

ASSESSING THE IMPACT OF ONE TO ONE TECHNOLOGY IMMERSION
ON STUDENT ATTENDANCE:
CHASING SHADOWS OR THE PANACEA FOR EDUCATIONAL REFORM?

A Research Paper

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II. ABSTRACT

Since the initial introduction of personal computers into K-12 classrooms in the early 1980s, proponents of educational technology have heralded the potential for computer technology to transform instructional environments and improve student achievement. In the 1990s and early twenty-first century, as computing power has increased and the per unit cost of wireless, laptop computing devices has plummeted, one to one technology immersion (where every student and teacher has access to a laptop computer) has been implemented in many classrooms and school districts across the United States. Advocates for these costly immersion projects have forecasted improved levels of student achievement, higher attendance rates, lower dropout rates, improved levels of student motivation to learn during and after the traditional school day, improved communication with parents, and acquisition of needed twenty-first century digital literacy skills as expected outcomes of these projects. In short, one to one technology immersion has been evangelized as a panacea for many of the problems and challenges facing K-12 education.

This study attempted to determine, with a limited data set, if rates of student attendance are higher within a technologically immersed school environment as predicted by advocates of these immersion projects. Student attendance rates at one of the twenty-two immersion campuses participating in the 2004-2006 statewide Technology Immersion Pilot (TIP) project in Texas were gathered, aggregated, and analyzed. Due to the presence of multiple outliers in recorded student attendance data in fall 2004 at Floydada Junior High School,

analysis for 8th grade attendance data was limited to the use of descriptive statistics. For attendance data for the entire campus, as well as grouped data for grades 6 and 7, inferential statistics (analysis of covariance) were utilized with current enrollment as the covariate, with non-statistically significant results in each case. For each grade level and the entire campus in the 34 school days following the start of technology immersion, average daily attendance was lower than pre-immersion rates, but the immersion condition was not statistically significant in accounting for these differences. Potential reasons for these observed results, as well as suggestions for further research are discussed in the following analysis.

III. REVIEW OF LITERATURE

Although US policymakers often refer to studies, surveys, and research analyses to support and defend current as well as proposed laws and legislation, support for new educational technology initiatives is generally poorly informed. Despite the billions of dollars spent each year to upgrade and install new technology hardware, software, and infrastructure in K-12 schools, “dominating teaching practices [have] remained largely constant in the years of greatest penetration of new technologies” across the K-16 grade continuum (Cuban, 129). While few observers would deny US students as well as teachers today have unprecedented access to diverse sources of information via the Internet’s World-Wide Web, and efficiencies for many administrative teaching requirements (like attendance and grade reporting) have been improved by technology, predominant instructional practices in K-12 as well as university settings have changed very little as a result of technologies introduced into the classroom environment.

Ignoring or not acknowledging this documented, broad failure of educational technology to transform instructional environments, US policymakers and educational leaders continue to pour billions of dollars annually into educational technology initiatives. A study in fall 2004 of projected educational technology spending in the United States concluded that “Overall, K-12 schools will spend more than \$7 billion on new technologies over the next 12 months” (eSchoolNews). A growing number of school districts as well as state education agencies are considering or implementing “one to one” technology immersion projects, in which every student and teacher has access to a laptop computing

device. In many cases, access to these devices is provided 24/7, where students as well as teachers are permitted to take laptops home in the evenings and on weekends to use as desired. According to some estimates, by the year 2000 over one thousand US schools were already implementing programs to provide each student at school with a laptop computing device (Milloy.) The transformative impact of technology upon business practices is well known and acknowledged. A business model is often applied to the educational environment by policymakers wanting to improve outcomes, similar to the way corporate profits have been raised in many cases through the efficiencies brought about through the use of technology. The result has been high levels of educational expenditures on educational technology solutions, which have been widespread (across school districts in the United States) and largely unquestioned by policymakers as well as other educational stakeholders.

In twenty-first century US political and academic culture, the potential for educational technology to positively transform teaching and learning, as well as improve educational outcomes at all levels, is an almost undisputed article of faith. In his 2001 book, Oversold and Underused: Computers in the Classroom, Dr. Larry Cuban thoughtfully highlights a four fold faith of educational technology evangelists. This faith involves the following “interlocking chain of reformers’ assumptions:”

- 1- Students should be provided with increased access to computer technology at school.

- 2- Increased access to technology will lead to increased student and teacher use of technology.
- 3- Increased use of technology in the classroom will lead to a transformation of instructional practice (teaching and learning)
- 4- As instructional practice is transformed, student achievement improves (Cuban, 34).

These assumptions form the foundation for educational evangelists' claim that one-to-one technology immersion is a panacea for many problems facing K-16 education. Research on educational technology's perceived positive impact is common, but results are often overgeneralized beyond the limited, specific focus of attempted research studies. A case in point is a 2003 research article by Patrick Traynor, published in the *Journal of Instructional Psychology*. The study analyzed student performance on capitalization pretests and posttests using a Computer Aided Instruction (CAI) software program. The researcher documented a statistically significant improvement of student capitalization skills in the study, but failed to utilize a control group (generally a requirement for scientifically designed research, even within the social sciences) and provided sweeping generalizations in the article's conclusions, providing what amounts to a blanket endorsement for CAI software and technology use within classrooms as a means to improve measured student achievement (Traynor, 143.) This research study is, not surprisingly, cited on the website of the commercial vendor of the CAI software package analyzed by Traynor, but the limitations of the study and its limited generalizability are not noted (Achievement Technologies.) Research

findings like these are rarely subjected to critical analysis in the popular media, but instead become additional layers in the fabric of faith enveloping twenty-first century US culture supporting the contention that any type of technology use in the classroom is favorable for student learning.

More widely known and cited research on educational technology's educational impact is John Schacter's 1999 study for the Milken Exchange on Educational Technology: "The Impact of Education Technology on Student Achievement: What the Most Current Research Has to Say." Schacter analyzed five large scale studies of educational technology use, several of which utilized meta-analysis to summarize results of hundreds of individual studies. His conclusion is straightforward and may, on its face (depending on how it is quoted), seem unequivocal. Schacter concludes:

These studies show that in over 700 empirical research studies...students with access to a) computer assisted instruction, or b) integrated learning systems technology, or c) simulations and software that teaches higher order thinking, or d) collaborative networked technologies, or e) design and programming technologies, show positive gains in achievement on researcher constructed tests, standardized tests, and national tests (9.)

The subsequent sentence to the conclusions above is pivotal, however, and should not be overlooked. Schacter goes on to write, "There is, however, evidence in some of these studies that learning technology is less effective or ineffective when the learning objectives are unclear and the focus of the technology use is diffuse" (10.) In other words, the pedagogical environment within which the technology is utilized is a critical variable affecting student achievement outcomes, as well as the specific ways the technologies are used.

This finding has enormous importance for education, and specifically for discussions involving educational technology. While many accept the contention (possibly on faith and poorly interpreted research studies) that educational technology in any form will improve student learning, a careful reading and analysis of the literature reveals that the specific ways in which technologies are utilized in the classroom is pivotal. As this researcher has argued previously:

In the final analysis, it will be the predominant pedagogy, rather than the technology, which will determine the direction and scope of impact of one-to-one technology immersion programs on student achievement (Fryer, 32).

Educational technology vendors as well as legislators may not like this conclusion, since it is less definitive and clear than the popular wisdom guiding educational technology expenditures in many circles. However, this perspective is consistent with existing research literature, and as a conditional endorsement of educational technology may be part of a more realistic paradigm for evaluating the benefits as well as costs of educational technology initiatives.

Academic research journals are replete with examples of studies about different uses of educational technology, but when it comes to the specific topic of measuring the impact of one-to-one technology initiatives, research is much harder to find. According to Andrew Zucker in January 2004:

Research has not yet provided policymakers with enough hard evidence of the benefits and costs of 1:1 computing to help them determine if the initiatives are worth what they cost, nor has research established the mix of factors that make 1:1 computing more or less effective (371).

Despite this lack of “hard evidence,” states as well as individual school districts have embarked on well-publicized and well-funded endeavors to provide all

students and teachers in selected schools with their own laptop computers, for school as well as home use. Under the prevalent mentality of “the more computers there are in the classroom, the better student learning will be,” the state of Maine embarked on an ambitious project in 2002 to provide every sixth, seventh, and eighth grade student and teacher in the state (over 38,000 people) with their own wireless laptop computer (Snow.) The Maine immersion project is one of the largest and well-known, but other projects on smaller scales are ongoing in other parts of the United States.

The research emerging from these one-to-one technology implementations is generally positive, but often qualitative in nature and limited in its generalizability due to lack of scientific design and rigor. Lowther, Ross, and Morrison’s 2003 study of twenty-one middle school classrooms in a Michigan school district implementing an “optional” student laptop program (parents had to pay a \$50 per month lease fee) found the following results:

1. Laptop classes reflected less usage of more traditional, teacher-centered strategies.
2. Students in laptop classes reported higher levels of interest and engagement with instruction and assigned work.
3. Laptop students rated higher on measures of computer literacy.
4. Students in sixth and seventh grades demonstrated a highly significant difference (improvement) in measured writing achievement levels on a district-created assessment.
5. Problem solving achievement results (on a researcher developed instrument) for sixth grade students using laptops were significantly higher than scores for comparable control group students.

Although in this Michigan school study not all students were provided with access to a laptop computing device, these findings are consistent with those of other

studies where immersion has been implemented more broadly. Kerr, Pane, and Barney's December 2003 technical report for the Quaker Valley School district in Pennsylvania on behalf of Rand Education found similar positive impacts:

Students had increased confidence, more willingness to work with and teach other students, and improved communication skills. Some students were reported to take more responsibility for their own learning.... Positive impacts for teachers included the availability of new materials and activities for lessons, and increased capacity for communication with students, parents, peers, and principals (Kerr, xii).

Negative findings were also reported, however, including:

Inappropriate [computer] use, and for some students, social difficulties due to excessive use of the computers.... teachers also reported an increase in workload related to using the technology for both administrative and instructional purposes (Kerr, xii).

In the cases of both the Michigan and Pennsylvania laptop studies cited above, researchers clearly stated the limited generalizability of their research findings due primarily to design limitations. As an example, in the Michigan study, authors conclude:

Given the ex post facto design employed in this study, the present results can be considered only suggestive rather than conclusive about the benefits of the laptop program. Additional research, using experimental-type methodology is needed to demonstrate similar findings, in diverse contexts and with other student groups (e.g. disadvantaged populations.) (Lowther, 43.)

Recognizing the need for scientifically designed research on the impact of one-to-one technology immersion, the Texas Education Agency in 2002 successfully sought to secure permission from the federal government to utilize No Child Left Behind (NCLB) Title II, Subchapter D funds in a competitive grant program titled, the "Technology Immersion Pilot" (TIP.) After funding was

secured and RFP responses were received from prospective vendors as well as participating school districts, twenty-two Texas middle schools serving grades six, seven and eight were selected as “immersion” campuses in the TIP project, and twenty-two other Texas middle schools were selected as “control” campuses in the project. A quasi-experimental research design was developed utilizing a philosophical framework similar to that used in large scale immersion projects in Maine and elsewhere. Immersion and control campuses were paired based on various factors, including geographic location and student population. All immersion campuses have “rolled out” laptops to both teachers and students during fall 2004, and funding for the project will continue through summer 2006. The Texas Center for Educational Research (www.tcer.org) received the TIP project contract to conduct formative, ongoing, and cumulative assessments of student and teacher perceptions and activities related to the project, and will study 2004-2005 sixth grade students through the 2006-2007 academic term (Shapley).

Central to the research agenda of the TIP project specifically, and one to one technology immersion projects generally, is the need to scientifically document and analyze the impacts of one to one computing environments on a wide variety of variables. One of these variables, believed to be highly relevant to student achievement as well as overall teaching and learning within education, is student attendance. Research studies as well as anecdotal stories emerging from immersion projects suggest that students in these environments tend to be more engaged in their school activities and therefore motivated to attend school. As a result, student attendance rates are predicted to go up when a campus is immersed

in a one to one computing environment. This study attempted to explore this hypothesis on a limited basis with student attendance data available for Floydada Junior High School in fall 2004, one of the twenty-two selected immersion campuses in the Texas TIP Project.

These results are not only of academic interest to researchers exploring the observed and measured impacts of educational technology, but also practically significant to policymakers considering the creation, renewal, or expansion of other one to one technology immersion programs. The results are also of interest to educational administrators, whose budgets are significantly affected by rates of average daily attendance. If one to one technology immersion initiatives significantly increase student average daily attendance, administrators are likely to be supportive of these projects, since that impact would correlate to increased levels of state-provided funding for the local district. If those increased revenues can be demonstrated to exceed over the long term the startup and maintenance costs for these initiatives, one to one projects could effectively pay for themselves and result in an incontrovertible educational benefit: Higher rates of student attendance in school. Other intentional as well as incidental benefits from one to one technology immersion are anticipated as well and also deserve thorough analysis, but a basic focus on the potential impact on student attendance rates appears to be a logical place to start in a rigorous analysis of this type.

IV. METHODS

This study utilized an ex post facto research design. A convenience sample of student attendance rates was obtained for analysis, so methods including random selection and/or random assignment of subjects to treatment levels were not used. Descriptive statistics as well as ANCOVA were utilized to test the following null hypotheses:

1. Rates of student attendance when a rural, junior high campus is not immersed with one to one technology are equal to those of the campus when students and teachers are immersed.
2. Rates of student attendance broken down by grade level for a non-immersed condition are equal to rates for an immersed condition for students attending a rural, junior high campus.

Floydada is located approximately fifty miles east of Lubbock in the Texas South Plains. Floydada Junior High School is currently 81 years old, having been built in 1923 (Gilroy.) Participants in the study were sixth, seventh and eighth grade students attending Floydada JHS between August 18th and November 23rd, 2004. During that time, the enrollment at Floydada JHS fluctuated between 220 and 231 total students. The breakdown of student enrollment variability during the study period is detailed in Table 1 below:

Table 1: Enrollment at Floydada JHS: 18 Aug – 23 Nov 2004

	Days Measured	Minimum	Maximum	Mean	Std. Deviation
Total Enrollment	68	220.00	231.00	225.7059	3.21405
6th Grade	68	70.0	74.0	72.382	.7336
7th Grade	68	78.0	83.0	80.353	1.4117
8th Grade	68	69.0	75.0	72.956	1.5495

According to the Handbook of Texas Online concerning Floyd County, where Floydada Junior High School is located,

In 1982, 98 percent of the land in the county was in farms and ranches, with 70 percent of the land under cultivation and 59 percent irrigated. Floyd County ranked twenty-first in the state in agricultural receipts, with 75 percent coming from crops. Primary crops were soybeans, sunflowers, cotton, wheat, sorghum, and corn; onions, bell peppers, cucumbers, and pecans were also grown in sizable quantities. The leading livestock products were cattle, milk, and hogs (Anderson and Long.)

In 2004, a large percentage of the Floyd County population continues to be employed in agricultural related jobs. Student enrollment at Floydada JHS for 2003-2004 according to the Texas Education Agency was 240 students. While recent years have seen a decline in the numbers of migrant families working in the Floydada community, due in part to the closure of major vegetable processing facilities, general population trends (including student attendance) continue to be strongly influenced by the agricultural economy. The overall population of Floyd County, the town of Floydada, and Floydada JHS are in gradual decline, consistent with population trends in other Midwestern rural communities.

Floydada JHS has a traditional academic schedule of rotating classes for students, with each class period during the day consisting of less than sixty minutes for instruction. The student population at Floydada JHS is diverse and primarily Hispanic. In order to qualify as an applicant campus for the Texas TIP project, each school district had to be classified as “economically disadvantaged” and serve a substantially large number of minority students. The threshold levels

for these classification categories were established by the Texas Education Agency in the TIP grant project RFA, and were met by Floydada ISD.

Subjects in this study were selected based on convenience, since the school district is participating in the TIP project as part of a collaborative group involving the Texas Tech College of Education (www.educ.ttu.edu/tip). The population for this study includes all sixth, seventh and eighth grade students in predominantly rural, Midwestern communities living in towns with less than 5000 total residents.

Teachers at Floydada JHS received laptop computers and a week of intensive technology orientation and curriculum integration training in August 2004 in the initial phase of the TIP project. Students at Floydada JHS received their laptop computers on October 6, 2004. Prior to that “student rollout” date, parents and students attended orientation workshops provided by district personnel and signed agreements regarding the respective limits of school district and individual household liabilities for purchased student laptops. Only students whose parent signed the agreement were eligible to receive a laptop on October 6th. Less than 10 students in the school were unable to receive laptops on the student rollout date, the rest received them in grade-wide meetings held in the school auditorium during the regular academic day on October 6th.

In this study, subjects were divided into groups based on the following variables and criteria. Student attendance rates were aggregated by grade level, and as seen in Table 1 previously, these numbers were fairly homogeneous. Secondly, student attendance rates were classified based on immersion status.

Days for recorded student attendance prior to October 6th, the student laptop rollout date, were classified as “non-immersed,” dates for recorded student attendance including and after October 6th were classified as “immersed.” For the study period of August 18th through November 23rd, students attended class for 68 days. Conveniently, 34 of these days (prior to October 6th) were therefore classified as “non-immersed,” while an equal number of days (34) were classified as “immersed.”

This equality in the number of subjects assigned to the treatment level for “immersion status” was statistically important, since the utilized Levene’s test for homogeneity of variance required for inferential statistics including Analysis of Variance (ANOVA) and Analysis of Covariance (ANCOVA) is most robust when the number of subjects in treatment groups is equal.

The instrumentation utilized to collect data for this study was the collection of attendance rates by day (including total absences by grade level and total enrollment by grade level) by the Floydada JHS administrative secretary. This collected data was aggregated by the administrative secretary and provided at the researcher’s request by the Floydada JHS principal.

Reliability of collected data is reasonably assumed to be high, in part due to the high stakes of attendance reporting for Texas schools and school districts including Floydada ISD. A large portion of state educational funding is assigned to districts based on student average daily attendance (ADA.) Therefore, district administrators and support staff generally exhibit high levels of attention to detail in accurately documenting student absence and attendance rates in Texas schools.

The dependent variable in this research study was daily student attendance. As previously stated, the general research hypothesis of interest in this study was whether or not the immersion of students and teachers in a one to one computing environment has a significant impact on rates of student attendance, and whether that impact varied by grade level.

The independent variables in the study were the immersion status (non-immersed or immersed), and total student enrollment. Daily student enrollment numbers were obtained by the researcher broken down by grade level, to permit analysis of possible grade level differences. In an attempt to control for initial differences, total student enrollment was utilized in the ANCOVA procedure as a covariate.

The expectations of the researcher in conducting this study were that rates of student attendance would be higher following the “student laptop rollout” date, but not significantly greater due to the small sample size and the fact that the TIP project was only in its initial semester.

V. RESULTS AND DATA ANALYSIS

Collected attendance data was aggregated by grade level and coded by immersion status (as previously described) and entered into SPSS (Statistical Package for the Social Sciences.) An initial exploratory analysis was conducted utilizing descriptive statistics to identify general trends and evaluate the distribution of collected data sets. This analysis included formative tests for homogeneity of variance, using Levene's test.

Histograms for total attendance (shown in charts 1 and 2 below) revealed distributions for total student attendance prior to immersion (student laptop rollout) and after immersion roughly approximated normalcy. The distribution for attendance values after immersion appears to be slightly negatively skewed.

Chart 1:

Total Attendance Histogram

For STATUS = Not Immersed

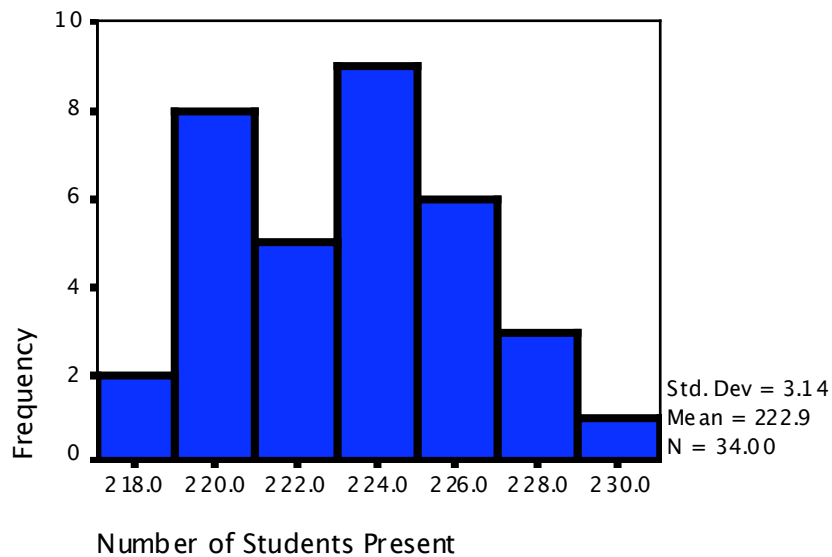
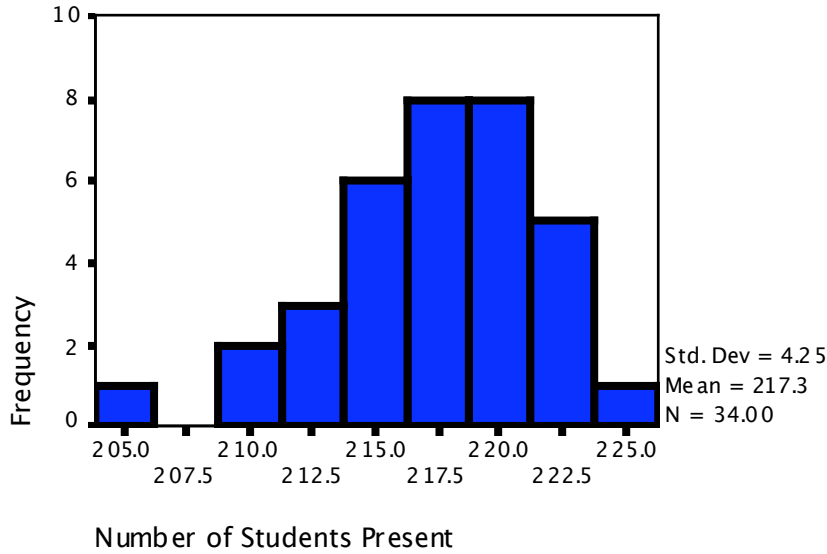


Chart 2:
Total Attendance Histogram
For STATUS = Immersed

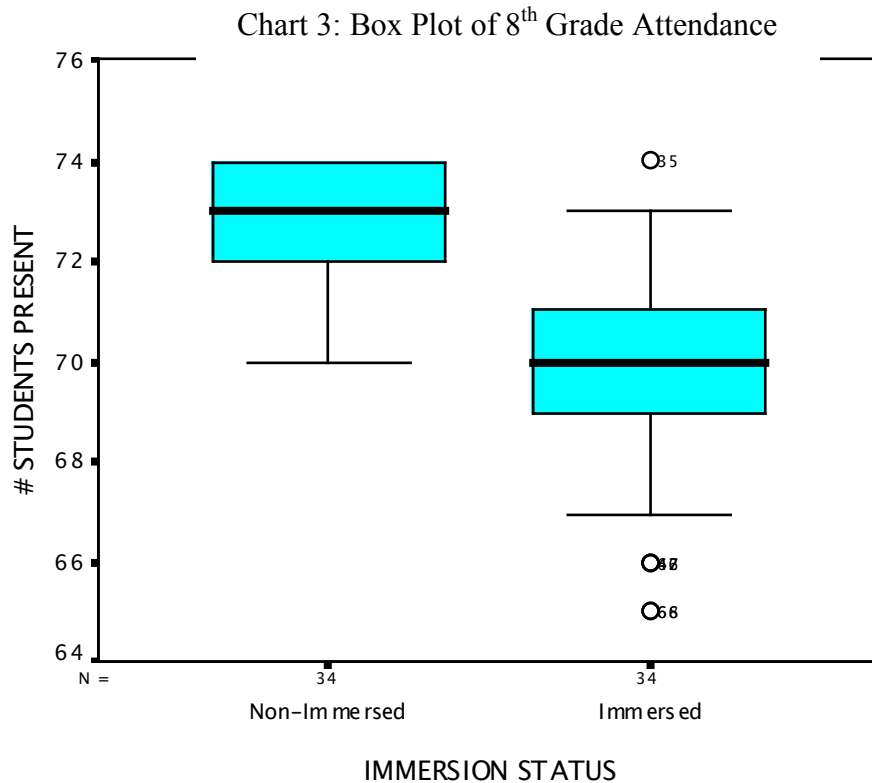


Results for Levene’s Test of Homogeneity of Variance at the .05 level of significance reveal that the homogeneity assumption was met for the overall attendance rates for students and for students in grades six and seven, but not for eighth graders. Results are shown in Table 2 below.

Table 2: Test of Homogeneity of Variance (Based on Mean)

	Levene Statistic	df1	df2	Significance
Total Attendance	2.137	1	66	.149
6 th Grade Attendance	1.701	1	66	.197
7 th Grade Attendance	1.530	1	66	.221
8 th Grade Attendance	6.830	1	66	.011

The reason aggregated attendance data for 8th grade students failed to meet the homogeneity of variance test (significance of the test was < .05) was because of multiple outliers in the data set. These outliers are clearly seen in a box plot of 8th grade attendance rates for the study’s timeperiod shown in chart #3 below:



Although several statistically approved methods exist for addressing the problem of outliers in a data set, in this case the researcher determined it was not appropriate to adjust for outliers. The justification for this decision is that in calculating average daily attendance, the state education agency does not adjust for outliers. Raw attendance data is used and averaged to calculate unadjusted ADA values. If adjusted attendance data was used in this analysis, it could result in misleading conclusions inconsistent with the state’s methodology for calculating and financially rewarding attendance rates. For these reasons, the 8th grade attendance data was not adjusted and outliers were kept. Since outliers caused the homogeneity of variance assumption to be rejected for 8th grade attendance data, however, inferential statistical methods including ANOVA and ANCOVA could not be performed on the 8th grade attendance data.

Analysis of Covariance (ANCOVA) was performed on total attendance rates for the research period (including students in grades 6, 7, and 8,) using total attendance as the dependent variable, immersion status as the independent variable, and total enrollment as the covariate. A non-statistically significant F value was obtained from this analysis, $F(1,65) = 0.967, p = .329, n^2 = .015$. Descriptive statistics obtained during the ANCOVA procedure are shown in Table 3 below, and reveal that ADA for students after immersion was less than previously recorded ADA. Prior to immersion, ADA for the 34 school days was 222.85. After immersion, ADA for the next 34 school days was 217.26.

Table 3: Descriptive Statistics for Total Attendance: 18 Aug – 23 Nov 2004

STATUS	Mean	Std. Deviation	N
Non-Immersed	222.8529	3.14433	34
Immersed	217.2647	4.25198	34
Total	220.0588	4.65811	68

ANCOVA procedures were similarly conducted for 6th and 7th grade attendance rates for the study period, Descriptive statistics accompanying these procedures are detailed in Tables 4 and 5 below. ADA for 6th grade attendance after immersion was slightly less (69.8) than ADA before immersion (70.9). ADA for 7th grade attendance after immersion was also slightly less (77.8) than ADA before immersion (79.2).

Table 4: Descriptive Statistics for 6th Grade Attendance: 18 Aug – 23 Nov 2004

STATUS	Mean	Std. Deviation	N
Non-Immersed	70.971	1.3593	34
Immersed	69.824	1.9144	34
Total	70.397	1.7461	68

Table 5: Descriptive Statistics for 7th Grade Attendance: 18 Aug – 23 Nov 2004

STATUS	Mean	Std. Deviation	N
Non-Immersed	79.176	1.9302	34
Immersed	77.794	1.4095	34
Total	78.485	1.8161	68

Non-statistically significant results were obtained for these ANCOVA procedures broken down by grade level: 6th grade attendance, $F(1,65) = 1.406$, $p = .240$, $n^2 = .021$; 7th grade attendance, $F(1,65) = 0.164$, $p = .686$, $n^2 = .003$. As previously discussed, the ANCOVA procedure could not be utilized on 8th grade attendance data since the homogeneity of variance assumption was violated due to numerous outliers in the data set, as revealed by use of Levene's test.

VI. DISCUSSION AND CONCLUSIONS

As expected by this researcher but not predicted by the prevalent cultural faith in instructional technology to bring about positive instructional change in the classroom, the immersion of the Floydada JHS student body and teaching faculty in fall 2004 did not significantly impact rates of student attendance. This result is not surprising, especially given the fact that the TIP project is only in its first semester, and only the first 34 days of student immersion with laptop computers were analyzed in this formative research study.

An unexpected result of this study was the observation that ADA for all grade levels was actually lower following immersion rather than higher. Although this researcher did not expect to find a statistically significant difference in attendance levels, he did expect to observe increasing measured levels of student attendance following immersion rather than decreased levels. This result demands careful scrutiny and analysis, which may provide suggestions for subsequent and more comprehensive research related to this topic.

It is not clear why student ADA went down rather than remained constant or increased during the study period. It is possible that as the academic term progressed, more frequent extra-curricular activities required greater numbers of students to be absent from school. It is also possible that as harvest time for crops grown in the Floydada area approached later in the term, larger numbers of students were needed to assist family members with extra farm duties. Illnesses caused by seasonal allergies as well as influenza are also possible explanations for higher levels of student absenteeism / lower levels of student attendance later

in the fall 2004 academic term. Absences surrounding the Thanksgiving holidays occurring in the latter part of the study period may also account for lower levels of student attendance.

The inability of the available data set to explain this trend suggests several possibilities for future research. Rather than using current student enrollment as a covariate, a subsequent analysis of student attendance could use student enrollment as an independent variable (along with immersion status) and the past year's attendance numbers (for the same date) as a covariate. In this way, seasonal attendance trends affected by extracurricular activities or illnesses could be statistically controlled within utilized statistical analysis procedures.

Additionally, attendance data from other TIP project control campuses as well as immersion campuses could be utilized in a comparative analysis. Rather than merely comparing pre-immersion to post-immersion attendance rates at an individual campus, as was done in this research study, a more robust analysis could compare attendance rates at control campuses to experimental / immersion campuses. Current enrollment could again be used as a covariate to adjust for smaller or larger campus sizes. This study could potentially utilize a degree of random sampling, with random days in the academic term selected for comparative analysis. Since all TIP immersion campuses are required to have laptops in the hands of students as well as teachers by the end of the fall 2004 term, a comparative analysis of attendance rates during spring 2005, fall 2005, and/or spring 2006 on TIP control and immersion campuses would meet requirements for this proposed study. Rather than individually contacting each

campus for these attendance statistics, data is likely available and retrievable for these campuses through the Texas Education Agency's Public Education Management System (www.tea.state.tx.us/peims/). Since attendance data is publicly reported, this study and proposed similar studies have the added benefit of not requiring a human subjects consent form generally required for similar research projects.

Although the statistical analysis procedures employed in this study were more advanced than simple correlational methods, the research question was extremely basic: Does the immersion of a student population in a one to one computing environment significantly (and positively) influence student attendance? In this study, the researcher failed to reject both null hypotheses, since the differences between attendance levels before immersion and after immersion were not very large. By studying attendance levels over a longer period of time, or conducting a more sophisticated study as previously described using control as well as immersion campuses in the TIP project, the likelihood of finding statistically significant differences could be increased.

Given the present political and educational climate described in the preceding review of literature, however, it is likely that ANY observed increase in student attendance levels for TIP immersion campuses (whether statistically significant or not) will be heralded by educational technology advocates as proof of the program's efficiency, utility, and viability. This pressure for simplistic, correlational conclusions regarding one to one technology immersion is unfortunate but not unexpected in the current political and educational climate.

Pundits always seem to be championing a new reform de jure for education, touted to solve problems and make life easier. The harsh reality generally seems to be, however, that the problems facing education are complex and multi-dimensional, and the programs developed to address those issues must be similarly sophisticated. It is possible that one to one technology immersion will be accurately perceived as a panacea for educational problems, since laptops in the classroom seem likely to serve as a significant, tangible change agent for prevailing educational processes and pedagogy. Those results remain to be documented in scientifically designed research studies, however. The next year and a half of TIP project implementations and analyses will likely be fruitful in helping to more adequately answer the questions considered in this research study as well as others focused on one to one immersion project impacts. Once “the results are in” and analyses have been performed, it will be interesting to see if reported conclusions are consistent, and if so, if policymakers will adjust their educational agendas and spending priorities as a result. Billions of dollars in educational expenditures will hang in the balance, as well as the potential nature of educational experiences for millions of K-16 students across the United States. Should every student in school have his/her own laptop computer? Check back with Texas TIP project immersion campuses, the Texas Center for Educational Research, and this researcher in two years. The results may surprise us all. Or, results may fall in line with previous studies of educational technology use, leading to the conclusion, “It depends what the teacher does with the technology and what the teacher asks the students to do.”

Despite policymaker and administrator professed desires to the contrary, it seems most likely that the individual teacher in the classroom makes the biggest difference and impact on student learning, rather than the technology that is present or absent from the environment. Academics can conduct all the statistical analyses they want, but that is one conclusion this researcher is willing to take to the bank.

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