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The Impact of a Student Device Technology Integration Professional Development Program on K-6 Performance Data

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THE IMPACT OF A STUDENT DEVICE TECHNOLOGY INTEGRATION PROFESSIONAL DEVELOPMENT PROGRAM ON K-6 PERFORMANCE DATA

by

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When schools choose to secure devices for their students to integrate into class, they are engaging in a student device technology integration initiative. Results of such initiatives so far have been inconsistent (Bebell & Kay, 2010, Gulek & Demirtas, 2005). These inconsistencies may be, in part, due to poor professional development and/or incomplete data collection. The purpose of this study is to examine the impact of a professional development program for teachers on the effectiveness of a student device technology integration initiative. "Effectiveness" will be defined by standardized test data as well as student attendance data and student behavior referral data. In this study, three K-6 schools in the same urban school district in Michigan are examined. All three schools have similar student demographics, enrollment numbers, and access to technology. One school receives a student device technology integration professional development program that includes two days of initial training and follow up coaching throughout the school year. Standardized test score data, student attendance, and student behavior referrals from all three buildings are examined. Results show a decrease in the number of chronically absent students and a decrease in total behavior referrals in the school that piloted the professional development program, and no noticeable difference in standardized test score data between the three schools in the study.

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INTRODUCTION

According to the United States Department of Education, K-12 students without their own computers or tablets in class may not learn as productively as those students with such devices (Future Ready Schools, n.d.). Consequently, many K-12 schools have chosen to secure devices for their students to integrate into class in an attempt to increase access to technology and improve learning outcomes ("Number and Internet", 2016). When schools make these purchases, they are engaging in a student device technology integration initiative. However, these initiatives have shown inconsistent standardized test score results (Bebell & Kay, 2010, Bebell & O'Dwyer, 2010, Gulek & Demirtas, 2005, Silvernail & Gritter, 2007).

Problem Statement

One possible reason that student device initiatives do not consistently improve student achievement metrics may well be due to improper training for teachers and administrators. Joyce and Showers (1981, 2002) make the argument that initial training without follow-up support is virtually valueless. Unfortunately, many K-12 schools' initial training lacks appropriate follow-up support (Glazer, Hannafin, & Song, 2005).

Furthermore, it is hypothesized that the focus of the initial training may be misguided and/or insufficient in three distinct ways. First, the focus may be primarily on how to use the device or how to use a specific program instead of on the purposes for using devices and programs and the advantages that they can provide. Second, training may highlight examples of *activities* that can be done with the devices and programs instead of highlighting *outcomes* that can be achieved. Lastly, even if follow-up support is provided, it may be offered too infrequently and may intensify the misguidedness of the initial training. These hypotheses are based on my personal experience as a technology integration professional development provider and research regarding professional development in general as well as professional development for student device initiatives specifically. Shapley, Sheehan, Maloney, and Caranikas-Walker (2010) found that teachers' quality of student device classroom integration correlated significantly with the quality of professional development provided. Concerning the type of training, Showers (1984) found that coaching for teachers following initial training is essential to ensure new teacher behaviors are implemented in the classroom.

Research on student device initiatives has suffered from a near-exclusive use of test score data to indicate improved student performance. A focus on student test score data may be masking improvement in other areas of student performance that are key "precursors" of academic achievement. Additionally, the impact of student device technology integration initiatives has been inconsistent. Though a number of studies have indicated improvement in standardized test scores subsequent to implementation of a student device initiative (Bebell & Kay, 2010, Bebell & O'Dwyer, 2010, Gulek & Demirtas, 2005), research also indicates that student device initiatives in K-12 schools do not consistently improve standardized test scores (Silvernail & Gritter, 2007).

Student performance metrics certainly include test scores directly. However, research shows that student attendance has a strong positive correlation with standardized test scores (Brown, 2014). Similarly, the number of student behavior referrals has a strong negative correlation with test scores (Polirstok & Gottlieb, 2006). Therefore, gathering data on student attendance and student behavior referrals in addition to initial standardized test scores could paint a clearer picture of the long-term impact of an experimental variable on standardized test scores.

Deficiency statement. Currently, there are many studies that show the impact of student device technology integration initiatives on standardized test scores (Bebell & Kay, 2010, Bebell & O'Dwyer, 2010, Gulek & Demirtas, 2005, Silvernail & Gritter, 2007). There are also studies that show the impact of student attendance on standardized test scores (Brown, 2014). Furthermore, there are studies that show the impact of student behavior referrals on standardized test scores (Polirstok & Gottlieb, 2006). However, there is a hole in the literature when it comes to measuring the impact of student device technology integration initiatives on standardized test scores as well as student attendance and student behavior referrals. This hole is meaningful because the impact of such initiatives may not be seen as quickly in standardized test scores as it is seen in student attendance and student behavior. Therefore, previous studies in which attendance and behavior data were absent, conclusions may have been drawn too quickly. This study seeks to fill that hole by collecting all three types of student performance data described above.

Research Questions and Purpose Statement

Research questions. The following questions will guide this study:

1. What impact does a specific technology integration professional development for teachers have on standardized test score?
2. What impact does a specific technology integration professional development for teachers have on student attendance and student behavior?

Purpose statement. The purpose of this study is to examine the impact of a professional development program for teachers on the effectiveness of a student device technology integration initiative. “Effectiveness” will be defined by standardized test data as well as student attendance data and student behavior referral data. This study will add to the existent literature on the impacts of student device initiatives in the following ways: (1) It will measure effectiveness using a profile of multiple measures to assess change in several, interrelated components of student performance behavior, and, (2) It will examine the impact of providing teachers a professional development program that is explicitly designed to address potential weaknesses in current student device technology integration professional development, such as: (i) a focus on how to use devices rather than why devices should be used, (ii) highlighting activities rather than possible outcomes, and (iii) inconsistent follow-up support.

Significance of Study

This study will be significant in two ways. First, by including multiple student performance indicators, this study is more likely to detect changes/increases in student performance and behaviors that are strongly linked to standardized test scores. Thus, this study may be able to both provide school district leaders and policy makers important information on the impact of student device technology integration initiatives on key components of student academic performance, as well as serve as a model for future evaluations of technology initiatives. Second, by looking for the differences in student performance impacts between two schools involved in a device initiative with only minimal professional development for teachers, and one with a well-designed professional development program, the study may be able to provide important information regarding the effect and value of such professional development programs. This information could be valuable for helping school district leaders and policy makers to understand the impacts that technology initiatives may have on student performance, as well as the value provided by well-designed teacher development programs on the effectiveness of such initiatives. Such findings may provide information that could significantly change our understanding of the importance, and cost-effectiveness, of well-designed professional development programs in supporting the effective use of technology to enhance student learning and achievement.

LITERATURE REVIEW

Test Scores

Student standardized test scores are used to evaluate multiple components of K-12 education. For example, in Michigan, public schools are ranked from top to bottom based almost entirely on student test score data of some kind ("MDE – Top to Bottom School Ranking", 2016). Additionally, Michigan's state-sponsored standardized tests contribute in large part to an individual teacher's evaluation ("Michigan Legislature - Section 380.1249", 2016). Many other states use similar measures to evaluate schools and teachers ("State of the States"). It would be understandable, then, if schools focused much of their attention on increasing student test scores.

Positive impact. Student device technology integration initiatives can have a positive impact on student standardized test scores. The following four studies highlight that point. Bebell and Kay (2010) examined five public and private middle schools in western Massachusetts. Each school provided 1:1 technology access to every student in the school. To measure the student device technology integration initiative's impact on standardized test scores, Massachusetts Comprehensive Assessment System (MCAS) scores were analyzed. When compared to schools in which students did not have the same level of access, Bebell and Kay (2010) found that students in the 1:1 schools improved their MCAS ELA scores more than their non-1:1 counterparts after two years of access to the devices.

Suhr et al. (2010) measured California Standards Test (CST) ELA scores for two groups of 4th and 5th grade students from the same school district. One group of students entered a 1:1 student device technology integration initiative in the 4th grade while the other group did not. Both groups were tracked over two years. After two years, Suhr et al. (2010) found that the students enrolled in the 1:1 initiative improved their scores on the CST ELA test at a statistically significant rate when compared to the students who were not enrolled in the 1:1 initiative.

Shapley et al. (2010) studied 21 high-need middle schools in Texas that implemented a 1:1 student device technology integration initiative. They examined the impact of several implementation indicators on student scores on the Texas Assessment of Knowledge and Skills (TAKS) standardized assessment. Results indicate that the level of student access and use of devices was a positive predictor of both TAKS reading and math scores. Additionally, home use of student devices was an even stronger positive predictor of TAKS reading and math scores (Shapley et al., 2010). Taking together, it seems increased use of student devices both at school and at home leads to higher standardized test scores.

Results from a study by Gulek and Demirtas (2005) show that middle school students that participated in a laptop program displayed higher standardized test scores than their non-laptop counterparts. Both groups of students hail from the same California school. Results from CST tests in both ELA and math indicate higher scores across 6^{th}, 7^{th}, and 8^{th} grades. The increase of the percent of students that met or exceeded CST standards in the laptop program over the non-laptop programs ranged from a minimum increase of 9 points (8^{th} grade math) to 20 points (8^{th} grade ELA and 6^{th} grade math).

No impact. Research exists that shows relatively no impact of student device technology initiatives on standardized test scores. The same Bebell and Kay (2010) study referenced above that showed a positive impact of 1:1 technology access on MCAS ELA scores found no significant difference in MCAS math scores. One might think that results like this might indicate that student device technology integration initiatives may more effectively impact ELA standardized test scores than in math standardized test scores. However, as cited above, Gulek and Demirtas (2005) found increases in both math and ELA CST scores.

Silvernail and Gritter (2007) analyzed Maine's statewide student device technology integration initiative and found mostly poor results. Starting in 2001, 7^{th} and 8^{th} grade students in Maine were given laptops to use in school. Five years later, there was no significant difference in Maine Education Assessment scores, which tests students in ELA and math. Taken together, research suggests that student device technology integration initiatives may or may not positively impact standardized test scores.

The following reasons detail why the inconsistent outcomes from student device technology integration initiatives may be a problem. First, taxpayer dollars or private donations are often spent with an expectation that these initiatives will increase standardized test scores. The absence of standardized test score increases in some schools/districts may lead to an increase in the rate of rejection for similar future funding proposals. Second, when student device initiatives fail to improve standardized test scores, they may be abandoned, causing K-12 schools to miss out on less visible benefits that student device initiatives may provide. For example, student device initiatives have been shown to increase levels of student engagement and interest (Bebell & O'Dwyer, 2010).

Professional Development

Inconsistent professional development may be one reason that some student device technology integration initiatives show gains in standardized test scores while other do not. Shapley et al. (2010) found that teachers' level of implementation in regards to student device technology integration was statistically significantly correlated to the quality of professional development that teachers received. Joyce and Showers (2002) have done extensive research on the value of peer coaching as a means of follow-up support when it comes to professional development. They found that coaching contributes to the transfer of training into classroom implementation in five distinct ways: 1) coached teachers practiced new techniques more often than uncoached teachers, 2) coached teachers adapt training to their own classroom goals better than uncoached teachers, 3) coached teachers kept their new skillset over time at a higher rate than uncoached teachers, 4) coached teachers explained new instructional strategies better to their students than uncoached teachers, and 5) coached teachers displayed a better understanding of the reasons that new strategies were being implemented than uncoached teachers (Joyce & Showers, 2002). It is important to note that their research on professional development did not explicitly involve student device technology integration initiatives. However, their research speaks to a larger point about teacher learning in general. Similarly, Glazer et al. (2005) theorizes that student device technology integration can be enhanced through collaborative apprenticeships, which have been shown to increase leadership and empowerment in teachers.

Alternative Data

It is possible that inconsistencies found about the impact of student device technology integration initiatives on standardized test scores could be related to the amount of time students had with the devices before data was collected. For example, in the Bebell and Kay (2010) study, data was analyzed after middle school students had used the devices for two years. They found higher standardized test scores in ELA but not in math. Alternatively, Gulek and Demirtas (2005) saw an increase in ELA and math scores after three years. It is possible that Bebll and Kay may have found an increase in math scores if they collected data over a longer period of time. Silvernail and Gritter (2007) collected data in Maine after the 7th and 8th grades had used devices for five years and found no significant difference in standardized test scores as compared to before the student device technology integration initiative. However, it is important to point out that in Maine, devices were given to all students in the 7th and 8th grades. These students presumably had regular access to a device at school for the years they attended 7th and 8th grade only. Therefore, even in a study that looked at five years' worth of standardized testing data, the length of time still could have been a contributing factor in the results. The following highlights other existent student performance data that could serve as a precursor to increased standardized test scores.

Student attendance. Gottfried (2010) studied the relationship between student attendance and student achievement. Specifically, he looked at elementary school and middle school students in the Philadelphia School District and standardized math and reading scores. The results show a statistically significant and positive relationship between student attendance in school and standardized math and reading scores (Gottfried, 2010). Similar results were found in Ohio. Roby (2004) analyzed over 3000 schools in the state, specifically looking at student attendance and standardized test scores on the Ohio Proficiency Tests for grades 4, 6, 9, and 12. The results of the study show a statistically significant and positive relationship between student attendance and standardized test score performance for all of the grade levels studied. The contrapositive has also been shown to be true. Brown (2014) looked at Washington DC students at the 4^{th} and 8^{th} grade levels. She gathered their attendance data as well as their National Assessment of Educational Progress (NAEP) scores. The results show that students who miss the most school tend to perform worse than their counterparts on the NAEP (Brown, 2014).

Student behavior. In California, Polirstok and Gottlieb (2006) studied three similar K-8 schools. Only one of the schools received special training aimed at reducing student misbehavior in class. The results show that the school that received training reduced student misbehavior as measured by referrals to the principal while the other schools did not. Additionally, standardized test scores increased at a higher rate in the school that received training when compared to the other schools as measured by the California Test of Basic Skills (Polirstok & Gottlieb, 2006). Likewise, in New Hampshire, Muscott, Mann, and LeBrun (2008) studied the effects of a behavior program called Positive Behavior Interventions and Supports-New Hampshire (PBIS-NH). After five years of implementation in 28 early childhood and K-12 schools, they recorded a large decrease in discipline referrals and suspensions. Results show that 73% of schools that implemented PBIS-NH with fidelity, measured using discipline data and self-report surveys, showed increases in math scores on the New Hampshire Educational Improvement and Assessment Program (NHEIAP). Fransen (2013) studied discipline referrals for class disruption in select 3rd grade classrooms in Missouri. She then examined standardized communications arts scores from the Missouri Assessment Program (MAP). The results indicate a statistically significant negative correlation between the number of student discipline referrals for class disruption and MAP communications arts scores.

Conclusion

Student device technology integration initiatives in schools have been shown to both increase standardized test scores and have no impact on standardized test scores. This discrepancy was discussed as a possible result of poor professional development. Moreover, it is possible that researchers, in some cases, did not allow for enough time for an effect of student device technology integration initiatives to be shown on standardized test scores. It may be prudent, in such cases, to gather alternative data, such as student attendance and student behavior referrals, which have both, respectively, been linked to increases in standardized test scores.

METHODS

In an attempt to answer the research questions, data from three buildings in the same urban school district in Michigan were observed for this quantitative study. All three buildings serve Kindergarten through 6th grade students. While enrollment and demographics are not exactly the same, they are quite similar at all three buildings (Table 1). In all three buildings, each grade level either shared one cart of 30 Nexus 7 Android tablets (K-1) or one cart of 30 Chromebook laptops (2-6).

Table 1
Student Characteristics for Building 1, Building 2, and Building 3

	School		
Characteristic	B1 (n=356)	B2 (n=525)	B3 (n=532)
African-American	71%	34%	56%
White	15%	46%	27%
Hispanic	10%	13%	12%
Multiracial	3%	7%	4%
American Indian/ Alaska Native	2%	0%	1%
Asian	0%	0%	1%
Free or Reduced Lunch	95%	91%	93%

Note: Taken from greatschools.org (2016)

During the 2014-2015 school year, all three school buildings received similar district-provided student device technology integration professional development. This professional development was minimal and focused on teaching teachers how to use and manage the devices that their students would have access to. For example, due to the fact that each grade level (anywhere between two and four classes) would share one cart of student devices, part of the professional development focused on strategies for efficient cart sharing.

During the 2015-2016 school year, Buildings 2 and 3 continued to receive minimal district-provided student device technology integration professional development that tended to focus on use and management. However, Building 1 received a different kind of professional development facilitated by a private local company named Communications By Design (CBD). Therefore, Building 1 served as the experimental group and Buildings 2 and 3 served as control groups.

Professional Development for Building 1

The student device technology integration professional development for Building 1 began with a two-day event during the summer of 2015 called Transformation Orientation (TO). This event was facilitated by CBD trainers out-of-district at CBD's Instructional Learning Center. CBD trainers are all former classroom teachers who now provide student device technology integration professional development full time. An outline detailing objectives for TO can be found in Appendix A. In general, the focus of the two-day event is to develop in teachers an understanding for the vast learning opportunities that student devices can provide, not only for content acquisition, but also for skill acquisition. Specifically, TO aims to increase teacher aptitude for the Seven Survival Skills (Appendix B) and the Instructional Transformation Matrix (Appendix C). Another goal of TO is to develop in teachers an increased awareness of technology tools that can be used for student learning, always within a context for how these tools can cultivate skills in students or make content acquisition more efficient.

The student device technology integration professional development for Building 1 also included follow-up support from CBD throughout the 2015-16 school year. This support is called Shoulder-to-Shoulder Coaching. Involved in this support were 14 dates in which a CBD trainer visited Building 1 for the entire school day. During these visits, the CBD trainer would meet with teachers in various ways to support them with their student device technology integration goals. Details of the frequency, formats, and objectives of Shoulder-to-Shoulder Coaching can be found in Appendix D.

Measures

For the measures below, baseline data was collected for one to two years prior to the introduction of the student device technology integration professional development.

Standardized test scores. Buildings 1, 2, and 3 administered the Northwest Evaluation Association's (NWEA) Measures of Academic Progress (MAP) in the fall and spring for all K-6 students in both the 2014-15 school year and the 2015-16 school year. Over 7400 schools, districts, and agencies use the NWEA MAP test for measuring student progress (NWEA, 2016). The MAP test measures mathematics and reading knowledge for K-2 students and mathematics, reading, and language usage for 3-6 students. Scores are reported on the Rasch Unit (RIT) scale, which is an equal-interval vertical scale and was developed by NWEA (NWEA, 2016). It was determined that the spring 2015 scores would serve as baseline data to compare with spring 2016 data. Reasons for this determination include 1) the time of year is consistent between the baseline and experimental data, and 2) the student device technology integration professional development program for Building 1 began in the summer of 2015 meaning fall 2015 scores could not be considered true baseline data.

Student attendance. The number of absences by individual student was not available for all three schools for the 2014-15 school year. However, the number of students with 10 or more absences in each building during both the 2014-15 school year and the 2015-16 school year was available. Therefore, student attendance was measured using chronic absence data.

Student behavior. Student behavior was measured by collecting the number of behavior referrals per 100 students for all three buildings during the 2013-14, 2014-15, and 2015-16 school years. Teachers and administrators in Buildings 1, 2, and 3 all report referrals through the School-Wide Information System (SWIS).

DISCUSSION

Results

Standardized test scores. Table 2 shows mean RIT scores by school and change in RIT scores for Building 1, Building 2, and Building 3 from spring 2015 to spring 2016 on the NWEA MAP Language Usage, Reading, and Mathematics content tests. Specifically, Building 1 showed growth on all three content tests. On the Language Usage assessment, Building 1 students grew by a 1.85 RIT score. For Reading, Building 1 students grew by 0.40, and for mathematics, they grew by 0.60 over the same time period. By contrast, Buidling 2 students showed a decline on all three content tests. For Language Usage, students declined by a 1.62 RIT score, for Reading, the decline was 2.86, and for Mathematics, the decline was 2.53. Building 3 showed the most growth on all three content tests. For Language Usage, students grew by a 2.23 RIT score, for Reading, growth was 1.78, and for Mathematics, growth was 1.47.

Table 2
Mean NWEA MAP RIT Scores for Building 1, Building 2, and Building 3

School	Spring 2015	Spring 2016	Growth
Building 1			
Language Usage*	196.30	198.15	1.85
Reading	181.36	181.76	0.40
Mathematics	186.13	186.73	0.60
Building 2			
Language Usage*	200.55	198.93	(1.62)
Reading	184.53	181.67	(2.86)
Mathematics	188.58	186.05	(2.53)
Building 3			
Language Usage*	196.13	198.36	2.23
Reading	184.58	186.36	1.78
Mathematics	187.80	189.27	1.47

*Grades K-2 not tested

Despite clear growth for Building 1 and Building 3 and clear decline for Building 2 (*Figure 1*), the raw RIT scores would indicate that there was very little difference between the three buildings.

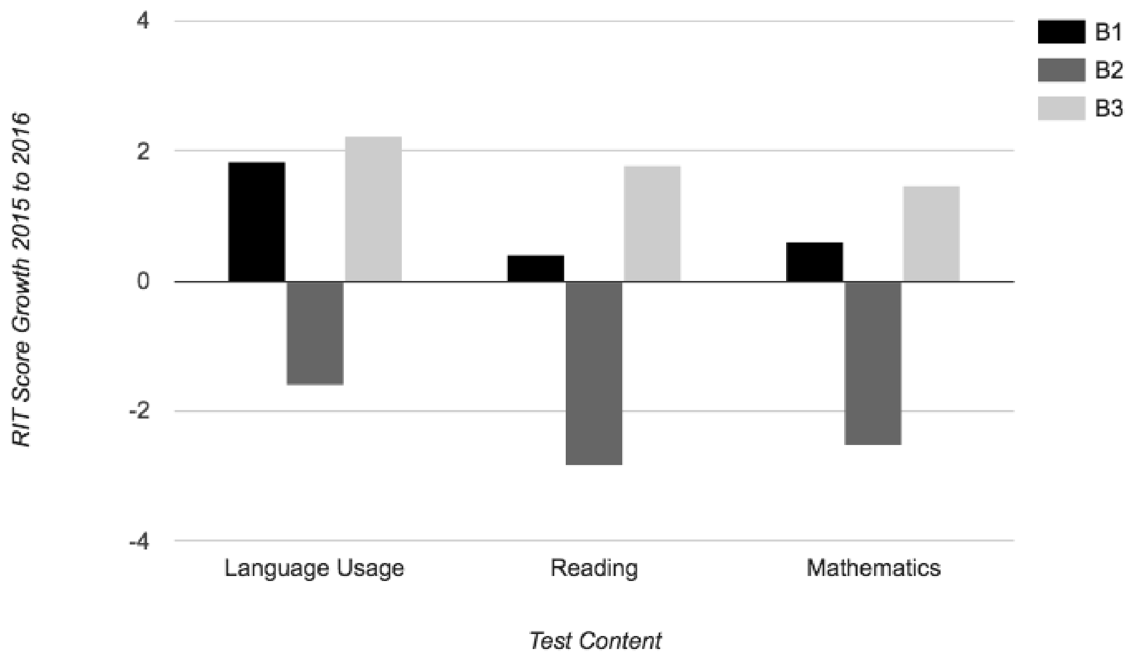

Figure 1. NWEA MAP RIT score growth from Spring 2015 to Spring 2016 for all test content subjects in Building 1, Building 2, and Building 3

Interestingly, when combining Buildings 2 and 3 to create one control group, the growth from Building 1 students exceed that of Buildings 2 and 3. Table 3 shows mean NWEA MAP RIT scores for Building 1 compared to the combined and averaged scores from Buildings 2 and 3. Now, Building 1 students show 1.54 RIT points in growth over Buildings 2 and 3 in Language Usage, .94 RIT points in Reading, and 1.13 RIT points in Mathematics.

Table 3

Mean NWEA MAP RIT Scores for Building 1 and Buildings 2 and 3 Combined

School	Spring 2015	Spring 2016	Growth
Building 1			
Language Usage*	196.30	198.15	1.85
Reading	181.36	181.76	0.40
Mathematics	186.13	186.73	0.60
Buildings 2 and 3			
Language Usage*	198.10	198.61	0.51
Reading	184.56	183.97	(.59)
Mathematics	188.18	187.63	(.55)

*Grades K-2 not tested

Figure 2 shows the change in RIT scores for Building 1 and the mean of Buildings 2 and 3 for all three NWEA MAP content tests from spring 2015 to spring 2016. There were no significance tests done on this data.

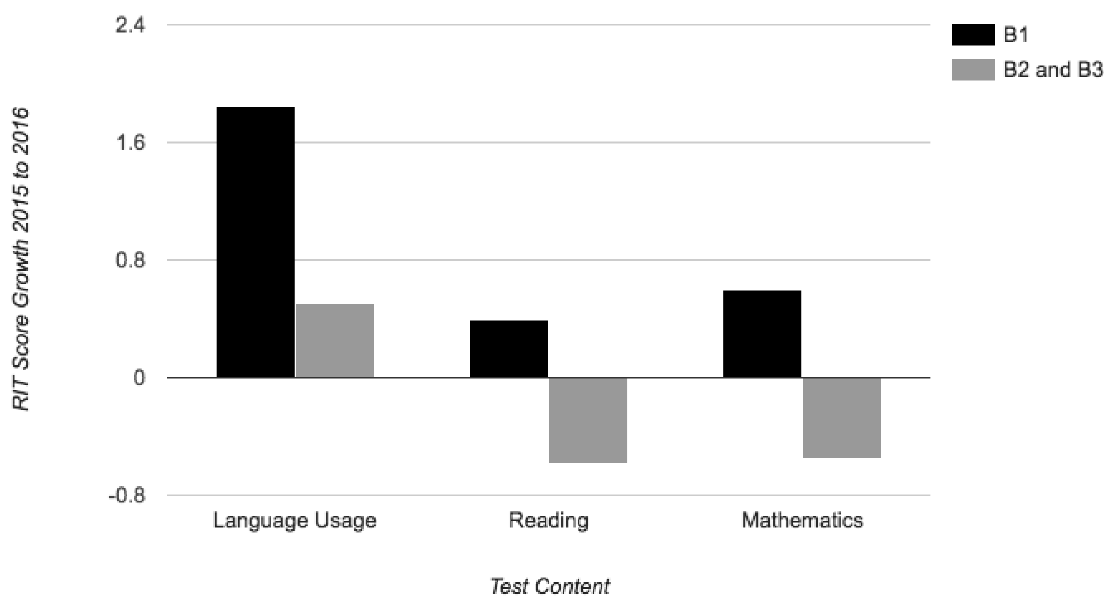

Figure 2. NWEA MAP RIT Score growth from Spring 2015 to Spring 2016 for all test content subjects in Building 1 and the Buildings 2 and 3 average.

Student attendance. Buildings 1, 2, and 3 each had between 38 and 43 percent of students who missed 10 or more days of school during the 2014-15 school year before the student device technology integration professional development occurred in Building 1. During the 2015-16 school year, Building 2 saw an increase in students with 10 or more absences from 42.29% to 52.83%. Likewise, Building 3 also reported an increase in students with 10 or more absences from 39.85% to 44.09%. Building 1, however, reported an almost 50% decrease in the percentage of students with 10 or more absences, from 38.76% to 20.71% (Table 4).

Table 4
Number and Percentage of Students with 10 or More Absences in Building 1, Building 2, and Building 3 in the 2014-15 and 2015-16 School Years

	2014-15			2015-16		
School	n	10+	%	n	10+	%
Building 1	356	138	38.76	309	64	20.71
Building 2	525	222	42.29	530	280	52.83
Building 3	532	212	39.85	508	224	44.09

Figure 3 demonstrates the change in the percentage of students with 10 or more absences in all three schools between 2014-15 and 2015-16. The implications of this change could be dramatic. While there was not a noticeable difference in NWEA MAP scores the year after the student device technology integration professional development occurred, such a drop as was observed in the number of students missing 10 or more days of school in Building 1 could serve as a precursor to increases in standardized test scores in future years.

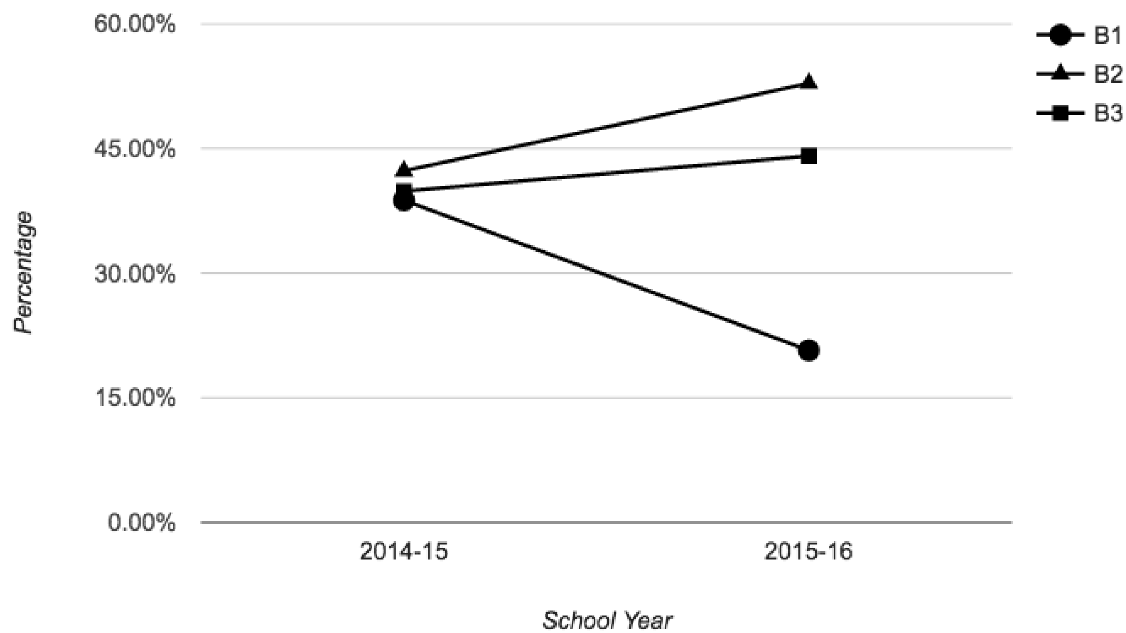

Figure 3. Change in percentage of students with ten or more absences during the 2014-15 and 2015-16 school years in Building 1, Building 2, and Building 3.

Student behavior. During both the 2013-14 and 2014-15 school years, behavior referrals were fairly consistent in Buildings 1, 2, and 3, respectively. In both years, Building 3 had the fewest number of behavior referrals per 100 students, Building 1 has the second fewest, and Building 2 had the most. However, in the year after the student device technology integration professional development program occurred in Building 1, both Building 2 and Building 3 reported slight increases in behavior referrals per 100 students while Building 1 cut the number of behavior referrals per 100 students by 94 referrals (Table 5). Such a dramatic decrease when weighed against slight increases in Buildings 2 and 3 is demonstrated in Figure 4.

Similar reasoning used to predict that a drop in the number of students with 10 or more absences may serve as a precursor to increases in standardized test scores applies here. A drop in the number of behavior referrals may be a predictor of future success on

NWEA MAP content tests despite the lack of effect on scores during the 2015-16 school year.

Table 5
Three-Year Behavior Referrals per 100 Students for Building 1, Building 2, and Building 3

School	2013-14	2014-15	2015-16
Building 1	142	160	66
Building 2	171	227	239
Building 3	89	87	101

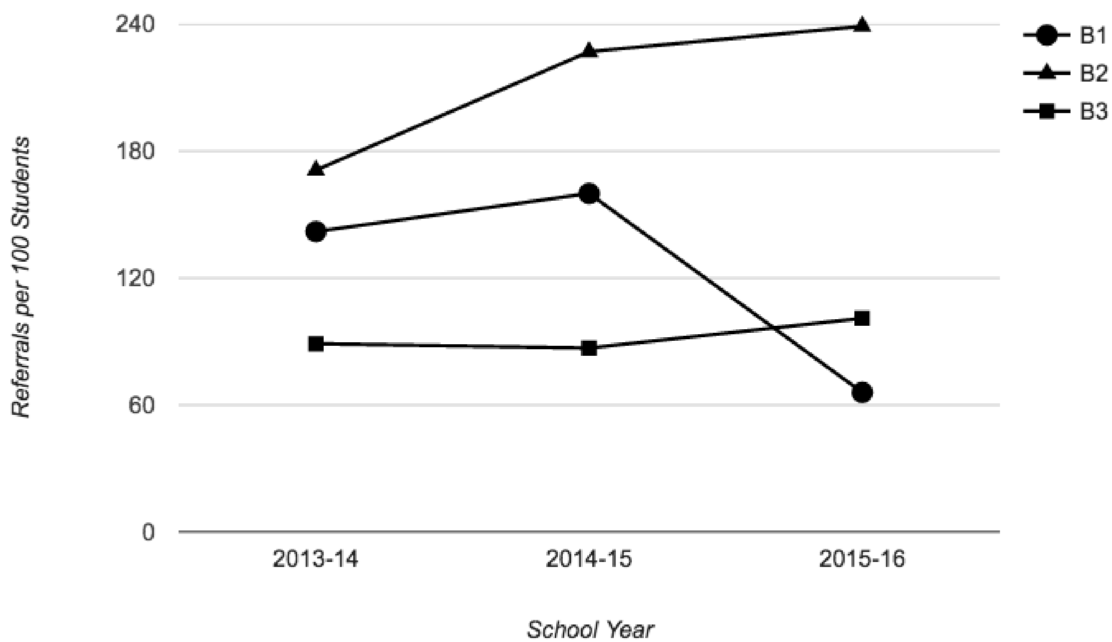

Figure 4. Number of behavior referrals per 100 students over three school years in Building 1, Building 2, and Building 3.

Strengths and Limitations

Strengths. The strengths of this study start with the many variables that were controlled. Each school in the study comes from the same school district, each school serves grades K-6, each school has a similarly diverse student body, each school has a similar socio-economic status, each school has similar technology access in terms of student devices. Students in each school took the same NWEA MAP tests at the same time periods. Teachers in each school reported behavior referrals in the same way. These consistencies strengthen the argument that the student device technology integration professional development that Building 1 received was a driving force behind the dramatic decreases in behavior referrals and students who were absent more than 10 days. There were relatively few differences between the schools other than the professional development received. Therefore, the professional development is the most likely cause of the changes in attendance and behavior data.

Limitations. There are many limitations in this study. Primarily, despite best efforts to control as many variables as possible, it is impossible to isolate the professional development variable. Urban schools such as those in the study often have transient populations. A changing student body can contaminate the experimental variable. Additionally, there may have been a new staff member, such as a teacher, custodian, bus driver, or lunch room attendant, who could have impacted attendance and/or behavior referrals. Lastly, Building 1 has a smaller number of students than Building 2 and Building 3, which may allow it to change more quickly to an external variable than the other schools. Consequently, it cannot be stated definitively that the professional development program that occurred in Building 1 caused the drops in student absences and behavior referrals.

Another limitation is the many parts and pieces to the student device technology integration professional development itself. It included a two-day orientation with unique content as well as follow up coaching and support. Which part of the professional development program made the most impact? Was it the orientation, the content, and/or the follow up support? In addition, was the frequency of the follow up support sufficient or insufficient? These are questions that cannot be answered from the results of this study.

A final limitation is the length of the study. One year after the experimental variable may not be long enough to recognize changes in standardized test scores.

Significance of Results

Despite the limitations described above, the results of this study are significant for district leaders, policy makers, and families. As stated above, many school districts are securing student devices or asking student to bring their own. This study shows one way that school district leaders can make the use of these student devices effective and impact student attendance and student behavior positively. For policy makers, the results of this study give compelling support to the idea of requiring specific kinds of professional development for schools that use grants or other forms of government resources to purchase student devices. Lastly, families who may be looking for schools that integrate technology purposefully can factor in the type of professional development provided to schools before deciding where to send their children.

Future Research

Taking the difficulties of the student into account, additional research could be done to focus the experimental variable(s) even further. However, the general model could be replicated quickly and provide immediate benefits to K-12 schools and districts that are beginning student device implementation programs. Further research could repeat the study in schools that are less diverse and/or a higher socio-economic status. Other studies could lengthen the study to include multiple years of standardized test scores in addition to student attendance and student behavior data. Future research could adjust the frequency of follow up coaching and observe the impact. Lastly, future researchers could include other measurements of student achievement, such as observational data on student engagement, grit, and collaboration.

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APPENDICES

Appendix A

Transformation Orientation Program Outline

During the two-day training event, teachers will:

1. Review and analyze the Instructional Transformation Matrix (ITM, Appendix B).
2. Discuss modern skills for success based on the work of Tony Wagner, author of The Global Achievement Gap.
3. Explore learning management systems, digital formative assessment tools, screencasting tools, and blended learning strategies.
4. Explore how to work with classroom teachers on the integration of technology into the curriculum and on articulating personal, measurable goals derived from the ITM.
5. Create lessons, assessment, find and organize digital content to be used in the upcoming school year.
6. Collaboration, communicate, and create lessons within grade level/content area groups to be implemented in the upcoming school year.

Appendix B

Tony Wagner's Seven Survival Skills (Wagner, 2008)

- Critical Thinking and Problem Solving
- Collaboration Across Networks and Leading by Influence
- Agility and Adaptability
- Initiative and Entrepreneurship
- Effective Oral and Written Communication
- Accessing and Analyzing Information
- Curiosity and Imagination

Appendix C

Instructional Transformation Matrix

Instructional Transformation Matrix

cbd	Entry	Adoption	Adaptation	Infusion	Transformation
	The teacher delivers curriculum content to the student.	The teacher designs instruction that allows for student participation.	The teacher facilitates students in exploring and self-selecting curriculum content.	Student chooses the methodology to achieve the outcome through the learning context provided by the teacher.	Student defines the methodology and outcomes of instruction collaboratively with the teacher.
Classroom Roles and Setting	• *Teacher is in front of the class. Conversation is one-way.* • *Only the teacher is using the technology for delivery of the content, through multimedia tools/teacher devices. "Put your student devices away".* • *The setting is arranged for direct instruction and individual seatwork.* • *Management is directives and appropriate behaviors articulated by the teacher to the students.*	• *Teacher is in front of the class. Conversation is one-way.* • *The teacher begins teaching the students how to collaborate, construct knowledge, and create projects.* • *The setting is arranged for direct instruction and individual seatwork.* • *Directives and appropriate behaviors are created by the teacher, with buy in from the students.*	• *Teacher is in the front of a small group of students.* • *Students can select to work individually if they choose.* • *The setting is arranged for some individual seatwork as well as some desks/workstations arranged for group work.* • *Directives and appropriate behaviors are created by the teacher and student, and monitored by the teacher.*	• *Teacher guides small groups or individuals.* • *Limited whole group instruction occurs.* • *The setting is arranged for flexible work environments with varied seating types/locations.* • *Directives and appropriate behaviors are created by the teacher and student, with monitoring by the teacher and peers.*	• *School schedule is fluid and the teacher consults based on the needs of the individual/group, per project.* • *Student consistently self-paces his/her individual instruction.* • *The setting is arranged for flexible work with varied seating types/locations. The school space is reallocated to accommodate collaborative learning environments.* • *Directives and appropriate behaviors are student created and monitored with the guidance of peers and the teacher.*
Motivation and Purpose	• *Teacher bases motivation upon competitive grading.* • *Teacher's purpose is primarily compliance with curriculum standards.*	• *Teacher bases motivation upon classroom objectives/standards.* • *The teacher's purpose begins to connect curriculum standards with class interests and abilities.*	• *Teacher motivates students individually or in small groups based upon differentiated objectives/standards.* • *Teacher and students work together to develop authentic learning connections.*	• *Student works toward intrinsic motivation with frequent encouragement from the teacher and peers.* • *Student chooses how to connect with community or world issues.* • *Teacher facilitates students individually based upon their abilities.*	• *Student is intrinsically motivated toward the learning goals he/she created within the learning context the teacher has created.* • *The student creates his/her connections to the learning standards based on personal purpose, passion, and play.*
Collaboration	• *Students are working in isolation, listening/reading independently. Limited collaboration occurs from the teacher.*	• *Teacher is allowing prescriptive group work. The groups are selected by the teacher, but are not grouped based on assessment data results.*	• *The teacher places students in groups based on formative assessments.* • *Students begin to work in self selected groups or individually when appropriate based on the assignment/project.*	• *Teacher guides/facilitates small groups and individual students based upon instant feedback through online assessments/assignments.* • *Students select peer groups for collaboration, and monitor the group's progress.*	• *Teacher encourages and facilitates groups to collaborate outside of the standard classroom space and time.* • *Students may choose to collaborate with experts and peers in other locations to support higher order learning activities.*
Content and Delivery	• *The content is delivered from the textbook by the teacher and students take notes, complete assignments with paper/pencil.* • *No digital delivery or retrieval systems (Class website or Learning Management System, LMS).*	• *Content is a mix of textbook/paper and digital supplements.* • *Teacher begins to offer content to students through the LMS with teacher-created. supplements and/or other digital resources.* • *Teacher begins to use digital content to differentiate instruction.*	• *Content is delivered through the LMS as digital content.* • *The content is both teacher created and supplemental digital resources.* • *Content and assessments are regularly accessed through the LMS.* • *Multiple resources are provided for students to begin self-differentiation.*	• *Students add and share content they discover/create through the LMS to both the teacher and other students.* • *Students consistently use the LMS to self-pace and differentiate their learning in the multiple content areas.* • *Teachers monitor student progress and facilitate/guide individual student learning.*	• *The LMS serves as a library of resources created and shared by the students to support individual and group work.* • *Teacher and students consistently use the LMS to monitor and coordinate their learning, and consult with the teacher and their peers.*
Reflection and Feedback	• *Assessment is used for monitoring the students' progress and moving along to the next concept/topic.* • *Grading is the traditional A,B,C system of averaging the scores.*	• *Teacher pre/post tests for the purpose of data collection.* • *Traditional A,B,C grading. Teacher is beginning to use a rubric.*	• *Assessment is frequently given for the purpose of establishing the needs of the small groups.* • *Steps towards mastery of learning are clearly articulated.* • *Students have the ability to retest to reach mastery of learning.*	• *Teacher and student establish learning goals through a contract.* • *Grading is a narrative of mastery of learning by the teacher.* • *Moving from time-based to performance-based learning.*	• *Student and teacher establish the process towards mastery of objectives, and build a learning contract.* • *Teacher reviews the narrative of mastery of learning created by the student.* • *Performance-based assessment of learning is frequently checked and revised.*

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Appendix D

Shoulder to Shoulder Coaching Model

Frequency:

- 14 full-day visits throughout the school year
- Additional follow-up conversations via phone and/or email

Formats:

- 1 all-staff professional development session mid-year
- 4 days of participation in grade-level meetings focused on instructional goals
- 1 day of co-teaching or model teaching in select classrooms
- 8 days of individual meetings with teachers
  - Meetings were 30-60 minutes in length
  - Substitute teachers covered classrooms during each meeting

Objectives:

- Support teachers in:
  - Setting and achieving goal(s) along the ITM
  - Training on specific digital programs or apps
  - Training on physical devices used in the classroom
- Hold teachers accountable to working toward goals that were set during Transformation Orientation
- Support administrators in establishing a building-wide digital platform for conveying and discussing pertinent information
- Support communication between teachers regarding student device initiative strategies, successes, and obstacles

Appendix E

HSIRB Project Approval

WESTERN MICHIGAN UNIVERSITY

Human Subjects Institutional Review Board

Date: April 7, 2016

To: Nancy Mansberger, Principal Investigator
Peter Grostic, Student Investigator

From: Amy Naugle, Ph.D., Chair Amy Naugle

Re: HSIRB Project Number 16-04-02

This letter will serve as confirmation that your research project titled "The Impact of a Technology Integration Professional Development Program on K-6 Student Achievement Indicators" has been **approved** under the **exempt** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may **only** be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., ***you must request a post approval change to enroll subjects beyond the number stated in your application under "Number of subjects you want to complete the study***)." Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: **April 6, 2017**

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