An Ecological Case Study of Two Middle Schools' Technology Integration

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In this paper, we use a mixed-methods approach to examine and compare how technology is being used in two middle schools and in outside-of-school settings. Teachers, local and district leaders, and students, completed online surveys. At both sites, we found students who reported engaging in technology activities did so predominantly outside of their school setting. The leaders and teachers at both sites reported strong agreement and recognition that technology integration improves student learning, but overall technology integration, according to our definition, rarely occurs. The urban school with equal white/minority student population was more likely to engage in more activities related to communications (e.g., email, blogs and/or wikis, texting, online video/audio chat), web (e.g., search engine, watch/download audio/video, visit the school/library site, social networking, multi-user games, virtual worlds), productivity (e.g., word processing, spreadsheets, presentation software, online productivity suites, concept maps, desktop publishing, drill/practice games) and creativity (e.g., create/edit pictures, audio, video, websites, share creation). They were also statistically more likely to do many of these activities in school.

Objectives

This comparison paper presents findings from two middle school settings and examines if patterns exist between:

a) student and teacher use of technology both in and out of the school setting;
b) student and teacher frequency of use of various technologies;
c) student self-reported skill level of various technologies used;
d) student report of teacher/student use of technologies in the classroom;
e) student report of types of technology-related activities in the classroom
f) teachers' digital technology self-efficacy, their attitudes toward learning technologies, their personal/professional uses of technology and their awareness of local technology vision/leadership;

g) school/district leaders' awareness of technology vision and assessment of technology leadership.

Unlike previous research that tends to focus only on teacher and leader perspectives, these empirical case studies target students, teachers, and administrators. The ecological framework employed (Bronfenbreener & Ceci, 1994) allows us to seek an understanding of all three perspectives as well as garner an in-depth understanding of each school's context.

Theoretical Framework

During the 1990's, a great deal of research was conducted to examine the "digital divide." The digital divide was defined dichotomously as those who have technology hardware and those who do not. Later, this term extended to Internet access either in or out of school (Gorski, 2007). In addition to ownership and/or access, the digital divide also referred to those who simply used digital technologies and those who did not (Hargittai, 2003). In 2001, DiMaggio and Hargittai proposed the idea that despite a seemingly diminishing digital divide, a digital inequality stills existed. They laid out five dimensions of inequality which go beyond accessibility of equipment to include a) quality of available equipment, b) autonomy of use, c) inequality in skill, d) availability of social support and e) purpose of use (DiMaggio & Hargittai, 2001).

In recent years, research regarding the "digital divide" and digital inequity has waned. But recent reports suggest that it still exists even in our schools, if not in terms of lack of equipment, then in terms of lack of access to that equipment either due to location of the equipment or the teacher's preparedness and desire to use it.

Technology integration is itself a continuous variable and is often not clearly defined (Belland, 2009; Eteokleous, 2007; Jamieson-Proctor et al., 2009, Lei and Zhao, 2007; Zhao & Frank, 2003). The degree to which technology is integrated in various schools, even various classrooms, fluctuates depending on several factors including available hardware/software, administrative (both local and district) and parental support, teacher buy-in, and professional development and teacher time for learning. "One of the most frustrating things when writing about technology integration is the lack of a common definition of the term (Belland, 2009). Lei and Zhao (2007) and Zhao and Frank (2003, p. 808) describe the phenomenon as "technology use" rather than "technology integration." Additionally the second set of authors broke down the term "technology use" into four main categories: "technology as media for inquiry, technology as media for Communication, technology as media for construction, and technology as media for expression" (Zhao and Frank, 2003, p.286).

We conceptualize 'technology integration' as the use of digital information communication technologies by teachers and/or students supporting constructivist and socio-constructivist instruction and learning (Cole & Griffin, 1980; Greeno, 1989; Greeno, Collins, & Resnick, 1996; Vygotsky, 1978) of subject area content (e.g., math, science, social sciences, languages, etc.). Optimal learning is a social practice that involves individual or group participation in activities that make use of contextually- and culturally-relevant (i.e., global, community, cultural, and individual) artifacts across time and spaces (Bransford, Brown, & Cocking, 2000). Thus, our conceptualization of 'technology integration' is one in which digital technologies are harnessed in support of optimal learning activities, as described by Bransford and colleagues. Such technology-supported learning and instruction involves students and teachers working together with digital activities that, as much as possible, reflect authentic activities and activities within the subject areas. Students use these activities to explore, conjecture, analyze, test, and discover concepts and topics within subject areas. Apprenticeship into a profession serves as a metaphor in which learners of science, for example, would use activities most closely matching authentic activities of actual scientists. Scientists might be using digital microscopes or field-based data collection activities like mobile probes for assessing temperature, pH, or motion. Journalists use word processors, blogs, Web pages, and books. Historians access primary source materials that may include multiple types of media. These examples provide glimpses of a range of 'authentic digital activities' that professionals use. From our definition of technology integration, we argue that PK-12 learners should be using these authentic digital activities for their own learning of subjects. Our definition of 'technology integration' does not imply that schools or teachers use the most recent technologies available; instead, it assumes teachers make decisions to use digital activities when they carry authenticity for the field and support in students' learning of subject matter. Certainly, there are other uses for technology, such as for administrative tasks like grading and attendance or for remediation or test preparation through technological tutoring systems. While these uses may yield positive impact on measures related to their goals, they do not fit within our definition of optimal learning or technology integration.

In previous research, factors such as teachers' self-efficacy of technology skills, professional development opportunities, teachers' perceptions of technology for teaching, or schools' infrastructure have been the focus of classroom-based technology integration research. Student perspectives have often gone unexplored. Research that does include student views centers on identifying what activities are available and utilized in the school. These studies have primarily looked at each variable separately and independently. We use an ecological perspective as promoted by Zhao and Frank (2003) to honor the complexity of technology integration at individual schools by exploring the variables as part of a complex system of interactions and relationships (Brofenbrenner & Ceci, 1994; Weinstein, 2002; Zhao & Frank, 2003). In this paper, we are particularly interested in understanding how these two schools are similar or different and if so, how and why.

Literature Review

Over the course of the last decade, several educational policy changes have reflected the need to address technology as a necessary element of education (ISTE, 2007, 2008, 2009, 2010; Partnership for 21st Century Skills, 2009; National Educational Technology Plan, 2010). The International Society for Technology in

Education created global standards, referred to as the National Education Technology Standards, for students, teachers and leaders. The NETS-S (students) were created to "provide the skills and knowledge students need to learn effectively and live productively in a digital world", while the NETS-T (teachers) provide skill and knowledge standards for changing teaching approaches and the manner in which educators work and learn in an "increasingly connected global and digital society (ISTE, 2010)." Finally, the NETS-A (administrators) provide norms to give leaders the activities they need to create and sustain an environment for supporting digital-age learning in addition to technology vision building and instructional transformation. On ISTE's Website, reasons for these policy creations include the need for educators to "demonstrate the skills and behaviors of digital-age professionals." Additionally, the site notes that technology is dramatically changing our society and with societal change comes expectation changes and changes in teaching (ISTE, 2010). Specific rationales underlying the impetus for technology integration in schools are preparation for the workforce, keeping pace with societal and global development, shifting approaches to teaching and learning, developing critical media literacy, acquiring information fluency, and exercising digital citizenship.

Cuban's (2001) research suggests that technology is doing little to transform instruction. Instead, teachers are using word processing, email, grading activities and the Internet for lesson preparation and administrative tasks. Zhao and Frank (2003) note that teachers are the key agents as they make the final decision of whether or not to and how to integrate technology in their classrooms. Attitudes play an important role in whether or not teachers will integrate technology, along with the interrelationships between teachers and teachers and leaders (Zhao and Frank, 2003).

In a report of how teachers used educational technology (Gray, Thomas, & Lewis, 2009), 93% of teachers had one or more computers in their classroom with Internet connectivity. In terms of instruction which utilizes technology, teachers reported that they and/or their students used the computer often (40%) and sometimes (29%) in the classroom, and often (29%) and sometimes (43%) in other instructional areas such as a computer lab. Teachers used word processing (96%), spreadsheets (61%), presentation software (63%) and the Internet (94) either instructively or administratively.

Anderson and Dexter (2005) attempted to understand how school technology leaders play a role in technology integration in schools. They used 1998 data obtained from school principals and technology coordinators, finding differences in technology leadership in terms of technology goals and policies, monetary support of technology, and leadership committees dedicated to improving technology across a variety of schools, and concluded that strong technology leadership is central to technology integration in schools. However, they did not look specifically at students or teachers in these schools.

Spires, Lee, Turner and Johnson (2008) investigated middle school students' perspectives on school, technology, and academic engagement by collecting data from the students themselves. Students in this study reported predominant in-school technology use in testing and word processing and the use of presentation and design/drawing software for sharing their work. On the other hand, outside of school, students reported using cell phones, computers and video games for communication and entertainment. Students were aware of the gap between what they did outside of school versus what was occurring in school.

In a recent Pew report (Zichuhr, 2010) it was found that outside of school, 57% of teens, ages 12-17 are going online to watch a video, 73% for social networking purposes, 67% for instant messaging, and 78% to play online games. Seventy-three percent of teens in their study read email and 48% make online purchases. A Kaiser Family Foundation Report (Rideout, Foehr, & Roberts, 2010) states that 33% of students spend an average of 16 minutes per day doing school work on the computer and that the does not vary by race or parental education levels. The authors surveyed 2,002 children between the ages of 8-to-18 who reported that they spend 25% of their recreational time on social-network sites, 19% of that time playing online games, 13% instant messaging, 16% watching online videos, 6% reading/writing email and 5% of their time working with graphics/photos (Rideout et al., 2010). A half-decade ago, in 2005, Lenhart and Madden were reporting that 57% of students were creating content such as photos, videos, websites and stories. Despite 36% of students in the middle school age range (11-14) having imposed limits for time spent on the computer, they average 1 hour and 46 minutes per day on the computer (Rideout et al., 2010).

Through in-depth case studies of middle schools, our research attempts to understand how students', teachers', and leaders' attitudes, beliefs, and actions in and out of school support technology integration for learning. Understanding all three perspectives gives a more complete picture of the school environment. Looking across schools, we can begin to understand what predictors are most influential in integrating technology in the classroom.

Our research questions include:

- What differences/relationships exist in how students engage in technological activities in and out of school?
- What student factors are associated with technology use in-school? What student factors are associated with technology use out-of-school?
- What differences/relationships exist in how teachers engage in technological activities in and out of school?
- What is the relationship, if any, between school and the distribution of professional development opportunities?
- What differences/relationships exist in teachers' self-efficacy, attitude toward learning technologies, and constructivist beliefs?
- What teacher/school variables are associated with teachers' use of technology in-school?
- What differences/relationships exist between school and leaders' mean assessment of the importance of various elements to the district/campus technology vision?

- What differences/relationships exist between school and leaders' NETS-A profile score? Is there a correlation between years of experience and the NETS-A score?
- What differences/relationships exist between school and leaders' ranking of improvement success in various categories?

Methods

Participants

Saguaro Middle School, built in the early 1950s and located in rural, southwestern United States, is our first case. The district serves 9,500 students from seven surrounding communities. In 2008-2009, the district had seven elementary schools, two middle schools, one high school and one alternative school. Saguaro Middle School itself serves approximately 1000 students.

The district met AYP (Adequate Yearly Progress) and was "Recognized" for student performance on their state tests, while Saguaro Middle School also met AYP and was "Academically Acceptable." Saguaro MS was "commended" in Social Studies based on the 2008-2009 test scores.

In May 2009, the entire Saguaro MS staff, along with the 6th and 7th grade students, were invited to participate in the study. Parental consent for student participation was obtained via letters and forms sent home. Students completed assent forms at the time of survey administration, as was teacher and leader consent. Nine leaders, 16 teachers, and 309 students, participated in our study.

Porter Middle School, our second case, is an urban middle school in a medium-sized metropolitan school district in the southwestern United States, also serving approximately 1000 students. Porter's school district is ten times the size of Saguaro's. The district did not meet Adequate Yearly Progress (AYP), in 2010, but Porter Middle School met AYP and with a rating of "Acceptable".

The demographics of Porter Middle School are mixed due to a district-wide minority-to-majority transfer program. In this program, students who are of a majority race/ ethnicity at their home school can request a transfer to a school where they are in the minority. So, while the regularly zoned school population is majority white, Porter has a student population of 40% Hispanic, 9.5% African-American, 47.9% White, and 1.5% Asian. The average home values in Porter's zoned area exceed $400.000, but the average home values in the transfer zones range from under $100,000 to $300.00. Approximately 39% of the students are economically disadvantaged.

Table 1 shows the ethnic and economic breakdown of the two schools. Saguaro MS is approximately 72 % Hispanic with a higher percentage of economically disadvantaged students than Porter MS.

In May 2010, the entire Porter Middle School staff and the sixth and seventh grade students were invited to participate in the study. Teacher and administrator consent was completed at time of survey invitation. Four leaders, eleven teachers, and 234 students participated in the study (Table 2).

Table 1: Racial and economic breakdown of Saguaro and Porter Middle Schools.

	Saguaro	Porter
Race/Ethnicity		
Hispanic	72%	40%
African-American	20%	9.5%
White	7	48%
Asian	1.5%	2%
Native American	.3%	0%
Economically Disadvantaged	74%	39%

Table 2: Breakdown of participants by role

	Leaders	Teachers	Students (6th & 7th)
Porter	4	11	234
Saguaro	9	16	309

Data Sources

A case study explores a phenomenon while taking context into consideration (Yin, 2009). For each case, we invited sixth and seventh grade students, teachers and campus/district leaders to participate in our study. Students completed the online survey during structured class time while adults answered their online surveys at their convenience over a two-week window. We collected data at Saguaro MS in spring 2009 and Porter MS in spring 2010.

Student survey questions focused on their computer activities in- and out- of school, how often they used the various applications/activities, and their perceived skill level. These activities/applications were divided into four core areas: Communication, Web, Productivity and Creation. They were also asked about specific hardware/software uses. Additionally, students were asked about technology integration habits of their teachers and themselves in different subject areas and other in and out of school technology issues.

Teacher survey questions included a modified version of the Cassidy and Eachus (2002) assessment of digital technology self-efficacy and their attitude towards learning technologies, which came from the "Technology Beliefs" section of Brinkerhoff's (2006) survey. Additionally, teachers were asked about the school/district technology vision; the frequency, purpose (personal/educational or professional), and skill level of technology use under the same core areas as the students; and their anticipated future uses of technology and content-connections.

Finally, the leader survey, taken by both campus and district leaders, was constructed primarily from the PTLA, Principal Technology Leadership Assessment (3), which has an overall reliability of .95 (McLeod & Hughes, 2004). Additional items included questions about the district technology vision, technology advising and technology integration.

Only slight changes in wording occurred between administrations due to awareness that clarity was needed to aid respondents in answering the question or in order to add more relevant, site-specific items. Most of these changes took place on the student survey.

Data Analysis

We calculated descriptive statistics on the survey data from both schools and ran Chi-Square tests, looking specifically at Pearson Chi-Square and Cramer's V, to discover relationships and the strength of those relationships between variables such as teachers' attitudes and/or their self-efficacy levels and their use of technology; professional development opportunities and teachers' use of technology; student use of technology in and out of the classroom; student frequency of use; student level of skill (as ranked by the student); and technology leadership and teacher's technology use. T-tests were also run to compare means in skill levels.

Results

The results are presented by research question, role in the school, and technology activity category. There are twenty-five activity use indicators categorized into four groups or domains: Communication activities, Web activities, Productivity activities and Creativity activities.

Students

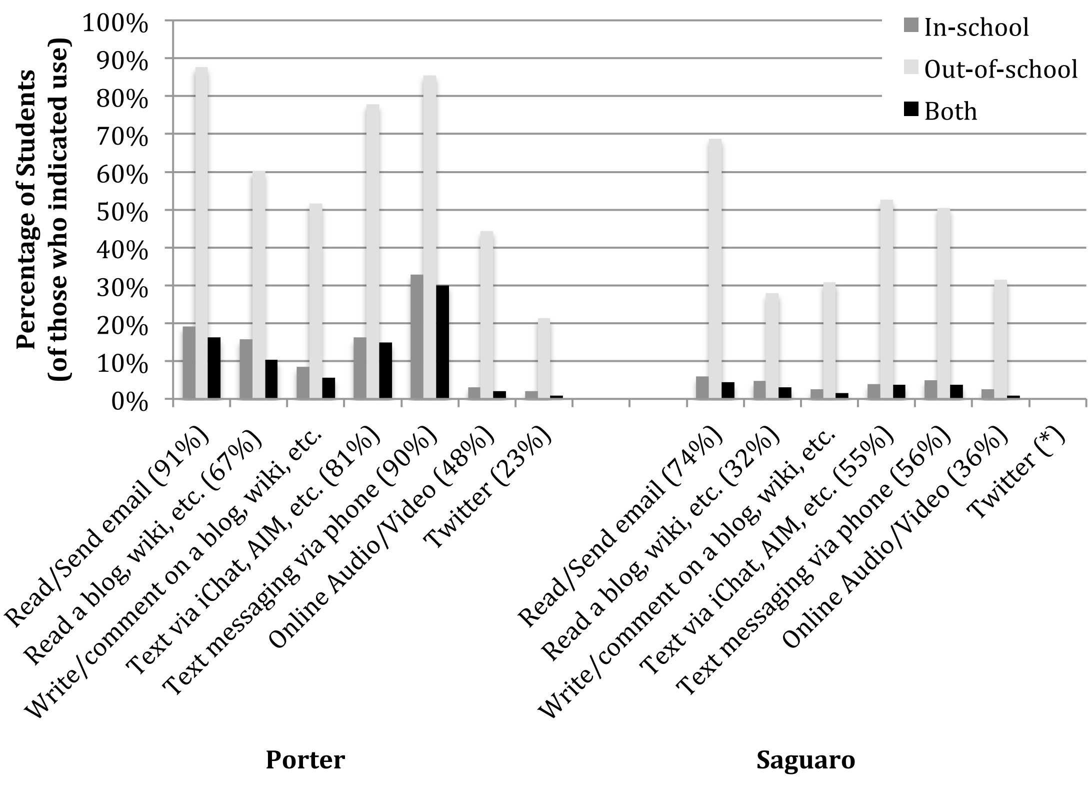
Differences in student use in- and out-of-school.

Students were asked to indicate which activities within four domains they engaged in, whether they did so in-school or out-of-school, the frequency with which they participated and their skill level in each activity. An additional variable was created when students marked engagement in the activity both in- and out-of-school. We then looked for patterns and relationships between various factors and engagement in these activities.

Communication

In the Communications category or domain, students were asked whether they used 6 common activities. These activities included reading/writing email, reading blogs, wikis, writing to blogs/wikis, texting via computer such as iChat or AOL Instant Messenger, texting via phone, and participating in online audio/video chats such as Skype. Porter students were also asked about the use of Twitter in which 23% responded that they used the tool. Generally, Porter students reported using all Communication activities more so than Saguaro students (Figure 1). For example, more students at Porter indicated they wrote/commented on a blog (56%) than students at Saguaro (34%). Additionally, Porter students reported using Communications activities in-school more than Saguaro students. In the same example, 9% of Porter students reported writing/commenting on blogs in school as opposed to 3% of Saguaro students. All the students reported they used the individual Communication activities more out-of-school than in school.

Figure 1: Students' Communication technology usage, disaggregated by "In" an Out"- of school and "Both in and out of school" locations and separated by school.



In determining a student's level of use in Communications activities, a variable was created to define each student as a low, medium or high-end user of Communications activities. If a student indicated that they engaged with 0-2 of the Communication activities, they were assigned a "low" level; if they indicated engaging in 3-4 activities, they were given "medium" level; if they indicated 5-6, they were given "high" level. There was a lower percentage of low-end users from Porter (16%), than from Saguaro (84%). Likewise, 68% of high-end users were from Porter and 32% were from Saguaro. These results also show that Porter students used more activities within the Communications category than Saguaro. There was a significant and strong relationship between the school and the students' level of use of Communication activities (x^2(2, N=555=103.59, p<.001, Φ=4.32).

In terms of location of use, more Porter (46%) students reported using at least one of the Communications activities at-school (Saguaro, 19%). A significant and moderately strong association between school and activity engagement in-school was found (x^2 (1, N=555) = 47.1, p<.001, Φ=.291). Based on odds ratios, students at Porter were 3.65 times more likely to engage in Communication activities at-school than Saguaro students. On the other hand, use of Communications activities outside of school was approximately even at both locations (Porter, 97%; Saguaro, 92.5%). There was no significant relationship between school and use of the activities outside of school. Finally, a significant and strong relationship was found between schools and the percentage of students who reported the use of Communications activities both in-school and out-of-school, with more Porter (41.5%) than Saguaro (14%) students reporting use (x^2 (1, N=555) = 54.98, p < .001, Φ = .315). This suggests that Porter students are 4.44 times as likely to report engaging in Communication activities both in- and out- of school.

Frequency information was gathered from students to determine how often they participated in the Communication activities they indicated using in any location. Students chose 1 (Monthly), 2 (Weekly), 3 (Daily) or 4 (Many times/day). Students at Saguaro (M=2.55, SD=.94, N=313) indicate utilizing their Communications activities overall more frequently than students at Porter (M=1.78, SD=.82, N=233). Chi-Square tests on each indicator also show that students from Saguaro who indicated doing these activities did so more frequently, with the exception of texting. For example, more Saguaro students who reported that they read/sent email also indicated that they did so "Many times a day" than did Porter students (Porter, 40%; Saguaro, 47%). A significant and moderate relationship was found between school and frequency of use in reading/sending email (x^2 (2, N=447) = 19.72, p < .001, Φ = .210).

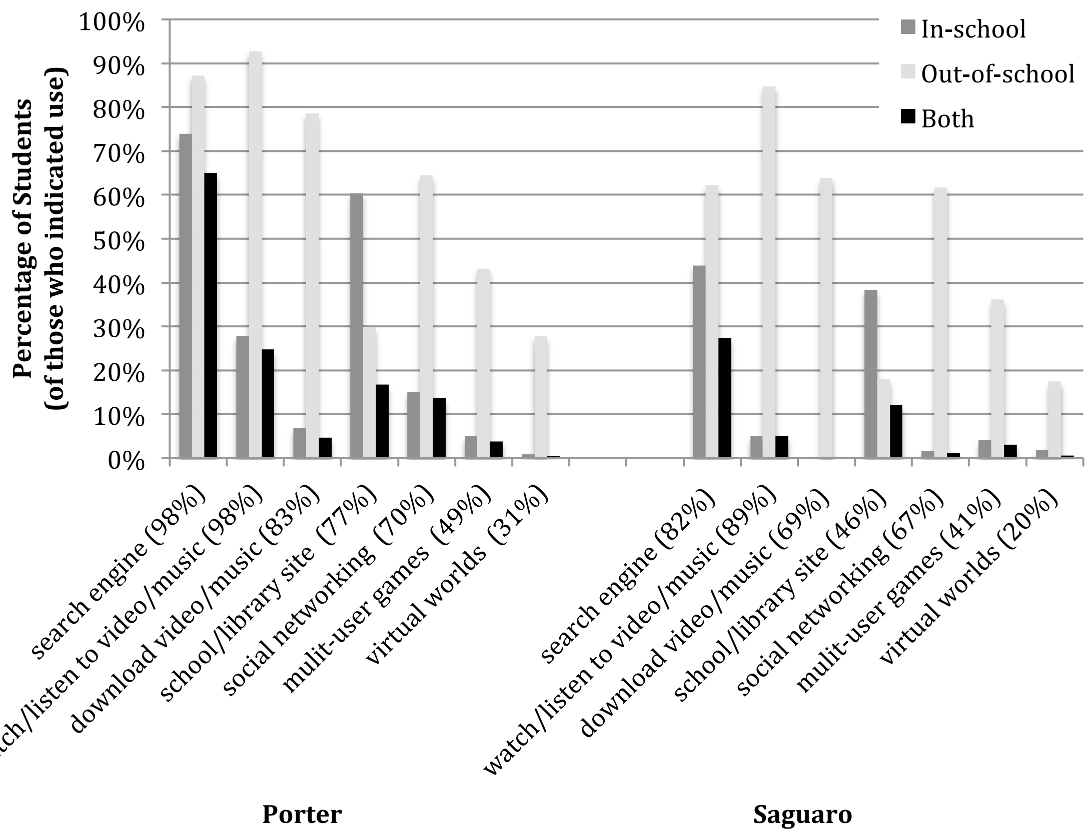
Finally, skill means were calculated with students ranking their skill level for each indicator as 1=Beginner, 2=Intermediate, 3=Expert. A mean was calculated for each individual indicator and then a mean of means was calculated for all six indicators to determine a category skill level mean. Students at Saguaro ranked their skill level in Communications activities between Beginner and Intermediate (M=1.76, SD=.71, N=312). This was only slightly higher than how Porter students ranked themselves (M=1.66, SD=.756, N=233). A t-test shows that this difference is not significant (t (543) = -1.58, p = .47).

Overall, students at Porter are more likely to indicate that they participate in specific activities within the Communications activities domain. Additionally, more students from Porter indicated that they do these activities at-school and both in-and out-of school than Saguaro students. On the other hand, Saguaro students are more likely to say they do these activities more frequently and possess a slightly higher skill level.

Web

Students were asked whether they engaged in any one of seven activities within the Web domain. Activities in this domain included using search engines, watching/listening to video/audio, downloading video/audio, visiting the school and/or school library site, social networking such as Facebook, playing multi-user games, and visiting virtual worlds, such as Second Life (Figure 2). Although more Porter students reported use for each indicator, the differences appeared to be smaller than Communications activities. For example, 70% of Porter students noted that they participated in social networking, as opposed to 67% of Saguaro students. With the exception of using the school/library website, all activities were engaged in by all students more out-of-school rather than in school.

Figure 2: Students' Web technology usage, disaggregated by "In" and "Out" –of-school and "Both In and Out of School" locations, separated by school.



If students reported engagement in 0-2 Web activities they were considered a "low" Web activities user. Likewise, students who reported engagement with 3-4 activities were assigned "medium" user and students who reported engaging with 5-

7 activities activities considered a "high" level users. More students at Porter reported use of 5-7 activities in the Web domain than did Saguaro (Porter=37.2%, Saguaro=23.4%). There was a significant and moderate association between the school and the number of activities engaged in by students (x^2 (2, N=555) = 31.53, p < .001, Φ = .238).

More students at Porter (69.2%) reported engaging in Web activities at both in- and out-of-school locations than at Saguaro (34.3%). A significant and strong relationship was found between school and the utilization of Web activities both in- and out-of-school (x^2 (1, N=555) = 66.2, p < .001, Φ = .345). Based on odds ratios, students at Porter were 4.33 times more likely to engage in Web activities both in- and out-of-school locations than Saguaro students. On the other hand, no significant relationship was found between school and the use of Web activities outside-of-school. Ninety-seven percent of Porter students reported engaging in Web activities out-of-school, with 93.8% of students reporting.

Students were asked how frequently they employed the use of Web activities, choosing from 1 (Monthly), 2 (Weekly), 3 (Daily) or 4 (Many times/day). Students at Saguaro had a higher mean of frequency (M=2.6, SD=.81, N=315) than Porter students (M=1.8, SD=.71, N=231). With the exceptions of "searching the Web" and "view or listen to music or videos," there were significant relationships between school and the frequency of use of the individual Web activities. For instance, a significant and moderately strong relationship was found for the activity "download music and video" (x^2 (4, N=449) = 34.5, p < .001, Φ = .277) with Porter students engaging in the activity more frequently.

Skill means were calculated for each Web activity and then a mean of those means was calculated. Students ranked themselves as 1=Beginner, 2=Intermediate, 3=Expert. There was no significant difference (t (544) = -8.34, p = .26) in the reported Web activities skill level between Saguaro (M=2.2, SD= .68, N=315) and Porter (M=1.7, SD= .61, N=231).

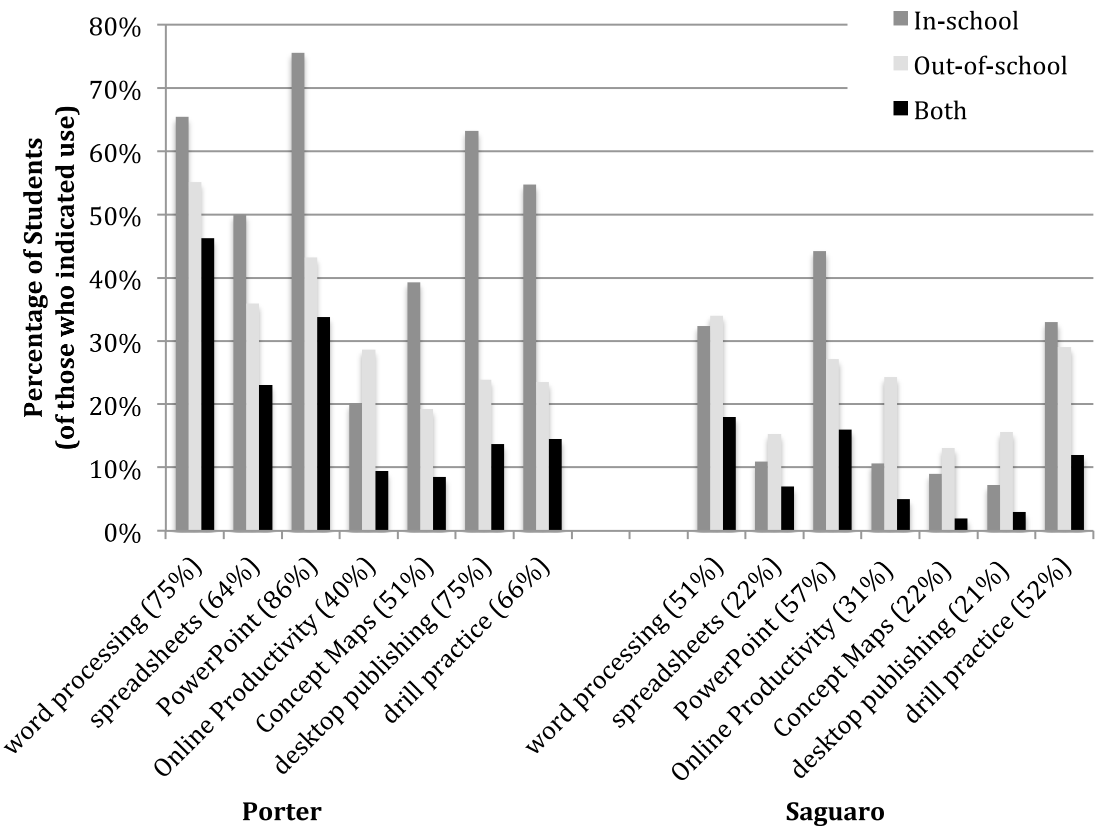
Again, students from Porter were more likely to indicate they engaged in the various activities within the Web domain and were more likely to use them both in- and out-of-school. However, Saguaro students reported higher frequency of use of the activities and higher skill levels.

Productivity

Students at both schools were asked to indicate whether they utilized one of seven common Productivity activities. Activities in the Productivity domain include word processing, spreadsheets, presentation software, online productivity suites, concept mapping activities, desktop publishing and content practice/quizzes (Figure 3).

More students at Porter (87.6%) reported using Productivity activities in-school than at Saguaro (66.7%). A moderate and significant relationship can be seen between school and the use of Productivity activities in-school (x^2 (1, N=555) = 32.07, p < .001, Φ = .24). Additionally, more Porter students reported doing these activities outside of school than students from Saguaro, however, the significance was minimal with a very weak effect (x^2 (1, N=555) = 4.4, p= .036, Φ = .089). Porter students (60.7%) reported use of these activities both in- and out-of-school more than Saguaro students (32%). Significance between school and use both in- and out-of school was moderate (x^2 (1, N=555) = 44.8, p< .001, Φ=.284). Based on odds ratios, Porter students were more 3.5 times more likely to report doing these activities in-school and 3.28 times more likely to report doing them both in and out of school.

Figure 3: Students' Productivity technology usage, disaggregated by "In" and "Out" – of-school and "Both In and Out of School" locations, separated by school.



"Low" users of Productivity activities were considered those who only indicated doing 0-2 of the activities, while students who indicated engagement in 3-4 activities were considered a "medium" user and students who reported participation in 5-7 activities were considered "high" users. As in the other domains, Porter students report engagement with more of the individual Productivity activities than Saguaro students. In contrast to Communication and Web activities, most students at both schools reported doing Productivity activities in-school as opposed to out-of-school. There was a higher likelihood that students reported participation in the activity in both locations as well. Additionally, there was a significant and moderately strong association between the school and the number of activities done reported by students (x^2 (2, N=237) = 18.567, p < .001, Φ = .280).

Students were asked how frequently they used the Productivity activities, choosing from 1 (Monthly), 2 (Weekly), 3 (Daily) or 4 (Many times/day). Students at Saguaro again had a higher mean of frequency (M=1.7, SD=.81, N=293) than Porter students (M=.95, SD=.56, N=228). There was a significant relationship between school and all indicators within Productivity activities. For example, a very strong relationship exists between school and the frequency of use for word processing (x^2 (4, N=389) = 48.6, Φ=.35).

Students ranked their skill levels for each indicator as 1=Beginner, 2=Intermediate, 3=Expert. While a t-test shows no significant between school and mean of reported skill level (t (519) = -8.28, p = .11), students at Saguaro (M=1.8, SD= .67, N=293) ranked their overall skill level for Web activities slightly higher than Porter students (M=1.3, SD= .74, N=228).

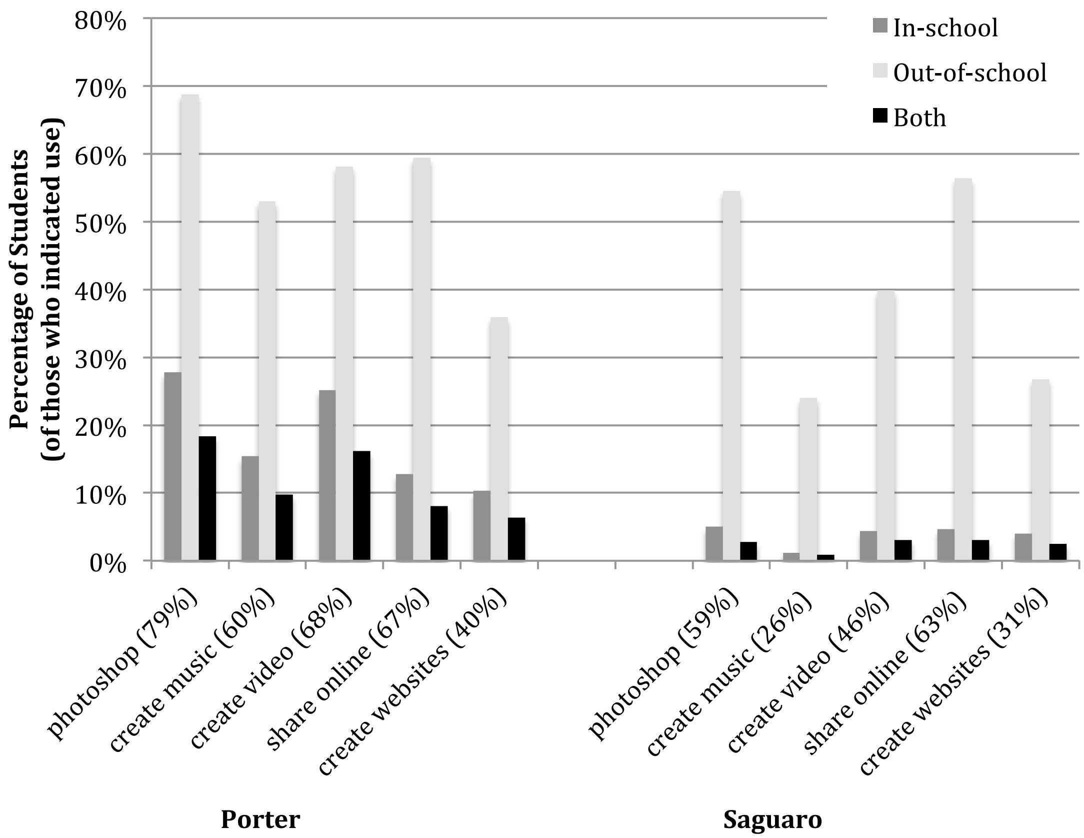
As with the previous domains, students from Porter were more likely to indicate they used the various activities within the Productivity domain and that they were more likely to use them in school and both in- and out-of-school. However, -there were no significant differences between the students' frequency of use or skill level on Productivity activities.

Creativity

Like the other domains, students were asked to answer questions regarding whether they engaged in particular activities, how frequently they did so, where they used them and rank their skill level. In the Creativity activities domain, there are five individual activities: create or change digital pictures, create or change audio, create or change video, share creations online, and create or change Websites (Figure 4).

Students at Porter (43.6%) reported using Creativity activities in-school more than students at Saguaro (12.5%), while Saguaro students reported using the tool outside of school more than Porter students (Saguaro 91%, Porter 85%). Only 8.1% of Saguaro students reported use in both locations as opposed to 30% of Porter students. While there was no association between school and out-of-school use, a very strong and significant relationship exists between school and in-school use (x^2 (1, N=555) = 68.9, p < .001, Φ = .35). Additionally, a moderately strong and significant relationship exists between school and use in both locations (x^2 (1, N=555)= 45.02, p < .001, Φ= .285). Based on odds ratios, Porter students were 5.5 times more likely to report doing these activities in school, and 4.78 times more likely to report using them both in- and out-of-school.

Figure 4: Students' Creativity technology usage, disaggregated by "In" and "Out" –of-school and "Both In and Out of School" locations, separated by school.



Since there were only five indicators for the creative activities domain, "low" users were those students who indicated participation in 0-1 activities, while "medium" users were those indicating 2-3, and "high" users were those reporting participation in 4-5 activities. Generally, Saguaro students were again less likely to report doing these activities. As was the case with Communication and Web activities, Creativity activities were more likely to be engaged in out-of-school than in school. A significant and strong relationship can be found between school and indication of participation for Creativity activities (x^2 (2, N=262) = 31.7, $p < .001$, $\Phi = 3.4$).

Based on rankings from 1 (Monthly), 2 (Weekly), 3 (Daily) or 4 (Many times/day), students indicated how often they did each particular activity. Frequency means for Saguaro students were higher (M=1.96, SD=.97, N=277) than Porter students (M=1.03, SD=.80, N=228). However only one indicator, "Create or edit digital pictures," was shown to have a strong and significant association (x^2 (4, N=417) = 50.6, $p < .001$, $\Phi = .348$).

Students ranked their skill levels for each indicator as 1=Beginner, 2=Intermediate, 3=Expert. There were no significant differences (t (503) = -7.5, p =

.069) in the students' reported skill levels at Saguaro (M=1.8, SD= .78, N=277) and Porter students (M=1.3, SD=.86, N=228).

Overall, there was little difference in skill level and frequency of use reported by the students at the two schools. However, Porter students indicated participation in more activities within the Creativity domain and were more likely to engage in the activity in school and both in- and out-of-school.

Student and teacher use of technology in school.

Sixth and seventh grade students were asked to report if their teachers used technology for instruction and if they used technology for learning. The graphs below (Figures 5 & 6) mark those that report that they and/or their teachers were using technology in the classroom either "some" or "a lot." With the exception of 6th grade Social Studies, Porter teachers and students in both grades are utilizing technology during instruction and learning more than Saguaro teachers. At both schools, teachers are using technology considerably more than students in all subjects except 7th grade Science at Saguaro where students are using technology for learning more than their teachers are using it for instruction.

For sixth grade, strong and significant relationships between school and teacher use and school and student use were found with the exception of teacher use in Science and use for both in Social Studies. For example, teachers at Porter were 14.25 times more likely to use technology for instruction than Saguaro teachers (x^2 (1, N= 177) = 33.15, $p< .001$, Φ=.325). Additionally, Porter 6th graders were 7.06 times more likely to use technology during Science than Saguaro students (x^2 (1, N= 169) = 27.48, $p <.001$, Φ= .403).

This pattern repeated for seventh grade with Porter teachers and students using technology more in the classroom than Saguaro teachers and students in all subject areas except student use of technology in Science. These differences were weak or moderate but significant for teacher and student use of Math and Writing, student use in Science, and teacher use in Reading and Social Studies. For instance, Porter 7th graders were 2.58 times more likely to use technology during Math than Saguaro students (x^2 (1, N=319) = 8.30, $p = .004$, Φ= .161). Porter teachers were 3.64 times more likely to use technology for instruction in Social Studies (x^2 (1, N= 339) = 15.221, $p < .001$, Φ= .212).

Figure 5: 6th grade students' report of technology use in class by themselves and their teachers disaggregated by school.

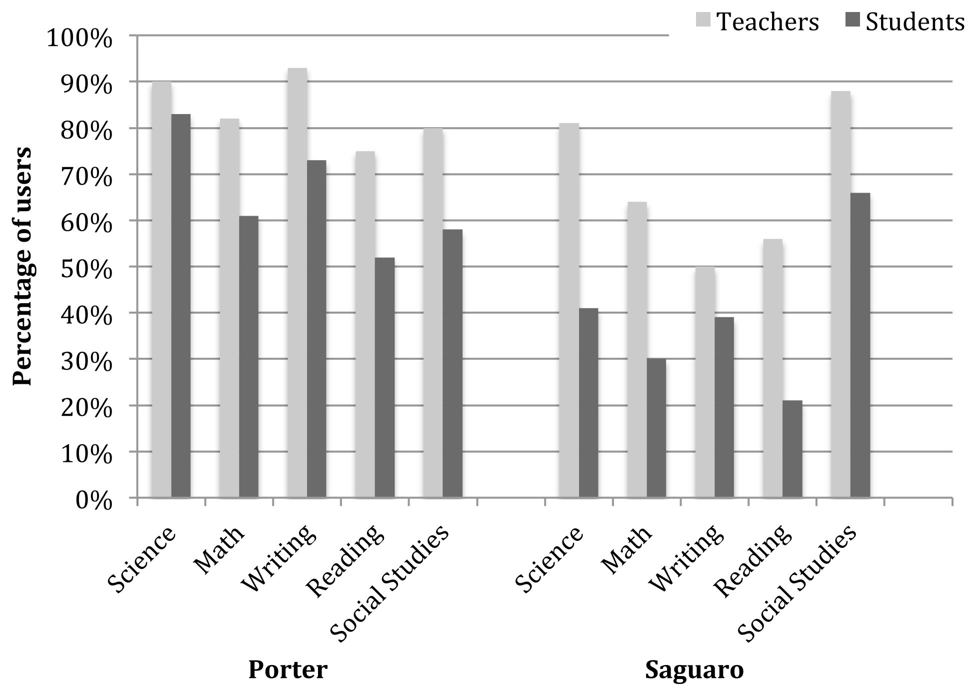
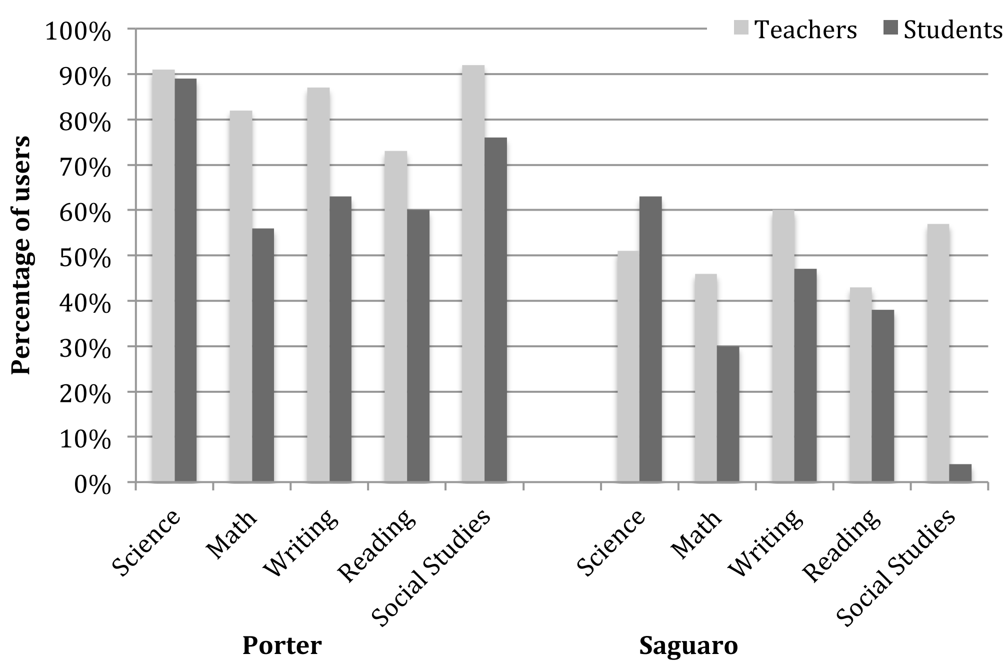


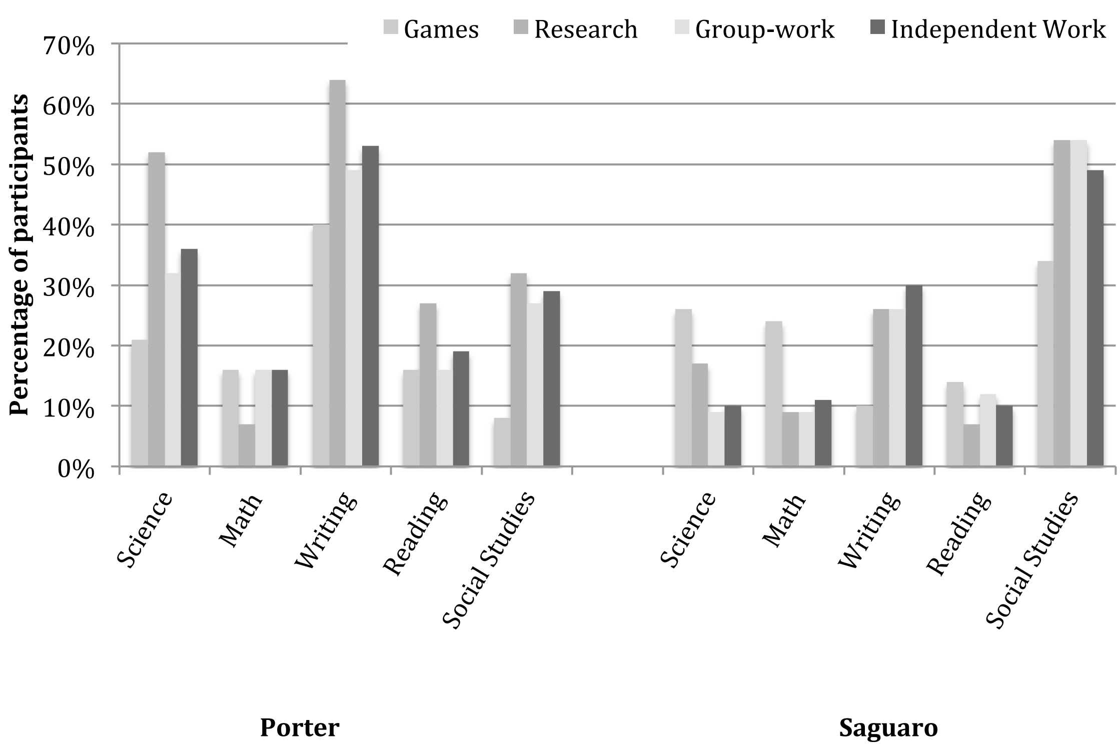
Figure 6: 7th grade students' report of technology use in class by themselves and their teachers disaggregated by school.



Types of activities involving technology.

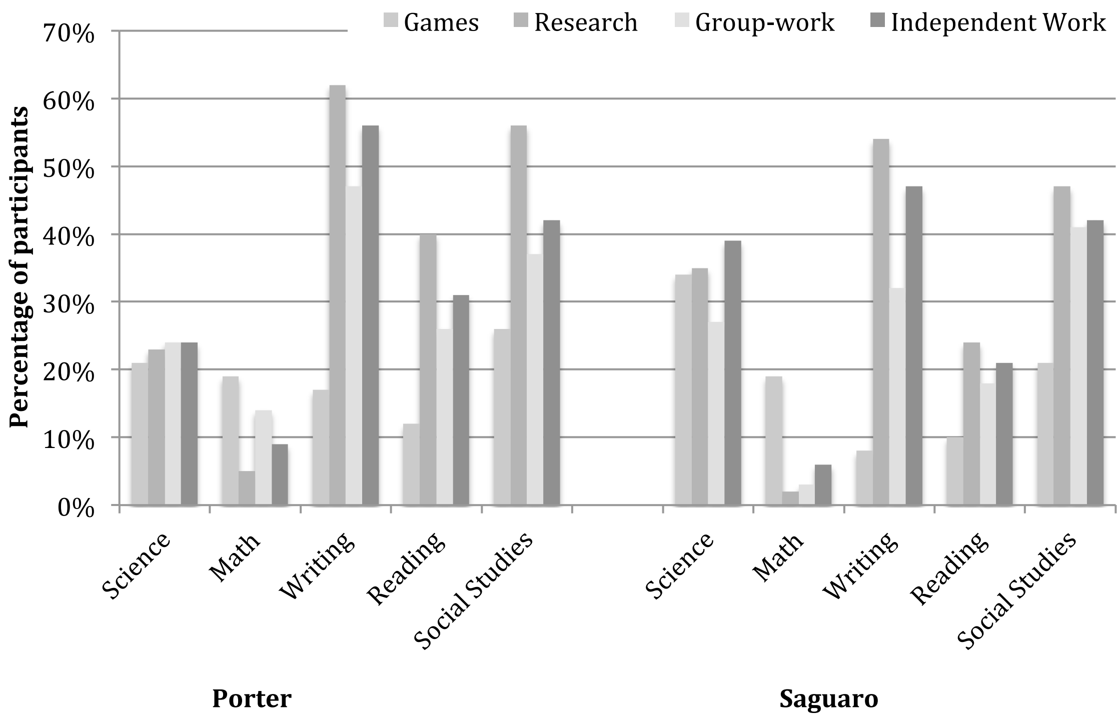
Students in both grades at both schools were asked to what degree they engaged in technology assisted games, research, group work and independent work. With the exception of social studies, 6th graders at Porter are doing more research and group and independent projects using technology across all subject areas (Figure 7). These findings are strong to very strong in significance. For example, 64% of Porter students use the Internet for research compared to 26.4% of Saguaro's students (x^2 (1, N=177) = 24.887, $p < .001$, Φ= .371). On the other hand, Saguaro students in social studies are far more likely to engage in any of these purposes over Porter students. This finding is moderate to strong in all four uses. For example, while Saguaro students are more 5.89 times more likely to engage in technology-assisted games in Social Studies (x^2 (1, N=177) = 17.017, $p < .001$, Φ = .295), they are also 3.22 times more likely to engage in technology-assisted group work (x^2 (1, N=177) = 13.797, $p< .001$, Φ= .265).

Figure 7: 6th grade types of technology-assisted uses disaggregated by school.



A similar pattern emerged at 7th grade Science. Saguaro students were more likely to engage in technology related games, research, group and independent work in Science than Porter students (Figure 8). Porter 7th graders were likely to engage in technology-related games, research, group and independent work in Math, Writing, and Reading and games and research in Social Studies. The findings in this grade level were weak to moderate. For example, Porter students were 1.91 times more likely to engage in technology-assisted group work in writing than Saguaro students (x^2 (1, N=353) = 8.446, p = .004, Φ= .155). Meanwhile, Saguaro students were 1.81 times more likely to engage in technology-assisted research than Porter students in Science (x^2 (1, N= 353) = 6.103, p = .103, Φ= .132)

Figure 8: 7th grade types of technology-assisted uses disaggregated by school.



Factors associated with increased participation in technology activities both in- and out-of-school.

We looked for relationships between factors use of activities in-school and out-of- school. Factors considered were gender, grade, ownership of home a computer and school location.

Gender

With the exception of Creativity activities use in-school and out-of-school and Productivity activities use out-of-school, there were no significant relationships found between gender and location of use. For Productivity activities (outside-of-school) there was a very weak significance (x^2 (1, N=554) = 5.46, p = .019, Φ = .099) with girls engaging in these activities more often. For Creativity activities (in-school), a very weak significance for boys' higher participation rates was found (x^2 (1, N=554) = 7.09, p = .008, Φ = .113), while another very weak significance was found for Creativity activities out-of-school use, with girls doing these activities more in that setting than boys (x^2 (1, N=554) = 9.63, p = .002, Φ = .132).

Grade

Only Creativity activities participation had a relationship (significant, but weak) between grade level and location in-school (x^2 (2, N=552) = 10.8, p = .005, Φ = .14) with 7th graders engaging in Creativity activities more in school. All other associations were insignificant.

Computer Ownership

Eighty-three percent of Saguaro students have computers at home, while 95% of Porter students do. The ownership of a home computer had the second most number of significant relationships. There was a significant but weak relationship between ownership of a home computer and use of Communications activities in-school (x^2 (2, N=545) = 16.56, p < .001, Φ = .174). Additionally, there was a very weak but significant relationship between computer ownership and participation in Communications activities out-of-school (x^2 (2, N=545) = 12.05, p = .002, Φ = .15). A significant but very weak association was also found between computer ownership and Productivity activities done out-of-school (x^2 (2, N=545) = 7.61, p = .022, Φ = .118); computer ownership and Creativity activities done in-school (x^2 (2, N=545) = 5.01, p = .082, Φ = .096); and computer ownership and Creativity activities done out-of-school (x^2 (2, N=545) = 8.57, p = .014, Φ = .125). Students who owned computers were more likely to engage in Productivity activities outside of school and participate in Creativity activities both in and out of school.

School

In all domains, school location was significant for use of activities in-school, but not significant or had only weak associations for use of activities out-of-school. For each category Porter students were more likely to engage in these activities in school. For Communications activities in-school the association was moderately strong and significant (x^2 (1, N=555) = 47.1, p < .001, Φ = .291), while for out-of-school the association was significant, but weak ((x^2 (1, N=545) = 6.59, p = .011, Φ = .107). For Web activities in-school a strong and significant relationship was found (x^2 (1, N=555) = 47.716, p < .001, Φ= .293), but no relationship was found for school and out-of-school activities in the Web domain. For Productivity activities in-school the association was significant and moderate ((x^2 (1, N=545) = 32.07, p < .001, Φ = .24); however, for out-of-school use the relationship was very weak, but significant ((x^2 (1, N=545) = 4.4, p = .036, Φ = .09). Finally, there was a very strong relationship between school location and the participation in Creativity activities in-school ((x^2 (2, N=545) = 68.8, p < .001, Φ = .35), with no association for out-of-school Creativity activities and school.

Overall, the greatest associations seemed to be between school and location of use with Porter students more likely to engage in technology activities in-school. Some association was also found between computer ownership and location of use and "gender" and location of use. The factor with the least number of associations was "grade."

Teachers

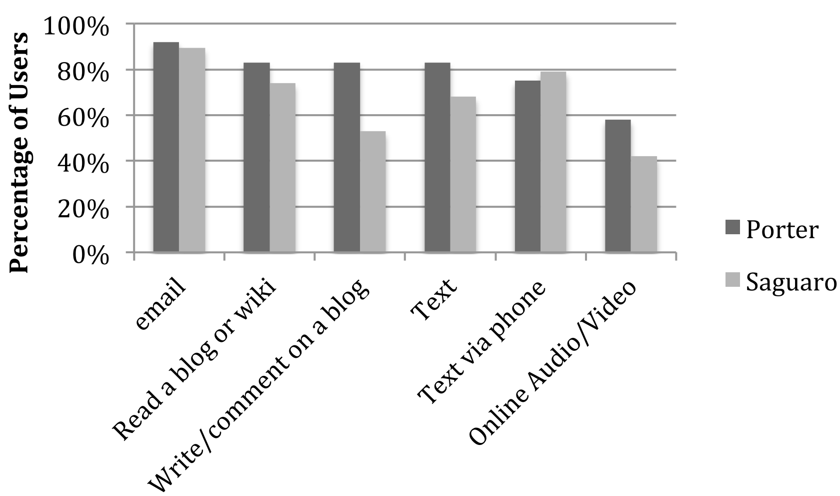
Difference in teachers' use of technology in- and out-of-school.

We answer this question using the same four categories as students: Communication, Web, Productivity and Creativity. Like the students, teachers were identified as "low", "medium" and "high" users in each domain. We also ask about frequency and skill level. Correlations were run to look for potential relationships between school and engagement in activities and school and frequency of use. The test for relationship was conducted by examining the Pearson's r coefficient. These correlations could not be run for skill level, as the two teacher groups answered these questions on different scales. Additionally, we asked teachers to identify their purpose of use on a scale of 1-5, from more personal to more professional.

Communication

With the exception of texting via phone, higher percentages of Porter teachers report doing the remainder of the Communications activities more than Saguaro teachers (Figure 9), however there was no correlation found between school and participation. There was also no relationship found between frequency of use and school, although the frequency mean was higher for Porter teachers (Figure 13). All teachers reported moderate skill levels and engaged in these activities more personally than professionally.

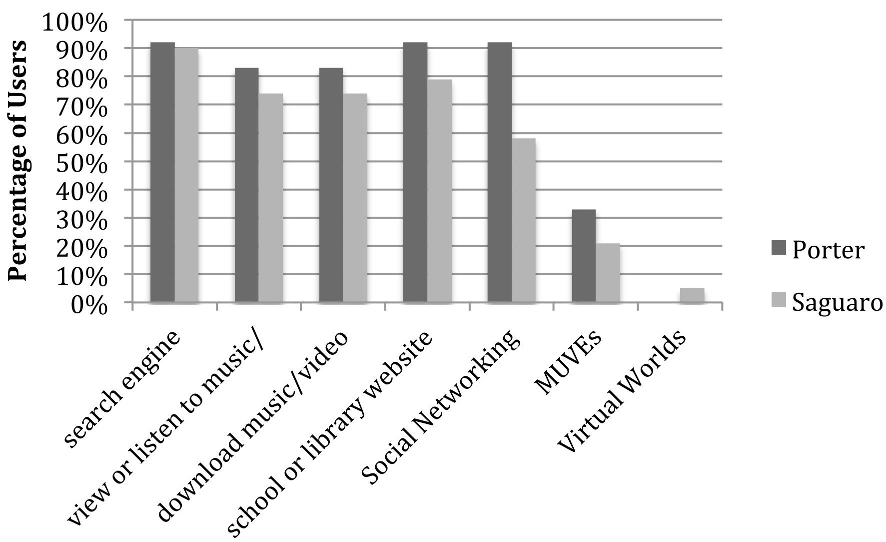
Figure 9: Breakdown of Communication activity use by school.



Web

Looking at percentages, Saguaro teachers reported less participation in Web activities than Porter teachers (Figure 10). Across each indicator in the Web domain, Porter teachers were more likely to report participation with the exception of Virtual Worlds. Again however, there was no relationship found between school and participation in these activities. One teacher between both schools indicated they used Virtual Worlds. Despite the fact that the frequency mean for Porter teachers was higher than Saguaro teachers (Figure 13), no correlation was found between school and frequency of use and both groups had moderate skill level means. Additionally, all teachers engaged in these activities more personally than professionally.

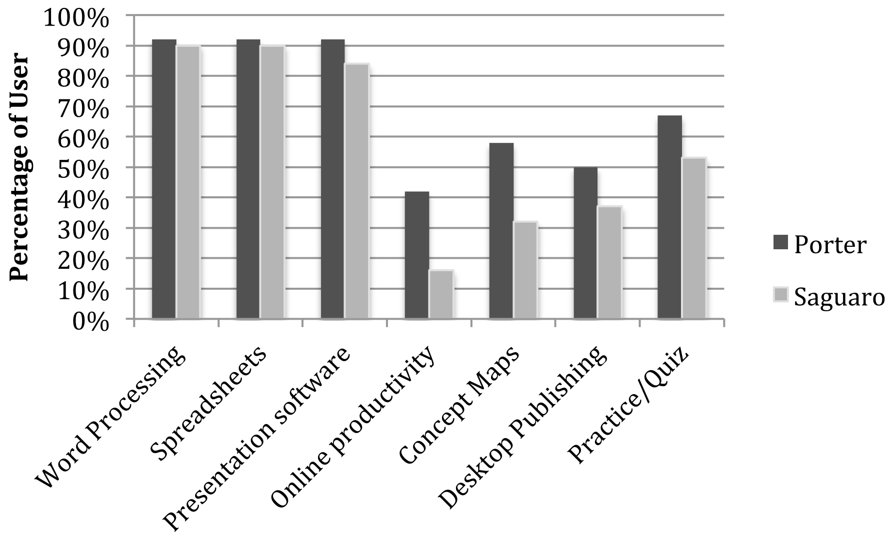
Figure 10: Breakdown of Web activity use by school.



Productivity

Porter and Saguaro teachers engage in the most common indicators for this domain, word processing, spreadsheets and presentation software about equally (Figure 11). While no association between school and participation was found, more Porter teachers do the remaining activities than Saguaro teachers. A significant and moderate correlation was found between school and frequency of use of these activities (r (28) = .536, $p < .001$), showing that Saguaro teachers do these activities more often than Porter teachers, unlike activities in the other domains. Skill level for all teachers was moderate, and teachers tended to engage in these activities more professionally than personally.

Figure 11: Breakdown of Productivity activity use by school.



Creativity

No correlation was found between school and participation in Creativity activities. However, more Porter teachers reported engagement in Creativity activities across the domain than Saguaro teachers (Figure 12). Creating and editing pictures was a favorite of teachers at both schools. However, Porter teachers were more likely to share their creations online. Again, skill level means for both schools were moderate. Although frequency means were higher for Porter (Figure 13), no correlation was found between school and the frequency of Creativity activities engagement. Teachers engaged in these activities more personally than professionally.

Figure 12: Breakdown of Creativity activity use by school.

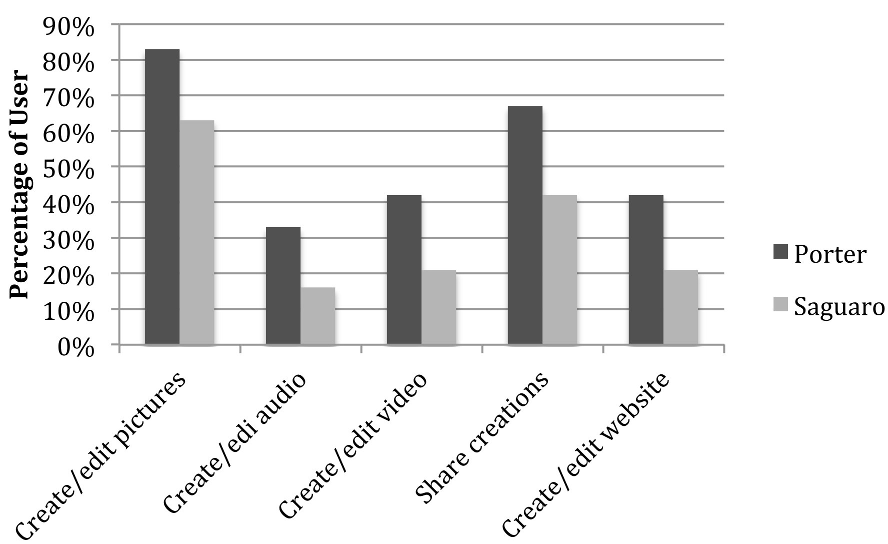
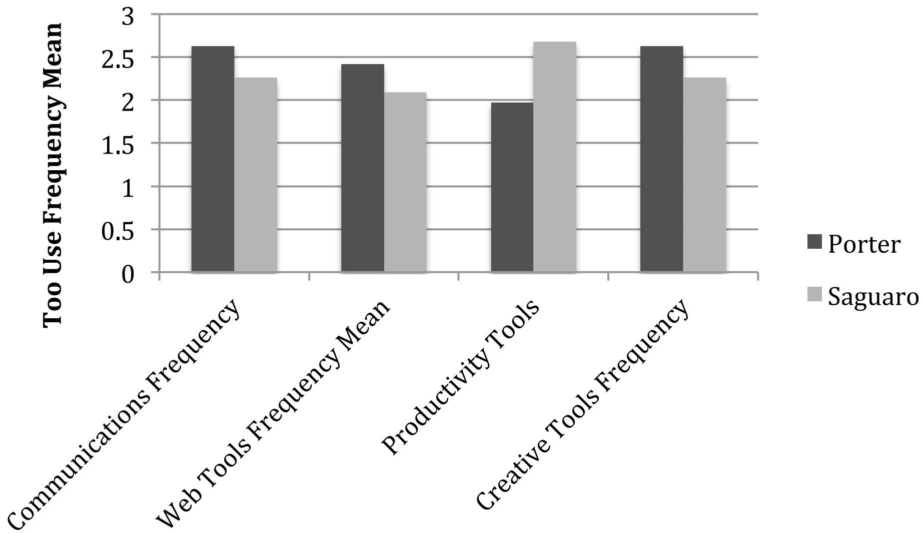


Figure 13: Frequency means for each domain disaggregated by school.



Generally, there is not a large discrepancy between Porter and Saguaro teachers in terms of what types of technologies they use, how often they use them or their reported skill level. All teachers at both schools tend to engage in these activities more personally than professionally with the exception of Productivity activities.

Differences in professional development opportunities and participation.

No relationship could be found between school and awareness of professional development opportunities or between school and participation in professional development. In both schools, teachers were aware of various professional development opportunities (Figure 14). Although being aware doesn't mean they took advantage of those opportunities (Figure 15). Figure 14 shows that Saguaro teachers were more aware of opportunities for outside district workshops, in district workshops, mentor/colleague relationships, district courses, group or 1:1 training and release time for individual professional development. In the cases of workshops run outside of the district and for group or 1:1 tech training, either the Saguaro teachers were that much more aware of opportunities that existed for them, or the school offered more trainings of this nature. On the other hand, Porter teachers were more aware of opportunities such as district supported college work, conferences, online PD, release time for grade-level planning and independent college work. Most professional development for both campuses was more focused on technology skill development than content-specific application.

Figure 14: Awareness of Professional Development Opportunities

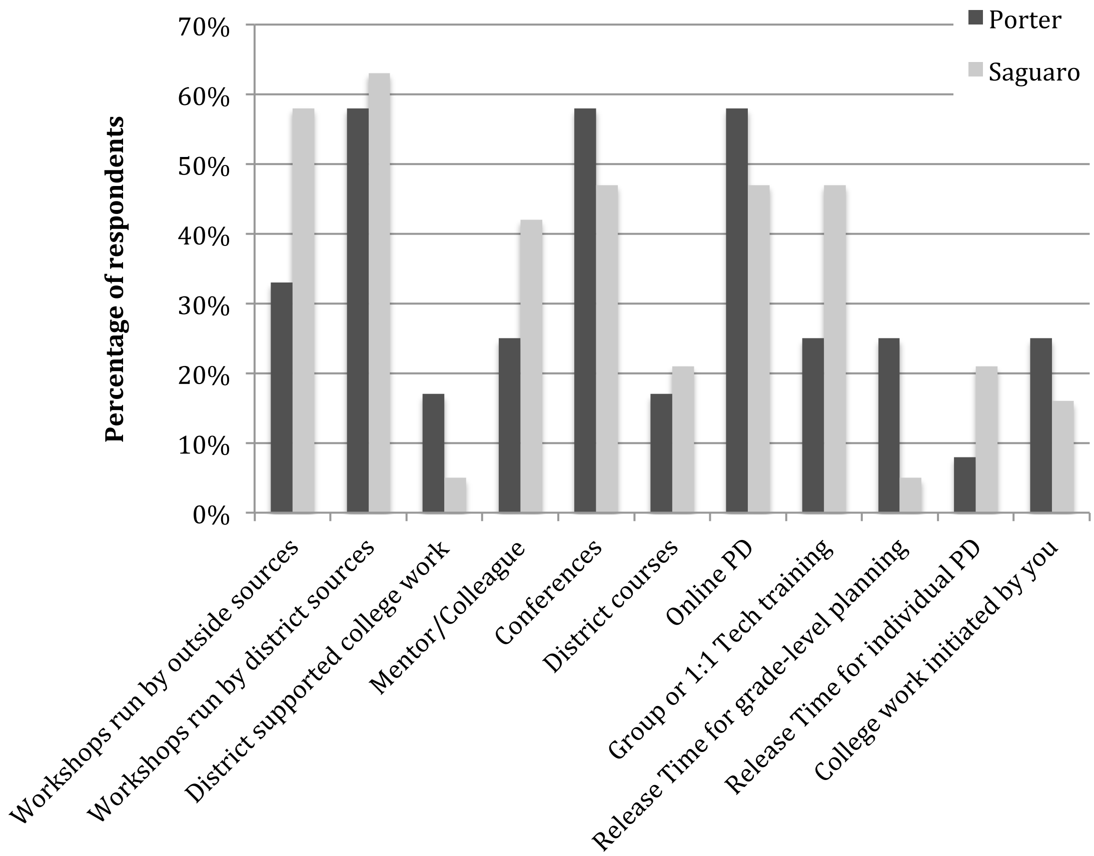
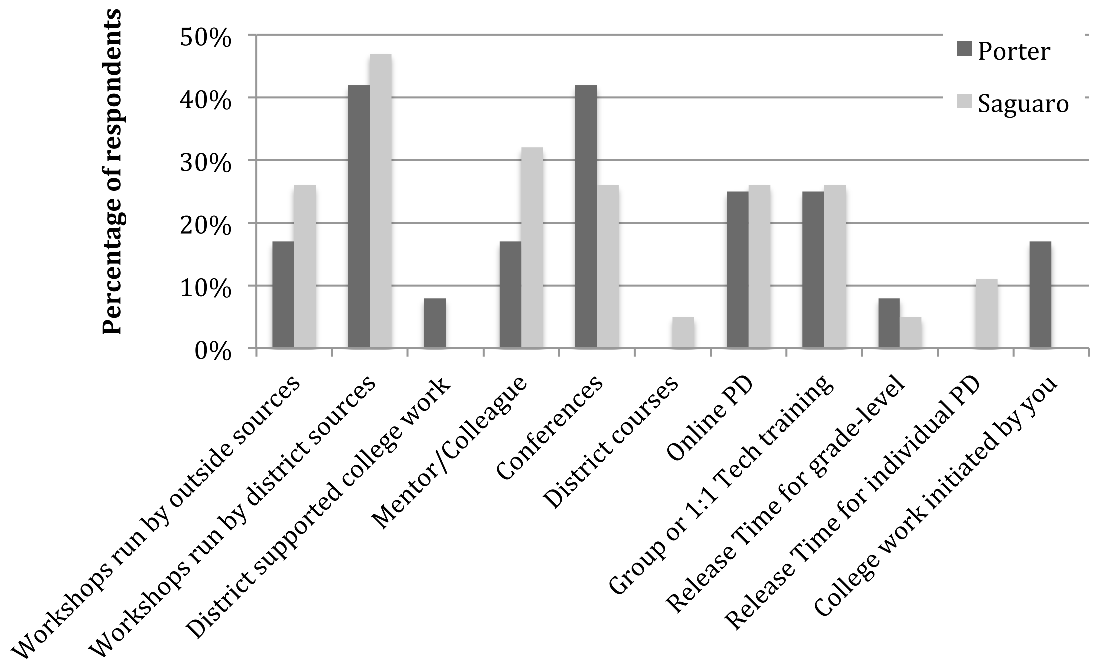


Figure 15: Teacher participation in Professional Development by school



Differences in teachers' self-efficacy, attitudes toward learning technologies, and constructivist beliefs.

Additional sets of questions were asked of teacher respondents to determine their digital self-efficacy mean, their learning technologies attitude mean, and the their teaching philosophies mean.

A higher level of self-efficacy corresponds to more advanced and efficient computer use with lower levels of stress. Teachers at both campuses were given 17 statements relating to use of digital technologies and was asked to agree/disagree with that statement on a 4 point Likert scale (1, strongly disagree to 4, strongly agree). Porter teachers' means were higher in digital self-efficacy (M=3.14, SD= .53, N=10) than Saguaro teachers (M=2.96, SD= .46, N=17). This difference was not significant, however.

Additionally, teachers were asked to agree/disagree with twelve statements regarding their attitudes towards technology integration on the same scale. Overall, Saguaro teachers' means in this line of questioning was slightly higher than Porter's (Porter, M=3.17, SD= .33, N=11; Saguaro, M=3.46, SD= .36, N=18). Again, this difference was not significant.

Finally, teachers were asked about their general teaching philosophies on a scale of 1-4. A lower score indicates a more directive teaching philosophy, while a higher score shows a more constructivist teaching philosophy. Although not significantly different, Porters' teachers averaged a slightly more constructivist teaching philosophy mean than Saguaro's teachers (Porter, M=2.05, SD= .36, N=10; Saguaro, M=1.9, SD= .39, N=14).

Leaders

In addition to campus and district administration, school curriculum specialist, content heads and librarians were interviewed as "leaders" in our study. At Saguaro, nine leaders completed surveys, while four leaders completed the survey at Porter. Descriptive information regarding their responses follows. Due to the low number of respondents to the leader survey, no statistical comparisons were made in this portion of the data.

Differences in leaders' opinions.

Approximately 70% of Saguaro's leaders (N=9) were aware of a district technology vision, while 75% of Porter's leaders (N=4) were aware of a vision for technology (Table 3).

Table 3: Breakdown of Leader reported importance in district technology plan by school.

Level of importance in your district/school's technology vision	Porter Mean (N=4)	Saguaro Mean (N=9)
Using technology to improve classroom instruction	3.5	4.0
Using technology to improve student performance	2.75	4.0
Student proficiency in learning and collaboration	3.5	4.0
Increasing teacher proficiency in using technology	3.5	4.0
Preparing students for future jobs	3.25	4.0
Improving student test scores	3.25	3.83
Promoting active learning strategies	3.5	4.0
Supporting instructional reform	2.75	4.0
Satisfying parents' and community interests	3.5	3.83
Improving student computer skills and abilities	3.0	3.83
Improving student proficiency in research	3.0	4.0
Improving student proficiency in data analysis	2.5	3.5
Improving teacher Productivity and efficiency	3.0	4.0
Increasing target level of technology	2.75	3.83
Collecting data for administrative decision making	3.5	3.5
Managing school operations	3.5	3.5
Improving Communication among faculty and staff	2.75	4.0
Improving management of student report cards/reports	3.0	3.83

Note: Reported on a scale of 1-4 from not important (1) to very important (4).

Differences in leaders' knowledge.

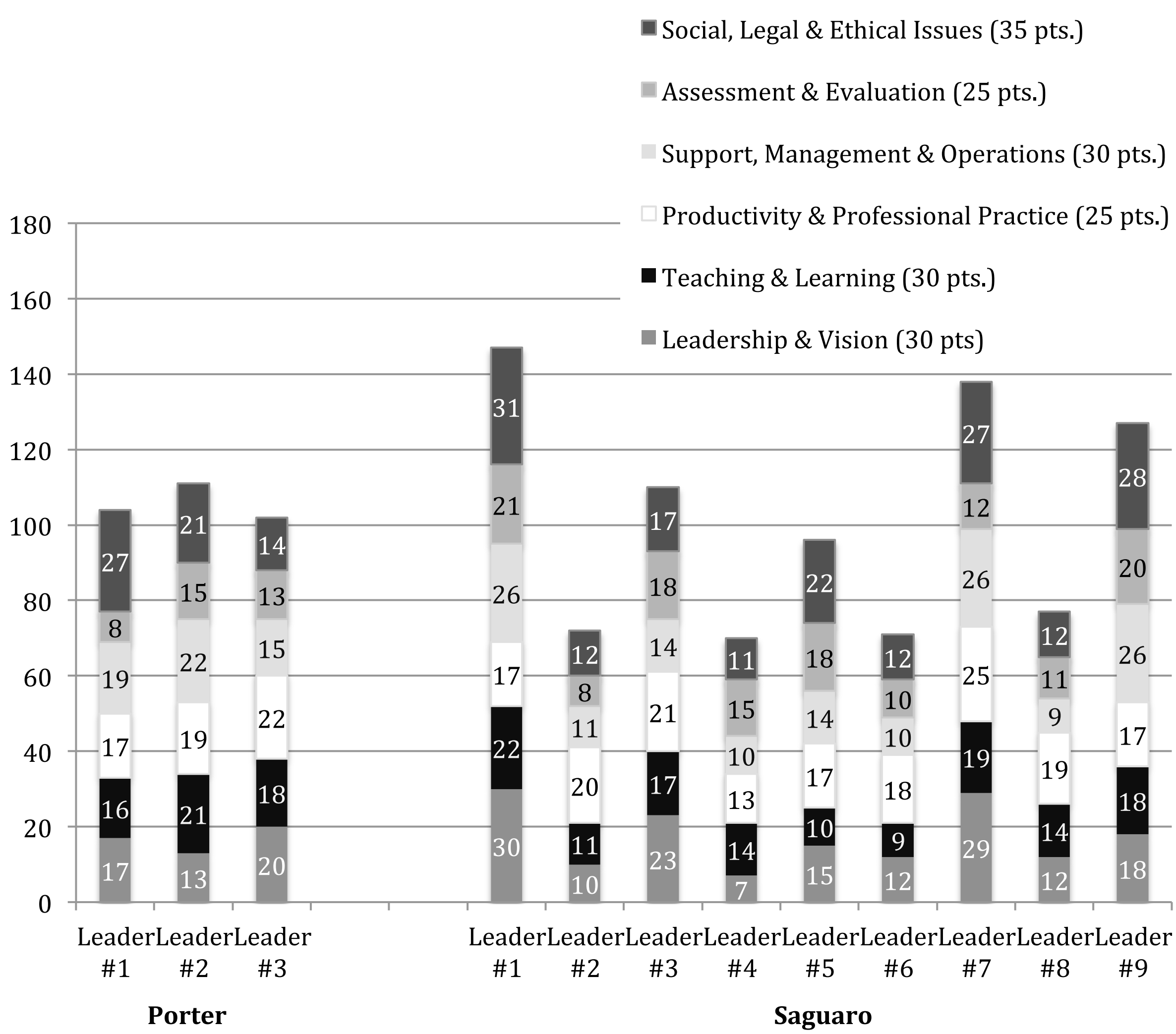
In 2002, the International Society for Technology in Education (ISTE) created the NETS-A standards for administrators, which complimented the NETS-S (Students) and NETS-T (Teacher) standards. These NETS-A standards are specifically designed to provide administrators and leaders with guidelines for effective technology leadership. The purpose of these norms is to impart awareness and responsibility to administrators and others as leaders in the effective use of technology.

An externally validated technology leadership assessment (McLeod & Hughes, 2004) calculates a total score (maximum of 175) and sub-scores that align with the NETS-A. Leaders were asked to rank, on a scale of 1-5 the extent to which they performed various activities across six domains with 1= "Not at all" and 5 = "Fully." In Social, Legal and Ethical Issues a total of 35 points was possible. In

Assessment and Evaluation a total of 25 points was possible, while in Support, Management and Operation a total of 30 points could be obtained. There was a total of 25 points possible in the Productivity and Professional Practice domain. Finally, the last two domains, Learning and Teaching and Leadership and Vision, each had the potential for 30 points.

Saguaro leaders (M=5.38, SD= .518, N=8) had on average more years of experience in education than Porter leaders (M=4.0, SD 1.7, N=3). All leaders at both schools had 5-6 years of total experience, with the exception of one leader reporting 2 years experience at Porter. As can be expected, no correlation was found between the number of years experience and their NETS-A score. Figure 16 shows the scores for each leader in each school with category section totals. The average total score for Porter was 105.67, while the mean for Saguaro leaders was 100.88.

Figure 16: School Leadership NETS-A Profile

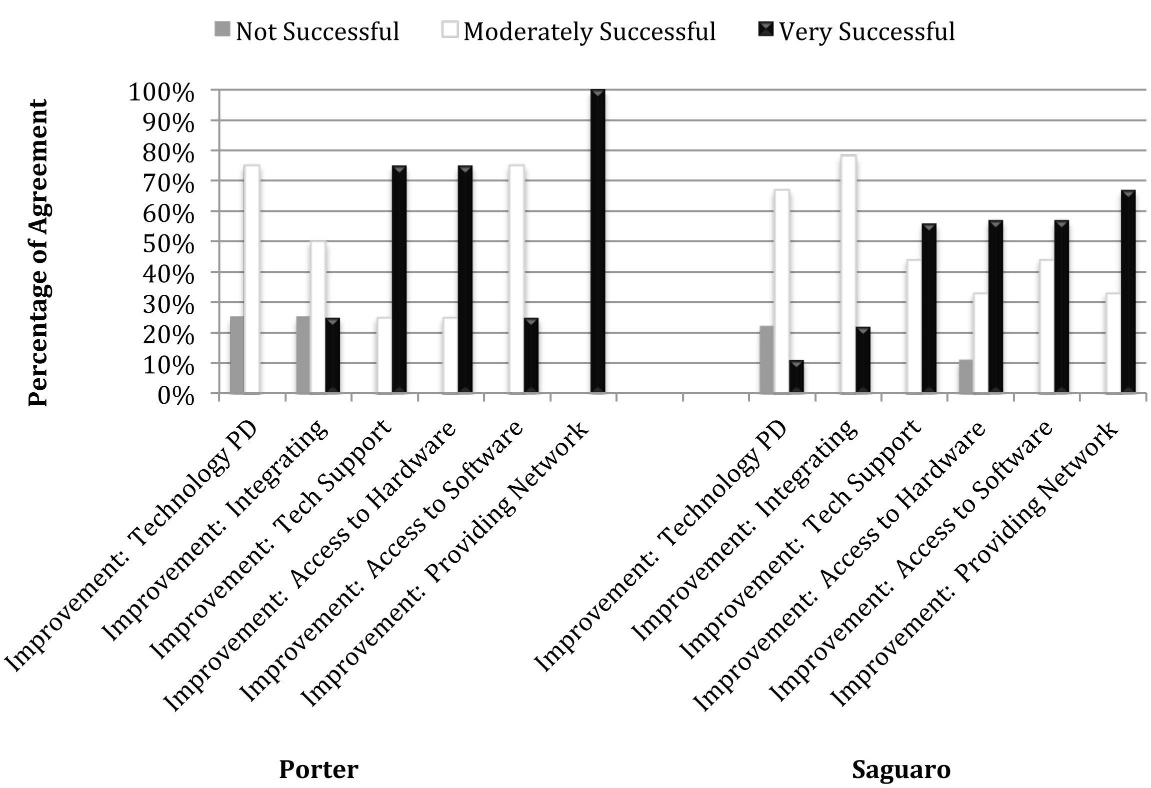


Differences in leader assessed technology integration success.

We asked the leaders who they would contact for advice related to technology and a variety of answers were given. Saguaro leaders would turn to the Director of Technology (reported=4), technology integration specialist (reported=3), technology applications teacher (reported=2), and the school librarian (reported=2). At Porter, leaders would consult the instructional technology facilitator (reported=3), the librarian (reported=1), and the Director of Instructional Technology (reported=1). All of these roles most likely to be consulted are formal technology/media roles, with varying technological responsibilities tied to their position.

In regards to professional development, leaders at Saguaro and Porter both report 100% "moderate to wide flexibility" in planning professional development. The following graph (Figure 17) compares leader ranking related to improvements in technology professional development (PD), integration of technology, technology support, access to hardware and software and provision of network services. Porter leaders generally felt they'd achieved improvement in these categories "very successfully" more so than Saguaro leaders with the notable exception of Technology related PD. Despite the "moderate to wide" flexibility reported from both Porter and Saguaro, both campuses' leaders felt that they were not successful to only moderately successful.

Figure 17: Leader ranking of improvement in various categories.



Discussion

Today, 100% of the schools in the United States have computers and Internet access (Gray, Thomas & Lewis, 2010; US Dept. of Commerce, 2008). According to the Kaiser Family Foundation survey report (Rideout et al., 2010), 84% of 8-18 year olds they surveyed reported having Internet access at home with 33% having Internet access from their own bedrooms. Fifty-nine percent reported that their Internet was high-speed. This leaves some 2/3 of students with less than total access to varying degrees. This does not vary greatly from a Pew Report (Smith, 2010), which states that 66% of American adults currently use high-speed Internet connections at home, while another 5% use dial-up. It would stand to reason that the digital divide as previously described has diminished. Yet, research shows that inequity still exists between groups. Three groups with high disparities are those from varying socio-economic and ethnic backgrounds and degrees of educational attainment.

As noted above, DiMaggio and Hargittai (2001; 2004) identify five dimensions of inequality still present among American families. These dimensions include differences in equipment, autonomy of use, skill, social support and the purpose for use. DiMaggio and Hargittai (2001; 2004) show that inequality in Internet use exists across several factors including ethnicity, gender, parental or self-education levels, age and income.

In terms of ownership and access, Jansen (2010) finds that those families earning >$75,000/year are more likely to own desktop computers (79%) as compared to those making less (55%). Additionally, differences in likelihood of ownership exist with other types of equipment as well including: laptops (79%, 47%); iPods or other mp3 players (70%, 42%); game consoles (54%, 41%); e-book readers (12%, 3%); iPads or other tablet computers (9%, 3%). He also found that 87% of those same families had Broadband Internet connection at home, while only 40% of those making <$30,000 have high-speed Internet. When Jansen controlled for other possible factors to slower Internet adoption such as race, ethnicity, gender, age, educational attainment and community type, the socio-economic element continued to be the greatest predictive factor.

Another Pew Report (Smith, 2010) finds that 56% of African-American and 66% of Hispanic (English-Speaking) families had Broadband Internet. Rideout et al., (2010) reports that children's access to computers in the home is approximately the same across race (White, 94%; African-American, 89%; Hispanic, 92%) but that access to Internet is still less than equal (White, 88%; Black, 78%; Hispanic, 74%).

Although Jansen did not find educational attainment to be a large factor, Rideout et al., (2010) finds that only 74% of students whose parents have a high school (or less) education have Internet access, while 91% of students whose parents have college degrees have Internet access. Finally, the range is 49% (high school or less) to 65% (college degreed) for high-speed Internet access.

In addition to what equipment is owned, quality of equipment is also an important consideration. For example, students who use late model computers with low amounts of RAM and hard drive space and antiquated browsers are at a disadvantage when it comes to viewing sites that rely on higher bandwidth to display java, graphics and streaming video.

As indicated, availability of equipment is an important factor. Jansen (2010) finds that adult internet users (86%) in higher-income households are more likely to go online daily and even several times a day from both work and home compared to 54% from the lowest income brackets. Autonomy of use refers to the user's ability to use the computer when they want to for what they want.

With little time to explore and learn, the user with limited access undoubtedly has developed little in the way of skills from the basic such as navigation to high-end skills such as critical thinking and evaluation of information received or skills needed for contributing to the wealth of knowledge available on the Internet through Web 2.0 activities. Experience is needed for the development of these skills.

Like experience, the option of purpose is directly tied to Internet competence. DiMaggio and Hargittai (2001; 2004) posit that Internet competence is related to the overall satisfaction users gain from their online experiences, their levels of frustration and success, and thus their desire to continue their Internet use in turn gaining additional experience.

Social support is the final dimension of inequality. Some users have family, friends and mentors who support and interact with their online endeavors and provide feedback for any content created and shared on the Web, while others are surrounded by people who use the Internet very little and/or do not understand or appreciate the culture surrounding the Internet. Users need technical support both locally and globally. At school, teachers and instructional support staff serve as social support for students.

To summarize, it isn't just about having access to the Internet, but also about how the Internet is used in terms of frequency, purpose, autonomy and quality of experiences. Choice in Internet use varies by these factors as well. In surveying college freshman, Hargittai (2008) finds even decisions such as which social network to use is impacted by these factors. For example, Hispanics in this age group preferred MySpace, while Whites preferred Facebook and Asians preferred Xanga and Friendster. African-Americans appeared to have no preference. She also found that students living at home were less likely to use any social network.

Inequity exists in schools too (Gorski, 2007). Student to instructional computer (both in the classroom and other locations, such as computer labs) ratios vary by school demographics. For example, in schools with >50% students of color the student to instructional computer ratio was 3.2:1, while in schools with <6% students of color enrollment, the ratio is 2.6:1. This parallels what we found at these two schools. According to Gray et al., (2010), this pattern of access continues across other types of hardware as well. For example, 53% of schools with <35% economically disadvantaged students reported having document cameras, while 46% of schools with >75% economically disadvantaged students reported having document cameras (Gray et al., 2010). Teachers from schools with more affluent students tended to use applications with students such as word processing, spreadsheets, presentation software and the Internet (Gray et al., 2010). Teachers from schools with less affluent students tended to use other applications such as software for administering tests, drill/practice software, social-networking sites, and subject-specific programs more. Internet use seemed consistent at 17 percent reporting using it sometimes/often across demographics with 22% reporting they rarely used it. The biggest variance of Internet use was in "sometimes/often" respondents from the city (17%) and rural (13%) areas. Teachers from schools with more affluent students reported that their students prepared written text on the computer, created or used graphics or visual displays, conducted research, corresponded with others, contributed to blogs/wikis slightly, developed and presented multimedia presentations, created art, music, movies or Webcasts, and used technology to design and produce a product more than teachers with less affluent students. Teachers from schools with 75% or more free or reduced lunch reported higher incidents of use in learning or practicing basic skills on the computer, the student use of social networking, using the computer to solve problems or perform calculations, and using the computer to conduct experiments.

Students who can are spending a great deal of time online for a variety of purposes. This variation in purpose is important for reduced digital inequality (DiMaggio & Hargittai, 2001; 2004). The acts that they are engaging in are likely a part of what Henry Jenkins (2006) refers to as the "participatory culture." In this culture, participants do the things described above—they create photos, audio and videos, games, stories and Websites. They contribute to blogs, wikis and fan-fiction. They post and share those creations on sites such as YouTube, fanfiction.com, Blogger, Wikipedia, and Flickr. They are certainly communicating with others, both local and global, by joining social networking sites like Facebook and Twitter, instant messaging through Facebook's built-in IM tool, Gmail or AOL, email, and commenting on each other's creations. Students who participate are encouraged to create and share, working collaboratively with others to add to the body of information and knowledge that is the Web. Students engaged in the participatory culture are developing skills in play, performance, simulation, appropriation, distributed cognition, multi-tasking, collective intelligence, judgment, transmedia navigation, networking and negotiation (Jenkins, 2006). These "new literacies" build social skill through networking and collaboration and are an extension to the traditional literacy skills of reading and writing, research and technical skills and critical analysis. The "participatory culture shifts the focus of literacy from one of individual expression to community involvement (Jenkins, 2006)."

Students who cannot are in the "participation gap" (Jenkins, 2006). Hargittai and Walejko (2008) studied what they referred to as the "participation divide" in first-year college undergraduates. Despite more opportunities for creating/sharing online, many are still not engaging. Using parental education as an indicator of socio-economic status, these authors find that those from lower-income families participate considerably less. They also find that men share online more than women when they are technologically more skilled.

Both Porter and Saguaro students are doing more, technologically speaking, outside of school rather than in school. Porter students are receiving somewhat more technology-rich experiences in school than Saguaro, suggesting the existence of digital inequality. The causes for this inequality are not explained by teachers' opportunities for professional development, their general attitudes towards learning with technology, their digital self-efficacy in terms of using technology in the classroom or their teaching philosophies. Both sets of teachers have philosophies more aligned with directive teaching than constructivist teaching. Neither are the causes for this inequality explained by differences in leadership knowledge and attitudes. A possible explanation is found in examining available resources at both schools. Whereas Saguaro teachers and students have access to only one lab, 2 laptop carts and 8 individual library computers, Porter teachers and students have access to four labs, 2 laptops carts and 18 individual library computers. Additionally, the Saguaro campus must share an instructional technology specialist with other campuses across the district, while Porter has their own devoted on-campus specialist. Both schools serve approximately 1000 students.

Technology integration is not truly happening at either school. Like students, teachers at both campuses are using technologies outside of school and are mostly reporting moderate to high skill levels. They are engaging in these activities more personally than professionally, however. Generally, students of teachers who are using these technologies instructionally are not getting their hands on the technology as often themselves to aid in learning. This may be due in part to the more directive, rather than constructivist, teaching philosophies held by teachers at both schools. Additional, unexplored factors exist. Peck, Cuban and Kirkpatrick (2002) suggests that technology integration is unsuccessful not due to low skill, but rather because of school structure, time constraints, competing educational priorities and defects in the technologies (pg. 11).

With very little time for group opportunities for collaboration related to technology at either school, technology integration as an innovation cannot develop. Fullan (2007) writes of the necessity to change the current state of teacher-isolated operating environments. With limited release time, teachers at both schools are often forced to learn new technologies and means of integrating it on their own. Further, educational priorities and accountability force teachers to focus more on strategies for improved testing scores. This complete fixation with standard-based teaching and assessment hinders the flexibility of teachers to integrate technology (Peck et al., 2002). Rather, the classroom discourse is typically crafted around specific standardized assessments; thus, creating classrooms of traditional skill and practice rather than a socio-constructivist, technology-facilitated environment.

With today's economic landscape, more and more jobs are being outsourced to other countries (McLeod, 2010). What is left here in the states requires a skill set more aligned with those described by Jenkins (2006) as a part of the new media literacies. Hargittai (2008) describes future job-skill sets as needing the ability to synthesize and analyze various types of information quickly and efficiently. Jenkins (2006) calls for the purposeful instruction of the new literacies in order to provide all students with equitable experiences and opportunities for creation and sharing and to provide students with skills that are not easily self-taught such as judgment and evaluation of quality material available on the Web, and ethical understandings of what is appropriate and inappropriate in terms of online actions and behavior.

Jenkins (2006) states, “Educators must work together to ensure that every American young person has access to the skills and experiences needed to become a full participant, can articulate how media shapes perceptions, and has been socialized into the emerging ethical standards that should shape their practices as media makers and participants in online communities.” Equitable and significant opportunities for technology experiences in all schools are needed. Schools should be a leveling field for teaching *all* students these skills and practices.

Scholarly Significance

By focusing on each school one at a time, our research team is able to construct a deeper understanding about what is occurring, technological speaking, in the lives of students and their teachers both inside and outside of school. We are able to discover common uses of technology that students and teachers utilize in both worlds. Additionally, we are able to examine the support of content-based technology integration and explore how and why technology experiences vary.

We discover these realities by working with students, as well as their teachers and technology leaders. By doing so, we captured each groups’ appreciation for newer digital technologies and their perspectives on skills needed to succeed in the 21st century. At Porter MS, like Saguaro MS, we find that students’ and teachers’ out-of-school skills move beyond word-processing and Internet surfing to create music, videos and Webpages that can be shared with others. Thus their skills for problem solving and critical thinking via digital activities is also expanding, but primarily outside of the school setting. Exploiting these skills educationally in school allows for mastery of the multi-dimensional “new literacies” (Leu, Kinzer, Coiro, & Cammack, 2004), which is required of them in the 21st century.

Unfortunately, this research is also confirming that not all students are receiving the same degree of technology experience, particularly in school. The biggest difference between campuses appears to be in the amount of technological resources with the Porter campus sporting more hardware than Saguaro Middle School. While Porter students are receiving slightly more technology experience, neither school is providing a great deal of technology integration. There is little difference in student use of technology outside of school, slight differences in home computer ownership, and marginal differences in teacher use of technology, their available professional development opportunities and their general efficacies, attitudes and philosophies. Along with only slight differences in leader’s knowledge and attitudes, there is little found in this research to determine why Porter students are exposed to more technology experiences and why neither school is integrating technology to a high degree. More research is needed to find variables that might further explain this phenomenon.

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