the school district.

4.2 Sampling Procedures

The superintendent and the entire population of principals in the district were interviewed. Using a purposive sample technique, a small sample of teachers from the two elementary schools and the middle school were interviewed. Individual school principals invited teachers to the focus group, based on availability. Due to time limitations, assembling a focus group of teachers from the high school was not achievable. For the most part, this subset of teachers represents teachers who use technology in some manner at each school. While we only spoke to a sample of teachers, they were highly engaged technology enthusiasts, and their reports were consistent. However, this sample of teacher voices allows the possibility of drawing clear inferences from the data, allowing for credible explanations.

All participants gave informed consent prior to research participation. All names in this study have been changed to maintain participant confidentiality.

4.3 Limitations

Since only a small sample of teachers were included in the study, we do not know whether the findings identified from this study capture the experience of all teachers across the district as a whole. However, we have carefully presented findings that are supported by multiple forms of evidence and consistent data. We are confident that these findings accurately represent the experiences of this particular subset of teachers.
4.4 District’s profile

The study district is a highly resourced Kn 12 district in southern California. The district enrolls approximately 3,100 students each year across two elementary schools, one middle school, one high school, and one alternative school, including a significant number of students from military families. The district has spent the last two years building a “device agnostic” infrastructure in order to support a BringYour Own Device mobile technology model. The district is now in the process of focusing on the use of devices within the infrastructure, with the most penetration at the middle school. In 2013–14, the district will flip the middle school, and will have 100% of students in a 1:1 mobile device program across that school. All technology in the district is accessed through the cloud with a single sign-on, for ease of access and in order to decrease the management burden at the classroom or district level. In terms of teacher development, the district has focused on supporting those individuals who are ready to use technology, allowing the culture to change gradually on its own. As an example, the district provides financial support to teachers who propose ways to use technology in their classrooms rather than requiring that all teachers use mobile devices. The district has begun the process of creating a personalized educational plan for each student, and is currently modifying its teacher evaluation system, placing a greater emphasis on the use of formative evaluations of students in those assessments.

5. Findings

5.1 Administration and teachers share a consistent vision for 21st century learning and teaching

The district’s vision of 21st century learning and teaching is consistent across administrators and teachers. All share similar ideas of what 21st century learning should look like in the classroom. The principals’ vision across school was similar to the district’s administration’s vision. The district’s 21st century learning initiative uses the technology strategic plan as a starting point. This plan centers on reliable infrastructure, professional development, adequate resources, and effective curriculum. The administration’s previous approach was more aligned with “if you (the teacher) like it (technology) then you can do it and we encourage it”. With the new initiative, the approach as become, “this (use technology) is what we are going to do in our district”. The district’s vision extends beyond meeting Common Core Standards. It is of paramount importance to all stakeholders that the curriculum incorporate the 4Cs (Communication, Collaboration, Critical Thinking, Creativity), that it emphasizes project-based learning, and that all schools aim to increase positive learning experiences for all students. Participants across the board believe technology is simply a tool to foster 21st century skills. As one principal notes:

Learning is a lot more than a device. You can teach 21st Century skills. You can promote 21st Century learning without instructional technology in your hands. How are we developing critical thinkers? How are we promoting collaboration? How are we having people analyze complex texts? Work within a team, as a member of a group? So, we look at 21st Century Learning as opportunities to promote those 21st century skills. – Principal

A teacher echos:

[…] We are trying to incorporate tools for the student to use so that they will be more engaged, to assess them better, and just to really raise their level of learning. – Teacher

Stakeholders believe 21st Century learning can only happen with 21st Century teaching. Effective and efficient teaching (not the technology) was the focal point of the district’s vision. Teachers and administrators noted that teacher practice needed to change in order to better prepare students for life beyond the classroom. The district is hoping to shift pedagogical practice and enhance the students’ learning experience through implementing such things as: data-driven curriculum, a Bring Your Own Device (BYOD program), and individual learning plans. A district administrator elaborated on this point.
A Personalized Education Program (PEP) changes how we deliver education to students. And a lot of educators are trying to bring it back to where we not only create the personalized program with the funding that we currently have, that’s built upon the factory model, but by using technology. It’s the only time in mankind’s history have we ever had the ability to create personalized instruction for masses of students. —Administrator

Site personnel generally agree with this administrators’ statement and with the overarching vision for the district. Of those interviewed, the majority believed personalized education was the right next step, not only for the district, but also for their students. The shared belief is that through a more personalized education program students are more engaged, thus more likely to take ownership of their learning process.

I think we’re all pretty enthusiastic teachers and we’re gung-ho about stepping into the future and making sure our kids are prepared. —Teacher

5.2 There is a discrepancy between district’s vision and its schools' capacity to implement it.

Although teachers consistently understood and embraced the district’s vision (as described in Finding 1), they noted a discrepancy between the vision and the schools’ capacity to implement it. Teachers hold some reservations about their ability to implement the vision as well. These reservations are based on their proficiency integrating technology in the classroom and in what they described as inadequate access to lesson planning time and mobile devices.

Professional Development and Proficiency with Integrating Technology

In this district there is a substantial focus on professional development in order to ensure that teachers are prepared to implement available technology and to ensure it is effective. However, teachers expressed concern about a lack of relevant professional development. Teachers at all three participating schools expressed desire for the district to offer a more in-depth, differentiated professional development program:

I do think the professional development, in my experience, has been somewhat limited as far as taking things beyond a more basic level. I feel that there are a lot of people in this district who are pretty gung-ho with technology and there are not a lot of people that can train us on something more advanced. —Teacher

So for, those of us who tend to be advanced… I feel we are often left out in some of the trainings. —Teacher

I also think that the differentiation, this is a side comment, but they always talk to us about differentiating for our students so the differentiating for the teachers needs to happen. They really should have the: ‘Here you go basic people, here is your training.’ If you are medium, here you go, and if you consider yourself advanced, here you go. They really should have these trainings that are differentiated. —Teacher

According to teachers, differentiating content variety in professional development is not the issue. Those who participated in focus groups called for variety in the skill levels professional development targets. For the early adopters, their innate motivation to integrate technology into their teaching is stifled by the limited support they receive as more advanced teachers. The lack of accommodation for various levels of expertise affects not only the early adopters, but as one teacher explained it, also those less able to integrate technology:

And for some teachers it’s not that they don’t want to be at that point, it’s not that they aren’t willing to be at that point, it’s just either: 1. They need more time, or 2. They need the confidence to believe they can actually do it. The extent to which teachers feel comfortable in the learning process influences their willingness and confidence in their ability to integrate technology into their teaching. One teacher elaborated on how grouping everyone together is a hindrance to those that are advanced and those who are not as advanced:
You could have some blockers, in that sense, that they need to have training provided at their comfort level and we should be differentiating for those people, so that they aren’t sitting in the room and they are trying to create their page, and here I am sitting next to them and I’m like, “Well, I am already ahead”. That makes them feel... That would make me feel a little uncomfortable... They feel like they are trying to catch up to what the other people are doing in the room. Differentiate us, and then people will feel like they are at their comfort level. – Teacher

5.3 Inadequate Planning Time for Technology Integration.

In addition to wanting a stratified professional development model, teachers desire more time to design curriculum around what they are learning, “I would like more time to develop things to implement in my classroom. That's the big thing.” One teacher emphasized the need for time to work with her team to translate the new information from professional development into their classroom settings:

I would love time to collaborate after a professional development. For example, we just went to the one---to---one institute. It would have been fabulous if the team that came from our school, to have a day when we came back to plan and implement. --- Teacher

Lack of the necessary time to design lesson plans that integrate technology was an expressed concern among both low and high integrators. For teachers, time to plan or strategize on how they will incorporate what they learned into their instruction, needs to follow adequate and relevant professional development. Teachers articulated that it takes time to internalize and implement the many uses of technology to enhance instruction in the classroom:

But sometimes too it takes a while to set things up and just a long time to explore it...there all these new uses for technology; people are flipping classrooms, they are doing screencasts of their work, people might be interested in how to do a screencast with a certain program, or even if it’s I already know how to embed videos but how do I take it further, how do I embed a video into a website I create and then also add in this thing?-- Meshing all the different technologies together (takes time). -- Teacher

Even with the management of an (iPad) cart, (We need) the time to decipher. -- Teacher

Making the leap from participating in professional development sessions, to effectively changing classroom instruction, takes time. This is particularly true in the case of technology integration, where many teachers express having to learn two things: how to operate the technology and how to integrate its use into learning and teaching. Teachers want to increase their effectiveness with technology integration through professional development, but recognize they also need the time and space to translate these skills into their classroom practice.
5.4 Insufficient Resources.

District teachers expressed wanting to feel more confident in their integration of technology, and that they desire a more personalized professional development that is responsive to their ability and challenges them to move beyond what they already know. District teachers also have reservations pertaining to device availability. Across the district, teachers are concerned that their schools lack the adequate resources to successfully carry out the 21st Century Initiative:

The thing is: the resources. Like you were saying earlier, we do have limited supplies, and it is like trying to be creative, and figure out if everybody doesn’t have their hands on an actual device, how can we still prepare them? -- Teacher

I think right now the perspective is they really want everyone to be on board, but a lot of teachers are trying to figure out how that is going to happen without all the equipment and devices, to be on board. How are we going to share all these resources and still be able to meet those standards? We know we have to meet the standards, but how are we going to be supported in meeting those standards? I think that is a big question. – Teacher

Teachers’ concern over not having enough devices hinders them from fully investing in the district’s vision. Although they are in full support of the initiative, the reservations they expressed indicate they are unsure if it can actually come to fruition. Regardless of the district’s efforts, the skepticism held by the teachers could obstruct the successful implementation of the initiative. A BYOD program is included in the initiative to extend device access beyond the number available through the district, but some teachers hold reservations about compatibility:

Well, now you have kids who bring in their own phones and IPads and stuff, but they’re not always reliable enough to do the same activities at the same time with those devices. -- Teacher

In the interviews, teachers expressed a need for assurance that proper support will be provided through professional development and resource allocation. Building confidence and peace-- of-- mind in these two areas could potentially reduce unnecessary barriers to future implementation of the initiative.

5.5 Conflicting accounts of infrastructure reliability

The district has made it a priority over the last 2 years to improve its wireless Internet access. According to administration, the upgraded infrastructure provides reliable broadband wireless access to all classes, students and devices. As far as infrastructure is concerned, the administration believes the schools have the right technology to implement the initiative. These sentiments were echoed at the principal level. Principals from all sites were confident that their infrastructure was adequate enough to implement the 21st Century Learning Initiative in every classroom. The two comments below give an explicit indication of the general perceptions principals held towards the wireless infrastructure.

If you have a whole school and every teacher wants to do mobile learning technology in their classroom, your infrastructure is solid. – District Administrator

Every student in the school could be on a computing device at the same time at any given time during the school day. – School Principal

We don’t seem to have a problem with accessibility to the Internet or with devices. -- -- School Principal

At the administrative and principal levels accounts of wireless connectivity were universally positive. However, conflicting accounts arose among teachers. Many of the teachers interviewed shared that within their classrooms, reliable Internet access was a problem.
I think they are working on it. In my room in particular, again being surrounded by the military, we are not sure what interference it is, but in my room I have definite zones where they can’t use the wireless, it just doesn’t (work). – School Teacher

Our bandwidth doesn’t support...We supposedly have it, but it hasn’t been switched on yet. That’s the rumor I’m hearing. […] We’re doing these MAP testing and all of a sudden four units go down. And we’ve got some poor kids who are wondering: “Did I push the wrong button? Am I dumb? Or did I do something wrong?” No, you were just randomly selected by the bandwidth gods to be sitting out today. – School Teacher

The reported inconsistency of the wireless network presented by the teachers could pose a serious barrier to the implementation of the 21st Century Initiative. First, not knowing if the Internet will work properly, could discourage teachers from planning and including technology—related activities in their lessons. When utilizing technology as a tool, increased classroom efficiency is a big motivator, but when there is a chance that some students will be unable to participate in the activity, or that the activity will take longer than expected due to Internet delays, that motivator is subverted. When these results were presented to the district’s superintendents, he viewed this as a positive finding because it showed that teachers were, at least, trying to incorporate mobile learning technology to enhance learning.

6. Discussion

6.1 Culture for Innovation

Two things that make the implementation of this initiative very unique for this district are the resources that are already made available to the district via various grants and the Schools’ Foundation and the fact that the district API scores are consistently high. These built in attributes make it easier to have more flexibility with changing the curriculum and provides leeway to take some risks with technology. Risks can be taken with curriculum innovation because financial backing is available and the pressure to raise API is not in play.

Whereas some districts might need to shy away risky innovation, this district is well positioned to implement advancements that will move students forward with 21st century learning skills. This 21st century learning skills initiative has a greater chance of success because teachers don’t feel the agenda of other pressures such as improving test scores or fundraising.

6.2 Allocation of Funding

Principals are choosing to allocate a large portion of their discretionary funding to the advancement of the use of technology to enhance learning. Because money does not have to go toward the purchase of hardware with the BYOD program, monies are freed to be spent on teacher professional development so that the best pedagogy can be in place to fully capture the potential of using technology in an educational setting. The principals all agreed that most of their teachers are on board for the 21st century learning initiative. However, while the principals are investing funds in mobile learning technology, they also stressed that technology does not replace good instruction. The principal’s confidence levels for success of the initiative was also very high because they believe that 21st century learning is data based and the district is promoting a data driven curriculum based on personal learning profiles. In terms of curriculum, the initiative promoted project—based learning to go hand in hand with Common Core Standards. Within this district, a blended atmosphere existed which exposed a teacher with compassion who was developing and growing the students in a smart way in which technology added a level of sophistication. As one teacher pointed out, “Technology can help to reveal students’ interest, strengths and weaknesses, and personalize learning.”
6.3 Embracing Technology

The on-- the-- job professional development might be missing its mark in improving teachers’ capacity to use new technologies and to increase the frequency of technology use. Teachers report wanting differentiated professional development in technology at their comfort level: basic, middle and advanced. One teacher said, “I have no doubt that they are probably going to say it (LMS system training) is mandated; you have to go to this training. But the reality is that I could teach it. So that is not going to help me; this is not going to get me anywhere.” Also, the district employs the “train the trainer model” where a few teachers attend a conference (ITSE, CUE, Google Teacher) and these teachers with advanced technology knowledge are then called upon to become the trainers. However, the expert technology teachers don’t always want to be the trainer, they also want to advance their skills. One teacher reported, “I don’t want to just be the trainer all the time. I want somebody advanced to come in and show me what else I could do.” There are also technology coordinators at each school who are an important source of advice on technology integration and implementation.

The teachers’ confidence level for implementing mobile learning technology in an effective manner was high. From the focus groups, we found that technology use did not differ dramatically from entry-- level to more experienced teachers or from younger teachers to older ones. Overwhelming, teachers stated that technology is not necessary for their lessons, but technology made learning more interesting for the students, faster, and more effective. Most teachers have access to common and emerging educational technologies, including LCD projectors, laptop computers, interactive whiteboards, DVD players, digital cameras, and mobile devices including iPADS and smart phones. As expected, teachers who are frequent technology users spent more time using technology for administrative tasks as well as educational tasks.

Perhaps the most important implication from the focus groups is that teachers’ use of technology for classroom instruction makes a significant difference in improving perceived student outcomes. Teachers felt like student command of technology was necessary on a number of fronts. One teacher said, “We do a lot more word processing so that the students in 2nd grade are comfortable using the computer, so that when they go to 3rd grade, they can do the Smarter Balance assessment at the end of the year and they’re going to know how to manipulate and keyboard and that kind of stuff. . . . They (students) have to learn how to keyboard so they can do the testing.” Teachers were very insightful in interpreting how the 21st century learning initiative is impacting learning. Figure 5 summarizes the teacher insights.

**Figure 5: Teacher Insights**

<table>
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<th>BYOD</th>
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<td>“But I have noticed that the students in the laptop (BYOD) classes catch on quicker. They are quicker, they are more proficient, their typing is better, they can find things, they troubleshoot – so even the aspect of them problem solving (is addressed), the students are familiar with using devices. And the ones (students) who don’t (have their own devices &amp; use netbook cart) not that they are at a disadvantage, but I just see this kind of difference in the speed of learning and their ability to problem solve.”</td>
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<tr>
<th>Authentic use of technology</th>
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<tr>
<td>“But as far as 21st century learning goes, I see it as creating meaningful lessons using technology and not just throwing in to use technology I am going to have them go do this game. But actually have meaningful things that the kids can learn from and kind of create their own learning and explore in more of that inquiry based lessons.”</td>
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<th>Assessment drives instruction</th>
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<td>“Within a year we’re really going to be teaching a different way because we’ll be assessing a different way.”</td>
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<th>Teacher Capabilities</th>
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<td>“I think that some of the younger teachers naturally have a better grip on the types of technologies that they can embed or use in the classrooms. The more experienced teachers may be set in some ways that they really like teaching and do not include technology. But wanting to and being able to are two different things.”</td>
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</table>
6.6 Promising Directions

This study suggests that the district is well positioned to tap into technology's potential to promote 21st century learning skills. Figure 6 provides evidence from the study to support each key element of 21st century learning:

**Figure 6: District’s promising directions in the six key elements of 21st century learning**

<table>
<thead>
<tr>
<th>21st century learning element</th>
<th>Promising direction being taken by study district to build momentum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Emphasize core subjects of English, reading or language arts, mathematics, science, foreign languages, civics, government, economics, arts, history and geography.</td>
<td>Not included in research study</td>
</tr>
</tbody>
</table>
| 2. Emphasize information and communication skills, critical thinking and problem-solving skills, and interpersonal and self-directional skills. | • The district makes sure students have equitable access to technology with its BYOD program.  
• Current 21st century tools in evidence: computers, iPADS, networking, audio, video, media & multimedia tools. |
| 3. Use 21st century technology tools to access, manage, integrate and evaluate information, construct new knowledge and communicate with others. | • The district has embraced a powerful vision of public education that values the use of technology to advance learning. |
| 4. Teach and learn in a 21st century context that reduces the boundaries that divide schools from the real world. This includes experiential learning, applications and experiences both inside and outside of school. | • The district’s leadership is aligned with a common purpose  
• The district collaborates with outside partners to provide professional development for teachers |
| 5. Teach and learn 21st century content including global awareness, financial, economic and business literacy and civic literacy. | Not included in research study |
| 6. Use 21st century assessments that measure 21st century skills including | • Assessments are in place to measure individual student's progress in 21st... |
high-quality standardized testing for accountability purposes and classroom assessments for improved teaching and learning in the classroom.

7.
Barriers to district’s effective implementation of district’s 21st century skills learning vision

Several areas were noted as obstacles in the district’s implementation of the 21st century learning skills initiative.

7.1 Not being able to “keep up”

Though administrators have made the district’s infrastructure a priority, during our interviews, two major issues in the system were raised: the consistency with the wireless in individual classrooms and the capacity of the broadband network. The inconsistency of the wireless connection affects the daily endeavors of classroom teachers whom are trying to implement a 21st Century learning environment. The capacity of the broadband has the potential to undermine the districts goal of assessing every student online at relatively the same time. The infrastructure needs to be reassessed to ensure both issues are remedied.

Another area that the district struggles with is the maintenance devices themselves and keeping up with most current software. The upkeep of technology, in general, is challenging and added to that is that in many hands, the computer seems to “age” faster. Therefore, hardware needs to be replaced every 3 years and this must be budgeted for. In a related concern, there is a restriction on the use of certain apps. For example, teachers cannot use any app that require students to “register” or that cost money. For teachers to “keep up” with the apps that are most effective for promoting 21st century learning skills (and do not cost or need personal information), they need professional development. New teachers must be brought up to par while continuing to expose veteran teachers to the latest, greatest apps.

Another area that presents a barrier to the effective implementation of this 21st learning skills initiative is the transience that the military presence in the community presents. In order to maintain the personalized instruction process, students need to remain in the district. On the flip side, children that enter the district need to be “caught up” to their current academic levels and also on their technology skills. To overcome this barrier, it is important that parents are involved in the school and frequent communication is in effect. With the BYOD program, the district has already overcome the issue of children who don’t have a device to bring by supplying iPad carts and loaner netbooks. However, some students are disadvantaged because they are not allowed to take a device home. Likewise, not all children have access to Internet at home. To overcome this obstacle, students are provided afterschool access to the library and a recreation center that has Internet.

7.2 Assessing the Impact of Technology on Learning 21st century skills

Currently, no standard of measure is in place in the district to determine how technology is impacting student achievement. This does not seem to be a big worry for the district because the district’s mindset is that technology already does have an impact. Both principals and teachers seem to agree with this teacher’s statement, “In order to be a 21st century school, it is imperative that our students have some interaction with technology”. The district realizes the importance that technology plays in developing the 21st century skill set. However, in addressing the question, “How effective is technology in helping a student learn?” very few teachers spoke of measuring or comparing learning with technology to learning without technology. One elementary teacher noted, “It makes teaching a topic go faster and the learners are more engaged.” This anecdotal endorsement of technology use could be more formally documented. Not documenting the role technology is playing in advancing their pedagogy or improving learning by the
students discounts the impact of technology on learning 21st century skills. In order to say that technology is having an impact on students learning 21st century skills, then evidence must be gathered to make that claim. Measurements must be in place because there is limited empirical research that states the role technology is playing in advancing learning. For example, teachers could conduct action research to formalize and document their actions, then present

7.3 Teachers are accountable
Currently teachers are not evaluated on their ability to demonstrate skills such as integration of technology into practice. However, 21st century learning is part of a larger 21st century environment where teachers are being held accountable for student learning. In this district’s next evaluation cycle, student achievement will count 30% toward a teacher’s evaluation format. This raises the stakes for teachers to ensure that computer generated, competency-based measures of student progress will be successful. To assist with this issue, the district’s teachers are being empowered by developing professional learning communities. These communities support peer coaching to ensure the long-term practice of continuous development through collaboration with colleagues.

8. Conclusion

8.1 Implications for Education
There is a digital revolution in education today. Realizing the potential of mobile learning technology in promoting 21st century learning skills requires new roles for teachers, a shift in pedagogical practices, an adequate infrastructure in all schools, and agreement that technology can enhance learning (Deriquito & Domingo, 2012; Dykes & Knight, 2012; Fritschi & Wolf, 2012). “One of the strongest barriers to the development of mobile learning is the lack of trained practitioners who can effectively incorporate mobile technologies into their classroom practice” (Shuler, Winters & West, 2013, p. 33). The recommendation from this study that professional development in mobile learning technology be stratified to most effectively reach the skill level of each teacher is an important one. This is because it is the teachers who are redefining learning experiences and planning lessons in which technology can enhance learning opportunities, foster participation and independence and promote empowerment (Hansen, Buczynski & Plunkett, 2015). This district serves as a model for a 21st century learning initiative.

8.2 Next Steps

This study revealed a common set of perceptions that helped to explain why some teachers tend to use technology more and with greater levels of sophistication than others. Because this study is based on a limited pool of teachers, a more robust survey of these perceptions would allow the district to pinpoint specific areas of need and to track changes in these needs over time. Information from the survey would provide the data necessary to help school leaders make informed decisions on how to best improve the use of technology to its full potential to promote 21st century learning skills. The survey, which could be administered electronically to all teachers, would expand upon these findings and thus provide a full report of the infrastructure’s consistencies and inconsistencies, the needs and desires for professional development, and general teacher readiness for implementation of 21st century learning skills. The survey should include constructs such as current uses of technology, professional development needs, and specific needs in the area of software tools.

References


