THE EFFECTS OF 1:1 COMPUTING INITIATIVES ON STUDENT ACHIEVEMENT

BASED ON STANDARDIZED TEST SCORES

By

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ABSTRACT

The purpose of this study was to analyze whether or not implementing a 1:1 computing initiative would enhance student achievement. The research includes findings that answer the questions, “Do students who have access to technology have better standardized test scores than those who do not?” and “Does giving students access to technology improve their standardized test scores?” Data was analyzed for AYP Math, AYP Communication Arts and Composite ACT Score. The data was collected from the Missouri DESE website. The findings were analyzed through Microsoft Excel and A Statistical Program (ASP) software. Findings indicate that there is no difference between the State of Missouri average scores and the district using 1:1 computing. It is recommended that another study may be helpful in the use of 1:1 computing to determine whether the initiative was effectively implemented in this particular district. A survey of teachers is also warranted to determine if there are other improvements aside from the standardized test scores analyzed in this study.
INTRODUCTION

Background, Issues and Concerns

A school district located in Missouri, hereafter referred to as NKC, and has implemented a program that provides a free laptop for each student. The district began the 1:1 initiative in 2009 for high school students. This initiative gave mini-net-books to each student. NKC examined its student population base and discovered that 40% of its student body was eligible for free or reduced lunch which indicated socioeconomic need in the district. The initiative gave students access to digital resources they didn't have at home. The district hoped this would better prepare them for the future in both the workplace and in college environments (North Kansas City Schools: HP Mini Brings Educational Advances to All Students, 2010).

Practice under Investigation

The practice under investigation is the use of technology in the classroom and providing each individual student with their own laptop.

School Policy to be informed by Study

The policy to be informed is a school district’s technology plan.

Conceptual Underpinning

The International Society for Technology in Education (ISTE) has set forth standards for teachers, administrators and students for the use of technology in the classroom. These standards are known as NETS or National Educational Technology Standards. For students these standards evaluate the skills and knowledge that students need to be successful and productive in a world that is digitally growing. For teachers, these standards help evaluate the skills and knowledge
needed for them to teach their students who are wanting more and more technology in their education. Administrators use these standards to support digital learning, implement technology and to help them transform the technology in their schools. (NETS, 2012) Schools use these standards to help them better implement technology in their classrooms. As the use of technology outside of the classroom increased, so did the need to implement it into the classroom. There began to be an achievement gap between students who had access to technology and those who did not. School districts saw this gap begin to widen and acted by implementing varying degrees of 1:1 computing initiatives. The initiatives can come in different styles students can have 24/7 access to a district provided computer, laptops that are only accessible to them while in school or access to their own laptop while in a specific classroom. In theory, the mini-net-books will increase student achievement.

Statement of the Problem

School districts may not have enough background data or information to make an educated decision as to whether or not students should be provided with technology. Districts also need to know if investing in classroom technology will benefit students.

Purpose of the Study

The purpose of this study is to determine whether student access to technology impacts student learning.

Research Question(s)

RQ1: Do students who have access to technology have better standardized test scores than those who do not?
RQ2: Is there a difference in standardized test scores between students who have access to technology and students who do not have access to technology?

RQ3: Does giving students access to technology improve their standardized test scores?

Null Hypothesis

There is no difference in test scores in districts where students are given access to technology in comparison to the student population as a whole.

Anticipated Benefits of the Study

This study is meant to benefit school districts who want to utilize technology in their classrooms, specifically those who want to have a case to provide laptops or some other computing device to their students.

Definition of Terms

DESE: Missouri Department of Secondary and Elementary Education

ISTE: International Society for Technology in Education

NETS: National Educational Technology Standards

Summary

NKC is a Midwestern school district that has 15 high schools. The school district has a fully implemented 1:1 laptop program in their laptop program. This program began in 2009 with netbook computers. In the 2012-2013 school year, the school is using Apple laptop computers for both students and teachers to replace the netbooks. This research investigates the use of 1:1 computing and its effects on student achievement. The research also looks at whether or not the
1:1 laptop to student ratio enhances student achievement. Finally, this research looks at whether or not their achievement is higher than that of their peers not involved in a 1:1 computing program.
This review of literature surveyed results of research studies in the area of 1:1 computing and its effect on student achievement. There are four main topics that are addressed in this review including student to computer ratios in the United States, statewide 1:1 computing initiatives, district specific initiatives, the overall impact that 1:1 computing has on student achievement. Within each of the topics there are other areas discussed that also influence student achievement including motivation and engagement. The information presented will give numbers and evidence of successfully implemented 1:1 computing initiatives.

One to one computing refers to the availability of access students have to technology (Bebell, 2010). Over the last decade, the student to computer ratio has been at a steady decline. In the United States in 2001 was 5.4 to 1 which had improved from 12.1 to 1 3 years prior (Internet Access in U.S. Public Schools and Classrooms: 1994-2001, 2002). In 2002 the ratio fell even farther to 4.8 to one and by 2008, the number had fallen to 3.1 computers for every student. This data suggests that schools in the United States are moving toward 1:1 student to computer ratios in schools. There is also a move away from desktop computers to laptop computers. As of fall of 2008, 58% of United States schools had laptop carts. In 2009 teachers typically had a 1:5.3 student computer ratio in their classrooms. The ratio of computers in the classroom can improve with the use of laptops (Warschauer, 2010).

There are statewide 1:1 laptop initiatives. At least 33 states have experimented with statewide initiatives (Kessler, 2011). One of the largest and most successful initiatives was that in the state of Maine known as the Maine Learning Technology Initiative. This program gives all students in the seventh and eighth grades, as well as their teachers, a laptop (Argueta, Huff,
Beginning in 2002, 34,000 students and 3,000 teachers were each given a laptop (Kessler, 2011). Ten years after the initiative began, 60% of high school students in the state of Maine have a laptop which is funded by local property taxes through the Maine Department of Education (Washuk, 2011).

Research shows that students in Maine were overall more motivated in school and the greatest increases were seen in students with disabilities and low-achieving and at risk students. Not only did student motivation increase but their achievement rose as well. Overall, student achievement improved but in particular the quality and quantity of their writing improved. On the Maine Educational Assessments (MEA), students writing scores rose 3.4 points from 2000, two years prior to the laptop initiative, to 2005, and the third year of laptop use. In 2000 29.1% of eighth graders met the writing proficiency standard on the MEA, by 2005 that number had risen to 41.4%. There is a significantly statistical difference between the writing of those students who use laptops for writing and those who do not, though both students who use laptops and those who do not met the state writing proficiency. On the same assessment, students at the pilot schools scored significantly higher in science, math and social studies in comparison to schools without a 1:1 initiative (Argueta, Huff, Tingen, & Corn, 2011). In one particular middle school math scores have taken a jump in the ten years since the initiative began. In 2001-2001, the eighth grade basic math test passing rate was at about 50%, in 2009-2010 the passing rate was at 91% (Washuk, 2011).

Another state that has experienced success with their statewide initiative is the state of Florida. Florida's initiative was funded through the U.S. Department of Education's Title II-D program, Enhancing Education through Technology (Argueta, Huff, Tingen, & Corn, 2011). The
primary goal was to change teaching practices through professional development using laptop
technology (Dawson, Cavanaugh, & Ritzhaupt, 2006). Eleven districts were chosen for the pilot,
this included 42 K-12 districts made up of 15 elementary schools, 13 middle schools and 11 high
schools, reaching 440 teachers and 20,000 students. This project had 2 phases, the first in 2006-
2007 which focused on “effective models for enhancing student achievement through the
integration of the laptop computer as a tool for teaching and learning in the classroom.” The
second phase, in the 2008-2009 school years focused on “effective integration of innovative
learning tools and project-based learning activities in K-12 curricula.” The second phase
involved 16 districts with 73 schools and 559 teachers. In this phase, only 4 districts were
implementing a 1:1 laptop program (Argueta, Huff, Tingen, & Corn, 2011). These 1:1 programs
had varying styles including “1:1 and 24/7 access to laptops, full school day access to laptops,
access to laptops while in a specific classroom (for part of the school day and/or at a ratio greater
than 1:1), and access to laptops in classrooms when a shared cart is available for use (possibly at
a ratio greater than 1:1)” (Cavanaugh, Dawson, & Ritzhaupt, An Evaluation of the Conditions,

The Florida initiative did not utilize standardized test scores as its primary means of
monitoring student achievement. This research indicated that laptops enhanced student
engagement therefore displaying a strong correlation between student engagement and higher
student achievement (Dawson, Cavanaugh, & Ritzhaupt, 2006). Of those teachers who
performed action research, 28% of them saw changes in student achievement in regards to “test
scores, higher level thinking skills, retention and transfer of learning.” There was a documented
increase in student motivation and engagement, students seemed to enjoy their work more, are
able to stay on task and are having a more positive learning experience, and all of these factors contribute to higher levels of student learning. Students also displayed an increase in skills that will benefit them in the future such as collaboration, innovation, leadership abilities and creativity (Cavanaugh, Dawson, & White, Leveraging Laptops: Effective Models for Enhancing Student Achievement, 2006).

Along with state wide initiatives, there are also individual districts who have undertaken their own 1:1 initiatives. Pleasanton Unified School District in California began a 1:1 initiative in 2001 with 60 sixth graders and by 2003 the program had grown to 259 students, 25% of the district's sixth, seventh and eighth graders. The students who participated in this pilot group earned significantly higher test scores and grades in mathematics, writing and English language-arts classes as well as earning higher overall Grade Point Averages (Group, 2006).

In Peace River North School District in Canada prior to the initiative implementation, girls consistently outperformed boys on the district provided writing assessment. Two years after the implementation, the gap all but disappeared with boys reaching 89% proficiency and girls at 88% proficiency. Prior to the initiative, students meeting provincial education standards for writing was at 70%, within the first year of the initiative that number improved to 92% (Group, 2006).

With the lowest achieving scores in the city of Erie Pennsylvania, Irving Elementary School implemented a 1:1 computing initiative (Group, 2006). The initiative gave 250 students and every teacher a laptop computer. Prior to the initiative, students did have access to a computer lab but were only permitted to use it 30 minutes a day (Review of State and National
Laptop Initiatives, 2011). After implementation, the district received the Governor's School of Excellence award for improved test scores (Group, 2006).

Research shows that laptops are used less in mathematics and science courses than it is for English language-arts and social studies (Bebell, 2010). The primary uses of laptops by students are writing and taking notes with word processing software, researching topics on the internet using internet browsers, completing homework assignments and communicating with peers and teachers using email clients and chat programs (Penuel, 2006). There have been reported differences in how computers are used in classrooms. For low-income schools students use the technology more to learn or practice basic skills. In high-income schools students use computers more for “written text, conduct research, correspond with others, create or use graphics or visual displays, develop and present multimedia presentations, create art, music, movies or webcasts, or design and produce a product” (Warschauer, 2010).

Overall, there has been a large improvement in English/Language Arts scores in 1:1 schools. Students who had higher gains showed the most improvement in testing subsets that included writing strategies and literacy response and analysis. These gains were not in the first year of implementation but the years that followed (Bebell, 2010). While the greatest gains have been in English/Language Arts, there have been some gains in the area of mathematics. In the first two years of laptop use, there has been a somewhat negative relationship between math scores and laptop use specifically in Algebra scores. This negative relationship all but disappeared by year three. In geometry, the relationship with laptops was not significant within the first two years. In year three there have been substantial gains in geometry scores where
laptops were used once or twice a week in comparison to when laptops were not used (Argueta, Huff, Tingen, & Corn, 2011).
RESEARCH METHODS

Research Design

The design of the research was data collected off of the Missouri DESE database of information about school districts. The independent variables were students with laptops and students without. The dependent variable was the test scores on various tests including AYP Math, AYP Communication Arts and ACT scores.

Study Group Description

The study group for this research consisted of the NKC school district. This district has an average enrollment over the last 5 years, 2007-2011, of 17,976 students spread throughout 32 buildings. Over the last 5 years the average ethnicity percentages for students who are enrolled in the district are 4.36% Asian, 12.56% Black, 10.7% Hispanic, 1.16% Indian and 70.22% White. The district has had an average of 41.6% of its student population on free and reduced lunch in the last 5 years. The district has an average 85.5% graduation rate. All of these buildings have one laptop per child that is provided by the school district.

Data Collection and Instrumentation

Data was collected via the Missouri DESE website. The data collected included AYP Math, AYP Communication Arts and ACT Scores from both the district as well as the state of Missouri over the course of 5 years. These data were compared and analyzed against each other.
Statistical Analysis Methods

A Statistical Package (ASP) software was used to complete the statistical calculations in this study. Descriptive statistics and a t-test were calculated. Additionally, Microsoft Excel was used to compile some totals used in the research.
FINDINGS

To determine whether or not student achievement was effected by the use of a 1:1 computing program, data was collected on the Missouri DESE website for both the State of Missouri and NKC. The data collected was taken from 2007-2011 for Composite ACT Score, AYP Communication Arts and AYP Math.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>t-Test Analysis Results Between State of Missouri and NKC Composite ACT Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>Mean</td>
</tr>
<tr>
<td>MO</td>
<td>21.6</td>
</tr>
<tr>
<td>NKC</td>
<td>21.56</td>
</tr>
</tbody>
</table>

Note: Significant when p<=0.25

NKC Composite ACT Scores were compared to that of the State of Missouri. The data was taken from 5 years, 2007-2011 for both NKC and the State of Missouri. The mean of the State of Missouri was 21.6 and the mean of NKC was 21.56. The Mean D or difference between the two groups of data was .04. The t-test result was 0.39 and the df was 8. The null hypothesis states there is not a significant difference in Composite ACT Scores between the State of Missouri and NKC. Since the p-value was 0.71 and the Alpha number was set at 0.25, the null hypothesis must not be rejected. Therefore, there is not a significant difference in Composite ACT Scores between the State of Missouri and NKC.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>t-Test Analysis Results Between State of Missouri and NKC AYP Communication Arts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>Mean</td>
</tr>
<tr>
<td>MO</td>
<td>49.9</td>
</tr>
<tr>
<td>NKC</td>
<td>50.75</td>
</tr>
</tbody>
</table>

Note: Significant when p<=0.25

NKC AYP Communication Arts scores were compared to that of the State of Missouri. The data was taken from 5 years, 2007-2011 for both NKC and the State of Missouri. The mean
of the State of Missouri was 49.9 and the mean of NKC was 50.75. The Mean D, or difference between the two groups of data was -0.86. The t-test result was -0.27 and the df was 8. The null hypothesis states there is not a significant difference in AYP Communication Arts scores between the State of Missouri and NKC. Since the p-value was 0.79 and the Alpha number was set at 0.25, the null hypothesis must not be rejected. Therefore, there is not a significant difference in AYP Communication Arts scores between the State of Missouri and NKC.

Table 3

<table>
<thead>
<tr>
<th>Source</th>
<th>Mean</th>
<th>Mean D</th>
<th>t-Test</th>
<th>df</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MO</td>
<td>51.22</td>
<td>-0.64</td>
<td>-0.83</td>
<td>8</td>
<td>0.83</td>
</tr>
<tr>
<td>NKC</td>
<td>51.86</td>
<td>-0.64</td>
<td>-0.83</td>
<td>8</td>
<td>0.83</td>
</tr>
</tbody>
</table>

Note: Significant when p<=0.25

NKC AYP Math scores were compared to that of the State of Missouri. The data was taken from 5 years, 2007-2011 for both NKC and the State of Missouri. The mean of the State of Missouri was 51.22 and the mean of NKC was 51.86. The Mean D, or difference between the two groups of data was -0.64. The t-test result was -0.83 and the df was 8. The null hypothesis states there is not a significant difference in AYP Math scores between the State of Missouri and NKC. Since the p-value was 0.83 and the Alpha number was set at 0.25, the null hypothesis must not be rejected. Therefore, there is not a significant difference in AYP Math scores between the State of Missouri and NKC.
CONCLUSIONS AND RECOMMENDATIONS

The null hypothesis stated that there is no difference in test scores in districts where students are given access to technology in comparison to the student population as a whole. The results of this study that the null hypothesis is correct in that there is not a difference in the standardized test scores between the school district with a 1:1 computer to student ratio in comparison to the State of Missouri average standardized test scores in AYP Math, AYP Communication Arts and Composite ACT Score.

Based on the data collected in this study, there is not significant evidence, when looking at standardized test scores, to support a 1:1 computing initiative in schools. The scores for each of the standardized test scores collected, the average test score for the State of Missouri was less than one point off from that of NKC. This means, according to the data collected in this study, that there is not any real difference between schools with a 1:1 student to computer ratio versus the group as a whole.

There are a few items to consider when looking at the data. The data from standardized test scores is not the only way to measure student achievement. Student engagement, motivation and their grades in class, not just on standardized tests, are other measures of student achievement that were not analyzed in this study. These are all areas that warrant an additional study.

In addition to this study done based solely on standardized test scores, studies that include information on student engagement, motivation and their class grades along with teacher observation, collected through survey, and would enhance the findings in this study. An analysis
of these results would be beneficial alongside the standardized test scores. This analysis would represent student achievement in all areas of their learning and not just on standardized tests.
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