Examining Response to a One-to-One Computer Initiative:
Student and Teacher Voices

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Abstract

The impact of a one-to-one computing initiative at a Midwestern urban middle school was examined through phenomenological research techniques focusing on the voices of eighth grade students and their teachers. Analysis of transcripts from pre- and post-implementation interviews of 47 students and eight teachers yielded patterns of responses to illuminate how one-to-one computing changed students' learning experiences and teachers' instructional practices. Key themes that emerged were changes in teacher pedagogy, effect on student learning experiences, impact on classroom behavior and management, potential for improved communications, and suggestions to address professional development needs. The students demonstrated their learning in varied and creative ways through the use of computer-based lessons. However, the altered format presented new demands on teachers as a delivery model. Although some students were distracted by gaming and chatting opportunities, learning benefits were reported for students of varied ability levels. This study builds on the theoretical framework supporting the role and use of technology to foster learning and to prepare

students for a global economy. The focus on student and teacher voices provided the opportunity to explore a new perspective and engage middle school students, teachers, and administrators in school change efforts.

A Midwestern urban school district recently launched a technology initiative aimed at developing 21st century skills. Each middle school student received a laptop computer and, upon high school graduation, will get to keep the computer. We were interested in exploring the effects of such an initiative on teaching and learning from the perspectives of the students and teachers themselves. The authors of this article work at a university located near the school, and the two institutions have a partnership that aims to benefit the students, instructors, and administrators in both settings. Mark was one of the founders of this partnership several years ago and now serves as the coordinator of the project for the university. Amy is the university's liaison with this middle school and spends approximately one day per week supervising cohorts of teacher education candidates placed there. Being somewhat "embedded" in this school afforded us the opportunity, credibility, and degree of trust to study aspects of the new

computer initiative on a personal level rather than on a strictly outcomes-based level. We wanted to know students' candid views both before and after the computers were introduced and to hear their teachers' perceptions. In her years of observations at this school, Amy noticed a predominance of teacher-directed pedagogy. Students were used to textbook-based instruction accompanied by worksheets. We were interested in the impact of the computers on this manner of instruction as well as other patterns that might emerge from student and teacher interview data. Our study builds on the existing bodies of literature, which have traced the development of ubiquitous computing in education; reports findings from previous studies of one-to-one computer initiatives; and explores qualitative methodology by incorporating student and teacher voices as a means to illuminate key questions and issues.

The district with which we partner serves approximately 6,000 students in seven elementary schools, three middle schools, one high school, an early childhood learning center, and a school for students with emotional needs. The district and university initiated a partnership in 2004. Two professional development schools were established; one elementary and one middle school. University liaisons were assigned to each building for the purpose of supervising cadres of student teachers. University courses were also taught at each school. University faculty members have been involved to varying degrees in the professional development of the teachers and in action research. The university was not, however, involved in the planning or implementation of the one-to-one project.

The One-to-One Initiative, implemented over a five-year period, provided first middle grades students, and then high school students, individual laptop computers. The project was funded through two sources: state funds to lease the computers and federal dollars to create a wireless environment in the three middle school buildings and one high school.

The decision to have all three middle schools participate in the district project study rather than the high school or elementary schools was based on the size of the student population. In the first year of implementation, all eighth grade students in the three middle schools were issued laptops. The One-to-One Initiative was part of the district's larger vision of preparing students for the future. They envisioned that the initiative had the potential to (a) enhance student creativity and critical-thinking ability; (b) provide wide and easy access to information

and a variety of resources through such tools as the Internet, online textbooks, Keynote®, and iChat®; and (c) offer the advantage for students to extend their learning beyond the school day through their access to teachers, resources, and other support services available for use after school hours at home. The initiative would allow teachers to engage their students through a variety of computer-based teaching methods and would provide students with in-depth and meaningful learning experiences.

The district gave the teachers their computers the semester prior to distributing them to students so that teachers would have time to familiarize themselves with the hardware and software and plan instruction. According to the program specialist for technology, a variety of professional development opportunities were provided by district personnel through mandatory trainings on early release days and two voluntary summer institutes. The first early release day focused on familiarity with the hardware and an overview of the included apps and media files. Based on a needs assessment of the teachers in the building we studied, two follow-up early dismissal sessions included breakout sessions on managing a classroom in a one-to-one environment, Moodle, and finding online resources. A third early release day requested by the building principal gave math/science, ELA/social studies, intervention specialists, and unified arts teachers information on Internet resources pertinent to their particular areas. In an evaluation conducted at the end of this third professional development session, 64.3% of respondents indicated they would benefit from further staff development.

Theoretical Framework

One-to-One Computing
Computer technology in education has been a prevalent topic in the literature for many years. Access to computing dates back to pioneers such as Seymour Papert. Papert likened a classroom with limited computer access to students sharing several pencils and expecting the impact of limited resources not to effect learning. The term "ubiquitous computing" describes how computers could be embedded within the environment of daily life (Weiser, Gold, & Brown, 1999). An education-related definition of ubiquitous computing is "learning environments in which all students have access to a variety of digital devices and services, whenever and wherever they need them" (van't Hooft et al., 2007, p. 6). Ubiquitous computing addresses the availability of the technology but does not attend to the focus of learning.

There is a growing body of research relating to ubiquitous computing efforts with middle grades students. The studies all focus on various changes that occur with one-to-one computing: changes teachers experience, impact on students, and effects on school communications. Studies range from a case study of two teachers (Garthwait & Weller, 2005) to a survey of 4,000 students (Lee & Spires, 2009). Researchers might focus on one school (Lei & Zhao, 2008; Oliver & Corn, 2008), two schools (Dunleavy, Dextert & Heinecket, 2007), or multiple schools across states (Warschauer, 2007). The studies all focus on various changes that occur with one-to-one computing; changes that teachers experience, impact on students, and effects on school communications.

Effects on Teachers

Introducing one-to-one computing in a school places new demands on and affords new opportunities to teachers. Although the content may not change, the technology enables the use of innovative and engaging instructional approaches. Researchers have studied the types of assignments and activities teachers choose to use when one-to-one computing is available. Dunleavy and colleagues (2007) studied eight teachers in two urban middle schools. They found teachers had students use computers most frequently to do online research in conjunction with productivity tools such as word processing or presentation. They observed drill and practice exercises ranging from low-level to high-level individualized types. They found e-communications, such as classroom websites, in use. In a larger study synthesizing observation, interview, and survey data from seven widely varying schools, Warschauer (2007) identified instructional changes linked to laptop availability. Teachers spoke of teachable moments or "just-in-time learning" to find answers immediately to questions that arose during a lesson. Teachers also had students engage in more autonomous and individualized learning and in more research.

Will an increase of computer use encourage teachers to use a more constructivist, collaborative model, or does it foster a behaviorist, direct instruction teaching style? Garthwait and Weller (2005) studied two middle school teachers as they implemented one-to-one computing and concluded that "having access to one-to-one computing did not automatically shift instructional styles from teacher-centered to student-centered" (p. 373). Similarly, in a two-year study at a single middle school conducted by Oliver and Corn (2008), students reported that direct instruction was the type of instruction used most often by teachers, both before and after the introduction of one-to-one computing. In that same study, classroom observations revealed no increase in cooperative or collaborative learning after the students received laptops; in fact, they found more students working individually. Some forms of collaborative behaviors, they suggested, may be difficult to observe, and it may take more than one year of implementation for classroom structures and teaching to change. The Garthwait and Weller (2005) study identified an additional barrier to teachers' changing their instructional patterns: "Statewide curricular mandates trumped time spent on planning for change" (p. 374).

It appears that some teachers transition to computer-based teaching more easily than others. In a case study of a single middle school, Oliver and Corn (2008) reported inconsistent results as teachers adopted the innovation differently. Warschauer (2007) noted some teachers did use the computers to foster critical inquiry; however, that type of teaching tended to occur in high-income communities and rarely in less affluent locations. In terms of teaching methods and promoting systematic approaches to working with information, Warschauer concluded computers will not make bad schools good, but good schools better. Garthwait and Weller (2005), studying only two middle school teachers, found their teaching with computers was affected by personal beliefs about teaching and learning and by pre-existing technical expertise.

To address teacher variability and specific needs, professional development becomes an important concern (Dunleavy et al., 2007; Oliver & Corn, 2008). Lee and Spires (2009) suggested that one way to bridge that gap could involve using tech-savvy students as a resource. Donovan, Hartley, and Strudler (2007) focused their attention on the concerns of 17 middle school teachers at an urban school that launched a one-to-one computer initiative. They found most teachers were concerned about how this innovation would affect them personally, and only a small number had moved beyond this initial discomfort to focus on how to best use the computers to become more effective teachers. The authors recommended that meaningful professional development needed to be aligned with teacher concerns. An account of a one-to-one computing initiative that appeared to have a positive impact on student learning and school culture also described a comprehensive professional development program (Lei & Zhao, 2008). Survey data and interviews at this resource-rich middle school

characterized professional development opportunities as convenient and sufficient, including subsidized courses, in-school workshops, and technology support discussions at weekly team meetings.

Impact on Students

Though introducing one-to-one computing clearly affects teachers and teaching, students are the main focus of this initiative. The primary goal is to enhance students' learning experiences and prepare them for the future with 21st century technology skills. Some researchers (Pennuel, 2006; Zucker, 2007) have called for stronger, experimental studies that address the effects of one-to-one computing on academic gains, but, to date, most research has focused on more easily measured student outcomes such as technical comfort/expertise. We found researchers discussed two important aspects of student impact: effects on behavior and effects on learning. For middle grades students, the excitement that computers generate, along with the freedom Internet connectivity allows, can lead to off-task behavior. Dunlevy and colleagues (2007) cited classroom management as a challenge that manifested itself in competitive and distracted student behaviors. In a study conducted by Lei and Zhao (2008), students reported they saw the potential for the distractions the computers enabled but were learning to be self-directed. However, nearly 40% of their teachers "believed that it had become harder for their students to concentrate in class after receiving the laptops, because the students were distracted by the Internet, e-mail, games, music, and so on" (Lei & Zhao, 2008, p. 116).

Today's middle school students are sometimes referred to as digital natives, but several researchers found students had much to learn about using computers. Studies (Lei & Zhao, 2008; Oliver & Corn, 2008) have found middle grades students become more technologically proficient after the introduction of a one-to-one computing initiative. The analysis by Lee and Spires (2009) noted differences between in-school and out-of-school computer use. Students may be proficient with the authentic, personal, and social uses of computers that they experience outside school but lack knowledge in research-related activities or word processing. They suggested teachers need to bridge this gap to build technological competence. Warschauer (2007) found that students did learn to access and manage information with their computers but not necessarily to evaluate this information. Lei and Zhao (2008) painted a more optimistic picture of students' technological competence with one-to-one

computing. They noted students were able to multitask and characterized students' use of the computer technology as imaginative, creative, and diverse.

Efforts to link one-to-one computers with academic gains are complex and inconsistent. While Lei and Zhao (2008) found student GPAs rose after computers were introduced, they stopped short of attributing the increase to the use of technology.

Impact on Communications

Introducing one-to-one computers to a school has the potential to change the overall school climate. A key aspect of this broader change is the impact computers may have on the manner and frequency of communications that occur between students, between students and teachers, and between the school and parents. Oliver and Corn (2008) reported significant increases in student-to-student communications aided by computers. These included discussion boards, chats, e-mails, and shared documents. Lei and Zhao (2008) listed communications as one of the key ways students used their laptops. They noted that, in addition to students e-mailing or chatting with other students, communication between students and teachers was enhanced, as students found it easier to reach their teachers with questions, for information, or to set an appointment. Teachers also reported that the computers made information accessible to all parents. Dunleavy and colleagues (2007) reported impacts on communication including frequent use of eCommunications, specifically, classroom websites, to disseminate information and to build communities.

Student and Teacher Voice

Lee and Spires (2009) suggested we take seriously the views and expertise of students when adopting technological innovations. "The voices of students should be prominently featured and resonate in this process; by listening to students, teachers will not only be better informed but also more effective as they facilitate their students' education" (Lee & Spires, 2009, p. 79).

Research methodology focusing on the voices of students and teachers has a solid history of practice and acceptance. Our work is framed, in part, by the critical theorists who have long suggested that voice be central in educational discourse (Giroux, 1988; McLaren, 1994). Yet, in the case of both teachers and students, voices have been silenced in educational research and in the policy-making arena (Cook-

Sather, 2002; Hargreaves, 1996). A growing body of literature on student voice argues that students' lived experiences in school deserve a more prominent place in the literature (Cook-Sather, 2002; Ferreira & Bosworth, 2000; Kruse, 2000; Lincoln, 1995). Kruse (2000) suggested that "students can provide clear messages about what occurs in classrooms" (p. 77), further arguing that the voices of students should have an impact not only on the efforts of teachers but also should be considered more directly in the process of school change. Lee (1999) stated that "when the voices of students are routinely unsolicited or ignored amid reform planning and implementation, the directions assumed by teachers and administrators can be misguided" (p. 215).

A focus on teacher voice becomes more relevant as we talk about any change effort in schools. As Hargreaves (1996) noted, "The voices of those whose lives are managed and assigned meaning by others deserve to be heard with attentiveness and sincerity, lest researchers misassign meanings to their actions, and policymakers mismanage their lives" (p. 16). It is often the case that teachers, while being held responsible for implementing change in schools, are rarely consulted in the reform development, adoption, or evaluation process; yet, given their expertise and skill, these are the very voices that are necessary in any discussion about school reform (Gratch, 2000). In our research we referred to the work of Ladson-Billings (1994), as we honored the work of effective teachers and consulted them for direction in determining the most successful ways of implementing change and innovation in schools and classrooms. We also considered the work of Darling-Hammond (1997), Bartell (2001), and Kaplan (2000), who argue that when teachers' voices are not part of the reform debate, the outcomes often do not meet the needs of students or teachers.

This focus on voice is meant to elevate rather than marginalize the students' and teachers' roles in the implementation and evaluation of school change efforts. Students' and teachers' voices provided perceptions of the educational experiences and the hopes of students and teachers.

Method

The methodology for this study was consistent with the principles of phenomenological research as described by Holstein and Gubrium (1994). In the initial phase of the study we gathered perspectives of students and teachers.

Our study took place in a grades 6–8 middle school located in an urban district. Eighty-five percent of the students in this building were African American; 65% were economically disadvantaged. The teachers in the building tended to reflect national trends: predominantly white and middle class. The school, having not met Adequate Yearly Progress for the past three years, was given the lowest academic designation by the state.

We invited all eighth grade students to participate in the study, since these were the first students to participate in the One-to-One Initiative. We interviewed the 47 students who returned their consent forms. This represented approximately half the eighth grade class, and, according to two teachers asked to review the participants' names, the students represented a cross section of personalities and ability levels, providing us with what we think is a balanced perspective of these students' experiences, ideas, and beliefs about the One-to-One Initiative.

We conducted two sets of interviews with the students. The first round of interviews was held prior to the implementation of the One-to-One Initiative to establish current practices in the school. In these interviews, we purposely did not directly ask about the use of technology, since we wanted to know if technology was a prominent part of the students' school experience (see Appendix for interview protocols). The second set of interviews, conducted with the same students approximately two months after the rollout of the computers, examined students' perceptions of how the laptops were being used and whether their school experiences had changed as a result. Semi-structured focus group interviews were employed with groups of three to five students. We chose to use focus groups with the students, given the advantages of that particular methodology (Shoaf & Shoaf, 2006). We believed that providing the opportunity for student interaction had the potential for enhancing student participation and building on the responses of other group members. In most cases, we jointly conducted the 45- to 60-minute interviews with each of the groups. Consistent with phenomenological methodology, we developed an interview protocol that was "directed to the participants' experiences, feelings, beliefs, and convictions" (Welman & Kruger, 1999) about their schooling experiences. In the first set of interviews, prior to the implementation of the program, we gathered information on the students' common academic experiences in the school. We asked them, for example, to think of a teacher in whose

classroom they were successful and to describe the teacher's characteristics and pedagogical practices. In the second set of interviews, we asked students how having laptop computers affected their school experience and the ways in which teachers approached instruction. In addition to the interview protocol, we sought clarification and elaboration. We assured the students at the beginning of each interview that their comments would be both anonymous and confidential.

We also interviewed eighth grade teachers at this building, who reflected a range of experience, time in the building, and content areas. For the most part, these teachers were working with this type of technology for the first time. In all, we interviewed eight teachers who volunteered to talk with us; one teacher provided written responses to our prompts. Together, we conducted individual 60- to 70-minute informal interviews with each teacher. We asked the teachers to talk about their use of the laptop computers in their classrooms, their perceptions of how having the laptops affected student learning, and how their pedagogical practices may have changed as a result of the One-to-One Initiative (see Appendix for teacher interview protocol).

We audiotaped and transcribed the interviews. Following each interview, we discussed the conversations, highlighting nuances, similarities, differences, and additional questions that might be asked in subsequent sessions. Our analysis involved each of us individually reviewing the interview transcripts and reflecting on them, identifying themes that seemed to illuminate the various aspects of our research questions. In addition, a graduate assistant read through all the transcripts and identified themes. She had not been a part of the project to that point, so she was analyzing the data through a somewhat objective lens. We then came together, shared our observations, and further discussed the emergent themes. Our analysis was consistent with techniques described by Glesne (1999).

Findings

Providing teachers and students the opportunity to talk about their perceptions of this particular change effort provided valuable insights into how the planning and implementation of the One-to-One Initiative affected their academic experiences after the first two months. Teachers were serious and honest in their responses to our questions, sharing information from their professional perspectives that illuminated their sense of the effects, both positive and negative, the program was having on their teaching and on their students' learning. Students were also thoughtful in their responses. In most cases, the students eagerly joined in the conversation, sharing their insights and experiences with the laptops. Students' sense of how the technology changed their experiences in school was substantiated in these conversations time and again. In the following sections, we use the students' and teachers' actual words, without substantive editing, to illustrate their perspectives on the One-to-One Initiative. All of the names are pseudonyms. The extended dialogue we include is from actual conversations we had with students. Some of these dialogues are "fictionalized," in that quotes from different interviews have been joined to create coherent conversation around a particular theme (see Richardson, 1994; Storz, 1998).

School Before Laptops
To establish a sense of current practices, we conducted 13 semi-structured small-group interviews with the 47 students a few weeks prior to the rollout of the computers. Our interview began with general questions about what it means to get a good education and moved on to a more personal discussion about whether they felt they were getting a good education. We asked them to identify, without naming names, classes in which they felt successful and unsuccessful and to discuss teaching methods they encountered in those classes. We also asked about assessment practices and types of homework assignments they experienced. We concluded the interviews by providing the students the opportunity to suggest ways to improve their school experience. Across the board, the students linked a good education to preparation for future goals. For the most part, they stated that they were receiving a good education, especially if they put forth appropriate effort. Interestingly, based on the state test scores for this school, many students are demonstrating less than adequate academic progress.

When describing classrooms in which students felt successful, two concepts were frequently described: (a) a teaching style in which the teacher "broke down" the material, used creativity, and challenged the students and (b) a teacher personality that was caring, understanding, respectful, and fun. In classrooms in which students reported feeling unsuccessful, the responses again clustered around the teaching style and teacher personality. However, in these classrooms, the students felt the teacher paced the

lesson too rapidly and provided poor explanations, and the teacher's personality was mean, disrespectful, and distant.

Nearly all of the students reported that their teachers tended to use methods such as lecture, worksheets, book work/reading from the book, and group work. Some students also mentioned projects and use of technology, primarily teachers' using videos. Assessment focused on tests, class participation, and homework. Homework was generally described as worksheets or book work. To improve their school experience, students recommended more creativity in teaching and assignments, specifically, more projects and hands-on activities. To a lesser extent, students suggested teachers display particular personality traits, such as a positive attitude, a caring manner, and consistent follow-through with discipline or promises.

From this round of interviews, we got a picture of the general instructional practices in use in this school before the One-to-One Initiative was introduced. The practices reported by these students also mirrored those Amy had observed in her work as the university's liaison with this school.

School After Laptops
As we analyzed the students' transcripts from the second round of interviews, their responses clustered around four major themes or areas for which the implementation of the One-to-One Initiative brought about change: (a) teacher pedagogy, (b) student learning experiences, (c) classroom behavior, and (d) communication. Not surprisingly, teachers' comments also grouped together in a similar manner. In addition, teachers talked extensively about the professional development needs that accompanied this change.

Teacher pedagogy. A stated goal of the One-to-One Initiative for the district was to allow teachers to engage their students through a variety of teaching methods. Introducing the One-to-One Initiative clearly impacted the way teachers teach, and studies cited in our literature review reported both the opportunities and the challenges it can create. Our study also identified patterns of pedagogical innovation and concern. Students and teachers had much to say about how the laptops were being used for assignments or assessments and also about the teaching styles teachers were now using. Predictably, more class assignments made use of the new technology, particularly using the pre-loaded software. One student's comment reflects a theme

expressed by many: "It's like our teachers have gone project crazy once we got the laptops. They just put up a billion research projects and Keynotes!" Keynote (the Apple version of PowerPoint) seemed to be the type of assignment or project most used by teachers, but this fictionalized conversation gives some insight into other ways some teachers used the computers:

> Angel: *We had to make a lesson for English, and we could make a podcast, we could use Keynote, we could make a movie.*
>
> Maurice: *Yeah, we got to choose things, too. In science, in place of a test we could create some project, and it could be, like, just anything, as long as it covered the information.*
>
> Angel: *Well, our art teacher, she got this program called Scratch. It's an animation program. You can make your own animation, like a cartoon.*
>
> Pat: *In French, the teachers had us iChat and video back to one another talking in French. That's one of the fun things we did in French.*

Teachers also made use of the easy Internet access to enable students to research information or to access specific websites. One teacher summed it up with, "I tell them, with this laptop, anything you have a desire to know about, you can go and seek that information on your own." A science teacher's use of specific websites received rave reviews from students:

> Bethany: *He gave us this website to go where we sort of designed our own volcano and changed settings on it to vary the eruption.*
>
> James: *Yeah, and there was this earthquake one, too. You get to, it's like an experiment-type thing over the Internet. It's pretty cool.*

We also found patterns indicating changes in teachers' teaching styles. Students and teachers reported less whole-class, lecture-format instruction and more small-group and individualized instruction. They also described examples of hands-on, interactive instruction. This fictionalized conversation captures some of the ideas students expressed:

> Franklin: *It used to be, like, all we did was, like, read out of the book and do worksheets, and now it's like we're doing a lot more projects and we're able to have a lot more … like, do stuff by ourselves more independently.*

Casey: *When we do projects, it's like we play games in the projects, and we present it … it's like we playing a game while learning it.*

Franklin: *Yeah, now instead of doing just a bunch of Cornell Notes, we work on the project in class, and I think … I don't know … we kind of learn about the same amount of information, but it's just … it's just a little quicker... and the result is better.*

Casey: *I like the fact that we could do it by ourselves, because I like to be able to work at my own pace and everything.*

Some students were less enthusiastic about changes they saw in their teachers' styles. As one student described, "I'd say less instruction. Like, it's mostly projects, the packet, or a little sheet that tells you what you got to do, when it's due, what it's about. You teach it to yourself."

For many teachers, changing the format from traditional whole-class instruction was challenging. One teacher said, "Instead of doing a whole-class presentation, I'm doing it more with small groups, but it's hard to keep track of what 20 kids are doing when you're doing it like that." Another teacher sounded more optimistic about the adaptations she was implementing to better use the new technology:

It has started me to change my teaching in terms of what I do. I don't want to take a lot of the 42 minutes to have them listen to me. I want them to have the laptops or do something that's going to get them involved, to move around, and to work at different levels.

That same teacher philosophized about teaching and learning in the computer age:

It creates a way for kids to explore and then be confirmed, and isn't that the way they play with video games, too—you explore for the weapon or key to a treasure or something like that? They explore and then they see, here it is—and they learn. That's the way I learn!

Perhaps one teacher best summed up the impact of the laptops on teacher pedagogy: "If we're still doing the same things we did prior to the computers, then we're misusing them."

Student learning experiences. As noted earlier, the goal of the One-to-One Initiative in this district was to have an impact on the learning experiences, in part,

to enhance student creativity and to provide wide and easy access to resources. When asked directly if the laptop computers had an impact on students' school experiences, teachers and students alike responded in the affirmative. Six of the eight teachers clearly stated that they thought the computers were having a positive impact on teaching and learning in the building; another teacher, while a bit less enthusiastic, also indicated a positive impact; and one saw potential. Teachers indicated that the most common effect seemed to be in providing students an outlet for more creativity, which, from their perspective, leads to more engagement and motivation. Similarly, in their response to a direct question on changes in their experiences as a result of the new technology, the majority of students responded positively, and rather spontaneously, that school was now "funner" "less boring," "easier," with more "cool resources" and "more work."

As noted in our discussion on changes in teachers' pedagogy, students were unanimous in their assessment that one of the most obvious changes in their learning experiences was that teachers were employing many more projects than in the past. Paul, in discussing the change in his learning experiences, told us,

Before the computers, we were doing worksheets, which was out of the book, which was easier. Now we have all these projects, and they're way harder. It makes class more enjoyable because it's fun. When we do projects, it's like we play games in the projects, and we present it. It's like we're being creative while we're learning it.

In this fictionalized conversation, other students talk about being more creative in their work:

Tameka: *You put your own creativity into it with transitions and stuff like that, so I guess it's more fun than doing a pencil and paper project.*

Darius: *Yeah, and when you're bored, you can mess around with backgrounds and transitions; you can create presentations that are a lot more dynamic.*

Tameka: *You can design your own project.*

In thinking further about how these projects allowed for creativity, one student commented on the ill-structured nature of one of her assignments. Salena shared with us that her teacher "definitely gives us more projects and is letting us be more creative

and giving kind of like a vague idea of what we're supposed to do and letting the students do their own thing from there." This comment reflected a comment two of the teachers made about allowing for creativity in their teaching. Mr. Connelly reported that he told his class, "If you guys want to make a movie about yourself rapping about the material, I don't care how you present it to me." Ms. Cole shared with us that she "likes to leave room for creativity, and their creativity has definitely blossomed with these laptops." When asked to provide an example of this blossoming creativity, she shared,

> *Students take the initiative. If I tell them to create a graphic organizer, they want to go above and beyond. They want to use Keynote. They know how to go on the Internet to save pictures. They can create something on the computers.*

There was substantial agreement among the students with regard to the easy access to resources the laptops provided. It was clear from the students that the access to the Internet, as well as having their textbooks and a dictionary on their hard drives, made their work easier and more productive. This fictionalized conversation revolving around assignments reflects much of what we heard from a variety of students:

> Pat: *It's way more easier to look up information, and it's up to date.*
>
> Danielle: *They (the laptops) are resourceful in some ways, like when we have projects, we don't have to go to the library and get a book. You can just go on your computer and look it up right there. I think they're better and make class more enjoyable. You're looking forward to actually doing the work.*
>
> Pat: *Instead of going and looking and flipping the pages in the book, you can go straight to the site where it's at. We have a dictionary on our computer, or we can go to the Internet. If you need more information for a project you're doing, you just go to the Internet and look it up.*

What was less clear in our findings was the degree to which this easy access resulted in the students' gaining knowledge in research-related skills as noted in the literature. In response to a question regarding the advantages of having a laptop, one student talked about "having the different skills for when we get older, for the real world, being able to research things.

That's probably a good thing." Another told us that he was receiving "a better education, more up to date with technology."

We think it is important to note that there were a few students who suggested that nothing had really changed as a result of the introduction of the laptops. As Jonathan noted, "You're doing the same thing, but you're using technology." Bianca, responding to a question about how her experiences at the school had changed, struck a similar chord when she told us, "Pretty much the same, except better."

There was by no means consensus around this perspective; however, some of the students' comments were compelling and worthy of teachers' reflection. Again, in response to a question about how the technology had changed his learning experience, Fred stated

> *I think it's made us lazier. They're giving us more projects, but they're pretty much always the same. Spew out facts, except only now you're putting them on the computer in a Keynote. It's not really much change, and they're making us lazier because it's not like we're doing much writing anymore.*

In a similar vein, Mary shared with us,

> *In reality, it's just made us learn actually less. We're doing the same thing, just on the computer. We pull out the computers for our journals, just like you have to pull out your notebook for your journals and writing. You're typing instead of writing, so basically the same thing, just on a computer.*

Finally, one student raised a pedagogical issue related to other uses for the technology in addition to the integration of more projects. Peter shared, "The projects are so, I don't know, mediocre. You do Keynote, and that's it. I wish we could have explored the subject more on interactive websites." One of the teachers echoed a similar concern when he told us, "Some kids' projects look all great and beautiful, kind of like a big, beautiful Cadillac, but you lift up the hood, and there's no engine!"

An important question that we did not directly address in our interviews was whether this project had any impact on student achievement. While it was too early in the project's implementation to gauge impact on student achievement, there was some anecdotal evidence to suggest that both teachers and

students were thinking about effects on learning. Three teachers did bring up the issue of grades, as did two students. Two of the teachers talked about how the grades in their classes had improved since the laptops were provided to the students. Mr. Tenor, for example, stated that "some students have actually raised their grades because some of the things they're doing, which they might not have with pencil and paper. For some kids it's a lot easier than writing." A few students agreed with this perception. When students were asked why grades went up, they responded by telling us that they "don't lose text books," and they are able to "turn work in" (drop box). In another group, students suggested grades went down "because students didn't know how to use the drop boxes." Mr. Connelly would agree. He told us, "My Fs increased because of them—because kids not turning in their stuff. Responsibility in class becomes a problem, too—are you going to chat with your friends online, or are you going to work?"

There was also some discussion among the students to suggest that they saw the laptops as having a positive impact on their learning. Imagine a fictionalized conversation in which students were asked if the technology was making a difference in their learning:

> Mary: *Since we got the computers, we've been doing a lot of Keynotes. I feel like more information sticks when I'm doing those.*
>
> Joshua: *You learn more, and it doesn't take as long to get through it. I'm faster typing than I am writing, so it's easier to take notes and stuff.*
>
> Darius: *We really go in depth and learn. We're doing all of these projects, and we're learning more.*

Teachers also commented, in more general terms, about student learning. Mr. Connelly, for example, told us he felt that "if they're utilizing information, they know to transfer to something else, that's synthesizing. They are taking knowledge that they know, and they are constructing something different." Ms. Houston, who was using a program to teach nonfiction text, used the technology to have the text read aloud to students. She noted an increase in her students' fluency and comprehension "because they're not struggling. They're not listening to each other, and they are all struggling readers. They're not hearing each other stumble and lose focus." Another teacher focused on the benefits of new formats for student work: "The special ed kids are really excelling. With Keynotes, it can be more efficient and

simpler than writing a paper. They can write just a couple of words about the main idea, get pictures, and be creative." That same teacher also commented on students at the other end of the continuum: "The "A" students, the abstract thinkers, are really getting it. This one kid just did a couple of iMovies® that were just incredible, and she did it with the video camera on the computer."

Classroom behavior. As we saw in the review of the literature, the implementation of a one-to-one program has the potential to create management challenges in the classroom—some new challenges and some that are just different. As one of the teachers, Ms. Houston, noted, "What's the difference if a kid is passing a note or God knows what; I think it's just an extension of that, a different version of off-task behavior." Even though this school was fortunate to have relatively small classes (many were 20 students or fewer), from our observations in the school before the rollout of the computers, behavior issues of varying sorts and of varying degrees were present throughout the building. Most of the issues were those typical of middle grades schools and young adolescents, such as socializing in class as well as verbal, and occasional physical, expression of anger. These issues often interrupted instruction and distracted both teachers and students from the work at hand. In asking the students and teachers directly if the addition of laptops affected student behavior, both agreed there were both positive and negative effects. Some students suggested that the laptops made student behavior worse, citing more off-task behaviors such as gaming and chatting. Other students claimed the laptops resulted in improved behavior, with students being less disruptive because the room was now quieter. One major issue that surfaced in our conversations with both teachers and students revolved around the use of iChat in the classroom.

iChat is a rich instant messaging application that makes it easy to stay in touch with friends and family using text and video. Students in this school had access to iChat not only with their peers in this building but also with students at the other middle schools in the district. As we will see in our discussion of the effects the One-on-One Initiative had on communication within the school, iChat has the potential to be a very effective tool to enhance communication between teachers and students and between students themselves. However, in the context of student behavior, iChat was a serious distraction in the classroom. Both students and teachers acknowledged the negative impact this feature had on classroom management. When asked what advice

he would give to the principal and teachers for next year, one student flatly stated, "The iChat thing … I don't think they should put that as an application because it's distracting." Few students agreed with this statement, as we heard when we shared it with others; however, the students were aware that iChat did cause distractions. This fictionalized exchange between two students reflects what we heard from a number of them:

> Tanisha: *Sometimes people were getting on iChat and they weren't paying attention in class, and when the teacher would ask them something, they be like "I don't know" because they weren't paying attention.*

> Ebony: *That happens in my class too. It's a problem; iChatting and doing your work, because sometimes you are in an interesting conversation, and you're waiting for them to respond instead of doing your work.*

Teachers also were aware of the dilemma faced by students. As Mr. Tenor noted, "The responsibility in class becomes a problem. Are you going to chat with your friends online or are you going to work? A lot of kids pick chatting." Mr. Lipton concurred and stated that "unless you're directly over their shoulder, they're going to want to access their iChat." The teachers we spoke with understood this and, in many ways, accepted it as behavior associated with young adolescents. As noted earlier, Ms. Houston equated iChatting with passing a note. Ms. Cole held a similar attitude, as noted in this comment:

> *There are times when you walk around the room and you can see they are iChatting when they should be working on the assignment, but they're going to do that whether they've got pencil and paper in front of them [or a computer]. You know they're going to talk to people in the classroom. Now they're just going outside the classroom.*

The laptops provided other means of distractions in addition to the iChat application. In all twelve of our interview groups, students referred to distractions of various types. In this fictionalized conversation, students talked about a number of these other distractions:

> Michale: *They just get on and play the game and, like, they never do any work. They just play. For the kids who don't know how to limit it, it's probably really hurting them.*

Mary: *I know for me, sometimes I get so distracted with the other things that's on the computer there I don't do my work, and some people don't use it as what it needs to be used for.*

Michale: *Yep. For some people, like, it didn't help them at all because, instead of doing work, they're in class playing games.*

Jonathan: *You are kind of off task more because if you're watching a video or playing a game and you're in the middle of it, and you got to go to a different class, you want to keep on doing it, but they're, like, saying "no turn your laptops off," so it increases bad behavior.*

While the distractions caused by the computers were certainly problematic, one student was emphatic in his belief that students "are not as disruptive because they are, like, consumed by the computer." Another quickly chimed in, "and music too."

Another theme that had wide agreement among teachers and students was that classrooms were quieter as a result of having the laptops in the classrooms. Overall, this was viewed as a positive outcome. As Mr. Tenor noted, "Rooms are quieter now. It's positive. Overall, the kids are more engaged in what's in front of their face." Two other teachers viewed the laptops as more of a management tool. Ms. Houston shared, "When you have down time … if you let the kids get on their computer it is quieter. When I have down time, I let them listen to music, as long as I don't hear it." Ms. Cole held a similar belief. She told us, "At the end of class, I just let them do whatever they want with the computers, and that way it keeps them from getting up and causing problems. They're actually in their seats."

Students held views similar to those of their teachers. Anna noted, "It gets quieter because everyone is doing one thing [playing games after completing work] all by themselves, instead of everybody grouping together." Similarly, Oscar told us, "Everybody plugs their headphones in, listens to music, or they're on the Internet doing something." There were also a number of students who suggested that the quiet was the result of their iChatting, since, as Nicole said, "You can say it over iChat instead of talking out loud. So it's probably quieter." Students also indicated that the quiet came from their engagement with their work. The following fictionalized exchange underscores what we heard from a number of students:

Chelsea: *In some classes where the class will use the computers a lot, people are more quiet because everybody's just on their computer.*

John Paul: *That's right. People be minding their own business, not talking to a lot of people. They more focused.*

Melanie: *It is a lot quieter. When you write and stuff, it's a lot quieter, a lot more peaceful.*

John Paul: *'Cuz they like be by they self on the computer doing their own work and stuff.*

One final issue that crept into the conversation on a few occasions was that of how teachers monitor student activity on the computers. While this topic was not discussed to the extent that the others were, there was recognition on the part of both teachers and students that this was an issue. The couple of students who raised this issue knew that a few of the teachers were monitoring their activities, and, as one student put it, "The teachers are monitoring us. I mean, what can we do?" Teachers, on the other hand, knew that they needed to monitor the students but were not certain of how to do it or whether the structure of the classroom allowed them to do it. In any event, monitoring computer activity was viewed as another classroom management challenge that needed to be addressed.

Communication. The potential benefits of this technology in terms of student collaboration and communication between students, teachers, and parents are apparent in the literature. In our study, however, there was not substantial conversation about the possibilities that technology offers in this regard. Few teachers made reference to issues related to communication. Students, on the other hand, seemed much more aware of the communication potential that the laptops provided. There was consensus on their part that it was easier to communicate with the computers, yet, as with many things, they acknowledged that some teachers were making good use of this communication tool while others, not so much.

Once again, iChat was at the core of the discussion. As one student noted, "I think the best thing we've used our computers for, for educational purposes, is iChat because, if you have a project or you forget to do it, you can always iChat your teacher or send projects through iChat." This student captured the two most substantiated benefits noted by his peers. Students agreed that the laptop computers allowed them the possibility of communicating with teachers,

particularly after school, to raise questions regarding assignments and other related issues. This fictionalized conversation captures much of what we heard:

Tamera: *When we didn't have the computers and you needed help, teachers tell you to come after class or come after school. And then some teachers got iChat, so, like, if you're at home, need help, and you just iChat them, and they'll send you the information.*

Aisha: *That's right. When you're in a classroom, the teacher doesn't necessarily have a lot of time to talk to you, and some of them aren't here after school, so by iChatting there's, like, unlimited communication!*

Derek: *I use it for asking the teacher what's the assignment, what's the homework. It's just easier to either ask for an assignment if I didn't get it or if something's due.*

Tamera: *It's easier when you go home. Like, when Mr. Connelly's assignments are due. I have one home today that I was supposed to send in, and then I video chatted Mr. C. and told him about it. You know, he gave me an extra day.*

Tamera highlights a second point that was often raised by the students: the ease of obtaining and submitting assignments through iChat and the online drop boxes. Students noted, "It's easier to get our assignments to our teacher because of that whole drop off/pick up thing." Another noted, "At home if you need to turn in something, you can just send it through iChat, and they'll get it." Two of the teachers we interviewed saw this as a benefit as well, particularly as it provided for immediate feedback. Ms. Cole shared, "[Students] submit it to me, and it provides instant feedback because, as soon as I get it, I e-mail it back to them, oftentimes in the same class period." Ms. Houston similarly highlighted the immediate feedback possible through iChat: "I'm telling them, 'Hey, you need to redo this,' or 'Try that.' And I can see who's on task and who's off task."

While students agreed that iChat provided positive communication, there was disagreement among the students as to the extent to which teachers used or were willing to use iChat as a communication tool. This fictionalized conversation reflects the students' perspectives on the teachers' use of this tool:

Henry: *Most of the teachers have iChat, but they don't log on that much.*

Anna: *I think they should let you email them. I think some teachers do.*

Alisa: *I'm pretty sure that any of the teachers, if you e-mailed them, would probably, like, wouldn't really mind. I think they should promote it maybe.*

Anna: *I know it's kind of personal, e-mail, but I think it would be positive.*

Henry: *Teachers don't prefer that. Teachers don't be on iChat.*

Professional Development

When you have teachers ranging in attitude and experience from "I was horrified and really couldn't believe we were going to do it" to the more positive, "Do I feel I was prepared? I, myself, was, and I kind of knew what we were getting ourselves into," the importance of professional development is obvious and crucial. Penuel's (2006) synthesis of research findings from a number of one-to-one computing initiatives identified extensive professional development as related to an initiative's successful implementation. Specifically, Penuel identified types of professional development that focused on integrating technology into instruction and getting help from colleagues or coaches as more helpful than sessions that focused on teachers simply learning to use the technology themselves. The district in our study was at the beginning stages of their laptop initiative, so their professional development was a work in progress. According to the program specialist for technology, prior to implementation, the district spent one year assisting teachers in their use of the computers. During the first year of implementation, the focus shifted to supporting teachers in their use of the laptops with their students. At this time, the district had plans for a third year of professional development that would focus on the use of the computers to create blended learning environments. However, professional development was identified by every teacher and even some students as inadequate to a point at which there appeared to be a mismatch in perceptions between teachers and the district in terms of the amount and quality of professional development provided.

According to the teachers we spoke with, the primary professional development effort was brief and focused on the software installed on the students' computers. According to Mr. Lipton,

We got a 15-minute explanation on how to do iMovie and Garage Band®, and part of the problem is, you've got teachers that are on all different levels. You've got teachers that don't know how to save things in a file and others that are using all these acronyms like POD and RSM—and I have no idea what those things mean half of the time.

Ms. Houston recalled a little more generous time frame and an effort to meet individual needs but not a particularly positive outcome:

It was a one-day thing, and you had to pick the two sessions of the three that most fit you. But we spent 30 minutes talking about Moodle and how Moodles could be used in the classroom and then learned we weren't even going to be using that format!

The teachers in this district identified the very things Penuel (2006) named as important aspects of professional development: instructional integration and continuing support. They wanted more emphasis on how to use the computer in their teaching, especially in their own subject areas. Some teachers ended up being pretty resourceful, with ideas and practices that responded to these needs. Although the teachers were interviewed individually, combining some of their responses to form a fictionalized conversation could sound like this:

Mr. Lipton: *I've learned a lot from Jim (the other social studies teacher). He's really good with the computer, even though it's only his first year, but I've learned a lot from him because he's very technologically savvy. We've actually gotten together and planned quite a few lessons.*

Ms. Berlin: *I had the same kinds of questions but no other teacher here in my subject area, so I've been e-mailing with the others at the two other middle schools. We've been sharing ideas and good websites. When we saw there wasn't much planned, we just decided to take the ball into our own hands. I think you have to be proactive in your own content area. Nobody's going to do it for you!*

Mr. Tenor: *I agree. I think we could meet as PLCs (professional learning communities) either within or across schools—teams of teachers who teach the same subjects. It would have been great if PLCs had been able to get together a couple of months before the students got their computers to look at software and come up with a couple of lessons that integrate the technology to get us started.*

Ms. Berlin: *Yes, that's what I'm saying. I think we should have vertical teaming by subject area to explore unit by unit or lesson by lesson and come together once a month. We need time to plan. It is important you present it in a way that makes it easy and lets teachers see that this is going to give you some great resources. I'd like to see us develop a bank of lessons that people have used successfully.*

The need for ongoing support and coaching, from peers as well as from experts, can even be extended to support from students. As we cited in the literature review, Lee and Spires (2009) encouraged tapping the expertise of tech-savvy students. The Penuel (2006) synthesis of research findings also identified some examples of students providing technical support. Some teachers in our study expressed this idea and even saw potential for mutual benefits. According to Mr. Lipton,

> *I'm not afraid to ask the kids to help me. In a way, that's kind of brought us a little bit together, too. They like that there's something they know and they feel kind of good about it that they can show the teacher something he doesn't know.*

Mr. Connelly agreed with Mr. Lipton when he told us, "I don't have a problem with telling the kids I don't know how to do that … how did you set that up? I think it's good for kids to see adults learning." Oscar, an eighth grader, summed up the thoughts of some of the students when he said about his teachers: "They don't really know how to use the computers, and they don't have as much knowledge as we do on the computers."

Discussion

The purpose of this study was to explore the early effects a one-to-one initiative would have on teaching and learning in an urban middle school from the perspectives of the students and the teachers. We believe this is an essential perspective to explore, since these are the individuals whose lives are most affected by such change. The voices of the students and their teachers provide a richness that does not necessarily come from survey data or observational notes. Their insights provided a candid firsthand account of what transpired in their school during the implementation of the One-to-One Initiative— insights that have the potential to influence decision makers in profound ways. In addition, the idea that addressing teacher concerns (Donovan et al., 2007) is a crucial element to the success of a one-to-one

initiative seems relevant to this study. Teachers seemed generally and genuinely pleased to have a forum to express their personal concerns as well as successes. They were interested in ways to grow personally and ways to help the initiative succeed.

For each of the themes we identified, we found clusters of advantages and limitations of the initiative. Many of these findings were consistent with those of other studies that explored the integration of laptop computers into middle school classrooms. It is clear from the perspectives of both teachers and students that, as a result of this initiative, students had the opportunity to demonstrate their learning in more varied and creative ways. At the same time, it was evident that too many Keynote presentations could lead to less creativity and more focus on appearance than on content. While, at times, it appeared that there was some low-level work being produced, there was movement away from the typical pencil and paper worksheet routine that is so common in many of our middle school classrooms. In addition, easy access to the Internet provided students with a more efficient and engaging way to conduct research. Instead of going to the library or the computer lab, students were able to use their laptops to access information.

Classrooms appeared to be quieter with fewer overt disturbances. At the same time, there was more off-task behavior that was more difficult for teachers to monitor. Students could communicate more easily with teachers about assignments through iChat, at times, even during evening hours. However, students chatted with each other and with friends at other schools during class when they were supposed to be doing other things.

Teachers' repertoire of teaching ideas was stretched, and they did more group and individual work with students than previously. What was less evident was the use of the laptops by teachers to teach content by extending their use beyond the creation of student-made products to their integration as a key instructional tool. Most of the teachers we spoke with felt unprepared, frustrated, and out of their comfort zone; hence the need for professional development, which was universally perceived as important and lacking. Teachers had multiple ideas for professional development that the district might consider as the One-to-One Initiative moves beyond the beginning stages. Supporting teachers' use of computers to help students learn to think and problem solve is another important area that professional development could address.

This study focused on the early, initial launch of a one-to-one initiative and, in that respect, differs from other research. We believe it would be important and useful to conduct further research to explore how the One-to-One Initiative evolves over time so that a more extensive discussion of the effectiveness of the project could be developed.

Further research is needed to explore the effects of such an initiative on the achievement of the students. While a few students and teachers in our study commented that, in some cases, class work and mid-semester grades went up and in other cases went down, there was no clear evidence that the resources in developing and implementing this project were yielding outcomes reporting gains in achievement. While improved student achievement is a desired outcome of this initiative, we conducted our interviews early and, thus, cannot comment on the academic achievement results. However, further research could and should systematically assess the effects of one-to-one computing on students' academic achievement and performance on high-stakes testing.

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Appendix A

Student Interview Questions
Before Laptops are Distributed

1. What do you think it means to get a good education? Are you receiving a good education at Wiley Middle School?

2. Think about a teacher in whose classroom you are very successful. What is it about that teacher or the way he or she teaches that helps you be successful (or enjoy learning)?

3. Let's talk about a typical day for you at Wiley Middle School.
   a. Describe your day to us.
   b. Do you like coming to school?
   c. How do your teachers teach? (if needed, prompt with things like lecture, group work, board work)
   d. What type of activities do your teachers typically use? (if needed prompt with things like debates, videos, discussion)
   e. How much homework do you usually get? What type of homework do your teachers usually give you? Do you do it? Why or why not?
   f. How do your teachers find out if you are learning the material they are teaching?

4. Do you have fun learning (engagement)? What's happening in the classroom when you are enjoying learning new things?

5. Do you feel you are successful in school? What makes you successful, or what would help you be more successful?

After Laptops are Distributed

1. The computers were rolled out in February, and now it's May. Have the laptops made any changes in your experiences at the school? In what ways/why not?

2. Describe a class where the computers are used a lot.
   a. Do they help you learn in that class?
   b. Do they affect how students behave in the class?
   c. Do they make the class more or less enjoyable?
   d. Describe some ways the teacher uses the computers in that class.

3. Describe a class where the computers are not used very much.
   a. Do you think you are learning a lot in that class?
   b. How do students behave in that class?
   c. Do you enjoy that class?

4. Do you think having the laptops has changed the way your teachers teach? Explain.

5. Did the computers change the types of assignments teachers give? If so, explain.

6. What would you recommend to your principal and teachers that Wiley do to prepare for all 6th, 7th, and 8th graders for getting the computers next year? Parents and students?

7. Do the computers change the way teachers communicate with you?

8. Anything else you want to say about having the computers this semester?

Teacher Interview Questions

1. What is it about you and the way you teach that makes you effective with this age group?

2. Reaction to the Initiative

   a. What was your reaction when you heard that Wiley students were going to be getting their own computers? Why?

   b. What do you think about it now? Why?

3. Experiences

   a. What have been some positive experiences with the computers that you have encountered so far?

   b. What have been some negative experiences with the computers that you have encountered so far?

4. Impact of Initiative on Student Learning

   a. Do you think the computers impact student learning? Explain.

   b. Do you think the computers impact student behavior? Explain.

5. Impact of Initiative on Teacher Pedagogy

   a. Do you think the computers affect how teachers teach? Explain

   b. Have they affected the way you teach? Explain.

6. Professional Development

   a. How well do you think the district prepared you and the students for the integration of laptops into the school?

   b. Is there additional professional development that would be helpful to you in using the laptops in your teaching?

7. Is there anything else you would like to say about this project?