Berkshire Wireless Learning Initiative
Final Evaluation Report

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Findings

Obviously, there are many potential ways to summarize the findings and outcomes of such a complicated and rich learning initiative. One of the most universal findings in the current investigation was that both the implementation and outcomes of the program were somewhat varied across the five 1:1 settings and over the three years of the student laptop implementation. In this section of the paper, we explore common trends across the various research results that directly address the original targeted project outcomes. Each of the four targeted outcomes (enhanced student achievement, improved student engagement, fundamental shifts in teaching practices, and enhanced student research and collaboration) are individually evaluated below.

Enhanced Student Achievement

There is emerging evidence that student achievement was positively enhanced through the types of educational access and opportunities afforded by 1:1 computing through the BWLI program. The chief results supporting this finding include the school-level and student-level analyses of the student achievement data, summary of teacher survey results, student survey results, and principal/leadership interviews. Specifically, the analyses of the pass rates on all of the available MCAS subject tests during the years when 7th and 8th grade students had full access to 1:1 computing saw growth compared to past averages as well as comparison school performance and state averages. After controlling for prior achievement levels, student level analyses of 8th grade test performance after two years of 1:1 computing in the BWLI setting revealed a statistically significant positive effect for BWLI participation in English Language Arts but not in Math. Further student level statistical models exploring students' individual technology uses in Year 3 of the BWLI program revealed few major relationships with ELA or Math performance, once students prior ELA and Math scores were statistically controlled. However, a randomized computer writing study in the final year of the BWLI implementation demonstrated the students produced both lengthier and higher-scoring

essays when allowed to compose and edit text using a computer, rather than the traditional paper and pencil required in the official state assessment. The computer writing study results also echo past literature suggesting that traditional paper/pencil assessments may be too insensitive for evaluating the impact of educational technology and technology savvy students.

In addition to the state test score analyses, teachers and principals were overwhelmingly positive in their assessment of the initiative on student outcomes. Seventy one percent of all 1:1 teachers reported that their students' quality of work had improved through participation in the program. The majority of surveyed teachers additionally reported that they had observed improvements in students writing quality and on student achievement. In respect to standardized assessment/state test score results, the final assessment from all school principals and leaders as well as the majority of BWLI teachers was that 1:1 computing has positively impacted student achievement (14% disagreed). The school principals were even more unanimous in their assessment of the impact of the BWLI and 1:1 computing on their students. For example, all of the interviewed school leadership reported unanimously that the "BWLI program has positively impacted my student's academic achievement". One hundred percent of all interviewed school leaders also believed that computers helped their students "grasp difficult curricular concepts" and allowed them to "create better looking products." There was only one school principal/leader who disagreed with the sentiments of the other four BWLI school leaders who reported that their "students develop a deeper understanding of the subject material when using a computer." Lastly, all of the responding school leaders were unanimous in their belief that "students would use technology more at my school if there was less pressure to perform on standardized tests" while the majority of BWLI teachers (62%) agreed that "the impacts of a 1:1 computing program may take many years to be fully understood".

Improved Student Engagement

There is strong evidence that student engagement increased dramatically in response to the enhanced educational access and opportunities afforded by 1:1 computing through the BWLI program. The chief results supporting this finding include the teacher survey, student survey, principal interviews, classroom observations, teacher interviews, and to a lesser extent the student drawings. In their final BWLI survey, teachers overwhelmingly reported improvements in student engagement and motivation. Eight three percent of teachers felt that engagement had improved for their traditional students, compared 84% for at-risk/low achieving students and 71% for high achieving students. Similar to the results on student engagement, teachers overwhelmingly found that the BWLI program enhanced their students' motivation. Similarly, 76% of 1:1 teachers reported that student motivation improved for their low achieving students compared to 73% for traditional students and 59% for high achieving students. Conversely, a very small minority of teachers (less than 2%) believed that the 1:1 laptops had led to declined class participation and student motivation for their students.

Similarly, the principal interview results were equally as positive as the teachers in their belief that student participation in the program has led to dramatically improved student engagement in the classroom. Nearly all of the building leadership reported throughout the three-year implementation period that the majority of students responded very favorably to the laptop initiative and that

students' engagement, attentiveness, and motivation was improved when they were using laptops in class. The classroom observation notes and analyses also found that a large majority of students clearly appeared more attentive and engaged when they were using their laptops in class. This sentiment was expressed repeatedly by numerous teacher interviews over the duration of the three-year implementation. Both the classroom observation and teacher interviews additionally observed that student engagement could also be enhanced when the teacher used technology in class, such as a "cool" technology-enabled presentation to present curriculum. Lastly, the student drawing quantitative analyses provided little additional evidence of changes in student engagement, however a number of students clearly depicted their preferences for writing with laptops.

Fundamental Changes in Teaching Practices

The third targeted project outcome was the documentation of fundamental paradigm changes in teaching, particularly teaching strategies, curriculum delivery, and classroom management. Without question, the BWLI program had major impacts across many aspects of teaching for the majority of teacher participants. The chief results supporting this finding include the teacher survey, student survey, principal interviews, classroom observations, and teacher interviews. The first year of teacher and student survey results speak volumes about the speed at which teachers adopted and implemented technology across their professional lives. Teachers quickly adopted and incorporated technology into a wide variety of new practices beyond use with their students in the classroom (which had itself increased nearly four times within the first six months of the student deployment). In the final teacher survey, nearly all of responding teachers (83%) reported that their personal computer skills had improved since the beginning of the BWLI program. Some of the most frequent "behind the scenes" uses of technology for teachers included such diverse professional tasks as researching and acquiring curricular materials, using email as a school-wide communication system as well as with parents and students, scheduling, record keeping and grades, managing educational web sites for their students, and creating tests, quizzes or assignments. Clearly, the majority of teachers' non-instructional professional practices were impacted by the 1:1 initiative—representing a marked shift in many aspects of teaching strategies and methods. The impact of the new 1:1 technology applied during actual instructional time was somewhat less universal across all BWLI classrooms, however the impact was still quite notable considering the major investments required by teachers to "transform" and "fundamentally change" their existing classroom practices.

Despite these investments and challenges, the majority of teachers reported that they experienced some degree of "paradigmatic shift" in the classroom. In the final survey administration, over 80% of BWLI teachers reported that the delivery of curriculum within their classes had changed since their school began the BWLI program. In addition, just under 60% of responding teachers believed that their school climate had changed as a result of the program and over 50% of teachers further believed that their role as a teacher within their own classroom had changed. In assessing the impact of these changes in their own teaching, teachers were nearly unanimously positive (or neutral) with 62% of BWLI teachers reporting that their teaching had "improved as a result of the 1:1 program" while less than 10% disagreed.

In addition to the teacher's own reflection in the surveys, there were also numerous examples in the classroom observations, teacher interviews and principal interviews of shifting teacher practices as a result of the 1:1 program. In some cases, teachers so fully embraced the multifaceted technologies available to them in their teachers strategies, curriculum delivery, and classroom management that the idea of a complete "paradigm shift" is not an exaggeration. Most teachers' experiences were somewhat more modest and nearly everyone involved expressed the sentiment that "even after a couple of years we still feel like were just getting accustomed to teaching in a 1:1 setting" and that the impacts of the initiative could take many years to be fully realized. Finally, there remained a very small number of teachers who were only negligibly impacted by the BWLI program and 1:1 computing. This small minority of staff generally felt satisfied with their pre-1:1 practices and teaching or were simply less confident experimenting with technology. However, in conclusion, 1:1 computing and the BWLI program substantially impacted all aspects of teachers' professional lives in the vast majority of participating classrooms, and often with positive results.

Enhanced Student Research Skills and Collaboration

There is supporting evidence that student research skills and collaboration were enhanced by the improved educational access and opportunities afforded by 1:1 computing through the BWLI program. The chief results supporting this finding include the teacher and student survey data, teacher interviews, principal interviews, and classroom observations. Overall, the vast majority (about 95%) of BWLI students reported having at least one computer accessible at home which was most typically connected to a high-speed Internet connection and used for over 60 minutes per day, on average. Thus, we can conclude that the vast majority BWLI students entered the 1:1 laptop initiative with considerable computing and Internet experience.

Based on the early survey results, BWLI students and teachers quickly adopted the Internet as a research tool and resource. One of the most consistent results across the study findings has been the great frequency with which students reported adopting the Internet to access information in school. Furthermore, in the Year 3 student surveys, the second and third most frequent technology use reported across all BWLI students (after using the Internet to access information) was "accessing a teacher's website" and "take notes in class." The frequency and widespread nature of these results strongly suggests students had increased their research capabilities through the 1:1 initiative.

Certainly, in every BWLI setting students access to digital resources and tools increased exponentially with 1:1 student computing. In both the classroom observations and teacher interviews, there were numerous accounts of how the 1:1 computing and wireless Internet access had changed the way students' access information and conduct research. It was generally observed that students quick adoption and preference for the Internet (and more specifically "google") was emphatically reported to be the research tool of their choice. In the teacher survey, BWLI teachers reported that once beginning the 1:1 environment they assigned their students much more frequently to create products using a wider variety of tools and mediums than had been available previously or prior to the 1:1 program. Specifically, teachers reported multifold increases in the frequency of their students creation of multimedia projects, pictures and art, stories and book, web pages or other web-based publications all using their new technology resources throughout the student laptop

deployment. Despite a peak in the variety and frequency of student products during the second year of implementation, after the third scheduled year of program implementation over 60% of teacher respondents still felt that their students have "greater freedom of choice with regard to their individual learning style" due to their participation in the BWLI program. Clearly, both practices and sentiments of participating students and teachers show that students' capabilities to conduct independent research increased through participation in the 1:1 program.

There is also somewhat more limited evidence that student collaboration and interaction with peers increased with the resources and opportunities afforded to students through 1:1 computing and the BWLI program. Although a harder outcome to measure, teachers across the BWLI setting generally observed increases in student collaboration for a sizable portion of their students, although not the majority. Specifically, in the final survey BWLI teachers reported that their students' interactions with other students had increased as a result of 1:1 computing for 44% of their traditional students, 42% of low-achieving students, and 39% of high-achieving students. Across all types of students, less than 7% of teachers reported decreases in student peer interaction as a result of the 1:1 initiative. The post-BWLI principal/school leadership interview also saw school leaders divided in their assessment that "students interact with each other more while working with computers" where 3 of respondents agreed (40%) or strongly agreed (20%) and 2 disagreed (40%). Alternatively, teachers were stronger in their assessment that the BWLI program had positively impacted students ability to work independently. For example in the final year-end survey, BWLI teachers reported that their students ability to work independently had increased for 69% of their traditional students, 65% of low-achieving students, and 52% of high-achieving students (less than 3% reported declines). Based on this evidence, we can conclude that student collaboration and interaction increased for many BWLI students and in many BWLI classrooms, but the impact of the initiative on student collaboration was less universal and dramatic than many of the other findings.