

**LAPTOPS FOR LEARNING**

**PROGRAM EVALUATION**

**2011**

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## Summary

This report details the final results of the Year 7 evaluation of the Laptops for Learning one-to-one computing initiative in Fullerton School District located in Orange County, California. The Laptops for Learning initiative was previously evaluated at the end of Years 1, 2, and 4. The focus of the Year 7 evaluation is student achievement in Math and English Language Arts (ELA) standardized tests and school and classroom readiness for 21<sup>st</sup> century teaching and learning environments.

Fullerton School District's one-to-one laptop program began in the 2004-05 academic year as a pilot of the Laptops for Learning initiative. At that time, students in select grades at select schools had 24/7 access to Macintosh Laptops as an integral part of the teaching and learning process. Since its first year, the Laptops for Learning initiative has changed in its intensity and its configuration. For this evaluation there are two distinct models of implementation of the one-to-one program: 24/7 access and school day access.

Data collected and analyzed for the Year 7 evaluation indicates:

- Students who have 24/7 access to laptops out perform students with no access or school day access, regardless of school, on ELA standardized assessments
- Students who have no laptop access out perform students who have school day access to laptops, regardless of school, on ELA standardized assessments
- There are no significant differences on Math standardized assessments across student laptop access
- Differences in Math standardized test scores can be attributed to individual school situations
- Between 2007 and 2010, both Math and ELA scores on standardized tests have improved for all schools in the District
- Between 2007 and 2010, students who had 24/7 laptop access (regardless of school) showed greater improvement in ELA test scores than other students in the District
- There exists pockets of Target readiness for 21<sup>st</sup> century teaching and learning environments within the District
- Robert C. Fidler is the only school that consistently reports readiness for 21<sup>st</sup> century teaching and learning
- Hermosa Drive, Acacia, and Richman have some grade levels with Target readiness for 21<sup>st</sup> Century teaching and learning
- Golden Hill and Valencia Park showed consistent but different levels of readiness between upper and lower grades
- At Nicolas, there was consistency across content areas with the exception of Special Education access
- Other schools do not appear to have any consistency in access or professional development practices and can at most be considered Mid level readiness for 21<sup>st</sup> Century teaching and learning

- Recommendations include:
  - Schools with school day laptop access should review what is happening at schools with 24/7 access and see how this model can be adapted to their situation.
  - The District needs to continue to work on having a clearly defined system for mentoring newer 1:1 teachers (e.g. less than 2 years in a laptop program), and for disseminating best practices with teaching with technology (e.g. video review of lessons,...).
  - To continue with recommendations from the Year 4 evaluation, each school must have a clear scope and sequence (perhaps as a school tech plan) that outlines available technology and how it is used.
  - There needs to be greater cohesion within schools (upper and lower grades) for 21<sup>st</sup> century readiness. This could be considered an extension of the Year 4 evaluation in which we recommended a clearly defined scope and sequence for technology access and use.
  - The District should examine and develop a plan for technology use in Special Education classrooms.
  - The District should consider a clearly defined data system that allows for tracking of individual student of data over time if they wish to be able to make conclusive decisions about the impact of laptop access or not on student achievement
  - Based on the data that showed consistency over time in which students with 24/7 access had statistically significant higher ELA achievement, we recommend that the District shares this information with parents because it highlights that having a laptop for more years has greater impact.

## Introduction

Fullerton School District in Orange County, California has made a dedicated effort to enhance learning of its students through the use of educational technology. In particular, since 2004, several schools in Fullerton School District have been part of the Laptops for Learning Initiative.

The Laptops for Learning Initiative placed Apple laptop computers in the hands of students to allow for 24/7 access to academic content. Now in its 7<sup>th</sup> year the Laptops for Learning program operates in two different models.

### 24/7 student access:

Robert C. Fisler - grades 2-8

Hermosa Drive - GATE program in grades 3-6 and all classes in grades 4-6

Nicolas Junior High School – 70-76 students who self elected involvement

### 8 hour school day access

Maple School - grades 3-6

Orangethorpe School - grades 5-6 (5<sup>th</sup> grade started in 2010/2011 academic year)

Pacific Drive Elementary - grade 6 only

Other schools or grade levels within these schools do not have a 1:1 program however students in those classrooms have access to laptop carts and other technology (e.g., iPod Touch) on a unique basis dependent on school and individual teacher.

The Laptops for Learning initiative has been evaluated by external evaluators multiple times (end of first year, end of second year, end of fourth year). Findings over the course of the evaluations have consistently found that using the laptops positively impacts student achievement as evidenced on standardized test scores.

We know from research on the impact of 1:1 programs in schools (Mouza, 2008; Trimmel & Bachmann, 2004) that the greatest benefits of a 1:1 program are not always evidenced in standardized test scores, but can be seen in the ways these students are prepared for 21<sup>st</sup> century citizenship.

The International Society for Technology in Education (ISTE) has clear technology standards for students, teachers and administrators. Further ISTE purports that “Today’s educators must provide a learning environment that takes students beyond the walls of their classrooms and into a world of endless opportunities. Technology standards promote this classroom transformation by ensuring that digital-age students are empowered to learn, live, and work successfully today and tomorrow” (<http://www.iste.org/standards.aspx>). Within the ISTE framework are essential conditions. These conditions among other things stress the importance of equitable access, skilled personnel, on-going professional development, technical support, student-centered

learning, and an alignment between curriculum and what we know about digital age learning (<http://www.iste.org/standards/nets-for-students/nets-for-students-essential-conditions.asp>).

As a result, the goals of this evaluation are to:

1. Document impact of the different implementation models on student academic achievement (as evidenced by standardized test scores), and
2. Look at the degree with which each of the models and the non-laptop schools can be considered a 21<sup>st</sup> century learning environment and use this information to make recommendations and decisions about the Laptops for Learning initiative.

This evaluation will be presented in two parts. For part one, student achievement, we will report on statistical analysis of student data. For part two, 21<sup>st</sup> century learning environments, we will be reporting on analysis of teacher and administrator perceptions of technology access, content/focus, and professional development as completed on an adapted version of the CEO Forum School Technology and Readiness (STaR) chart (Appendix).

From the STaR chart, we are able to describe a school technology profile and identify whether a school/program is using technology effectively and if there are specific areas for programs to focus on to show greater evidence of a 21<sup>st</sup> century learning environment.

## Evaluation Design

This report describes the 7<sup>th</sup> year evaluation of the Fullerton School District's Laptops for Learning Program. Although conducted and presented at the end of the 7<sup>th</sup> academic year, student test score data is from the 4<sup>th</sup> through 6<sup>th</sup> years of program implementation.

The evaluation was conducted in two parts: Student Achievement Data and 21<sup>st</sup> century learning environments.

### Student Achievement Data

Student achievement data from 2007 to 2010 were provided by the District. We did not receive any individual student data and individual students were not able to be identified from the data provided. Specifically, data were provided by 'average score' per grade level per school. Given the data provided we analyzed the data by laptop access (1:1 24/7, 8-hour school day, and no laptop).

The complexity of the student achievement data analysis was compounded by the fact that since the program was last evaluated, individual schools and grade levels have changed their model of laptop implementation. With the exception of Robert C. Fidler and Hermosa Drive where the laptops have been part of the school culture consistently, other schools such as Maple, Pacific Drive and Orangethorpe only began the 8-hour school day access program in 2006-2007 school year in 6<sup>th</sup> grade. Maple school expanded this to 4<sup>th</sup> grade for the 2007-2008 school year and to third grade in 2009-2010.

Using a statistical analysis program (SPSS), student achievement data was organized by program and comparisons across programs were made. Because Math and ELA are the only two subjects consistently assessed with standardized tests across all grade levels, we only analyzed these two content areas. We focused on three different analyses. *The first two are for 2010 data only:*

1. Using data provided as average score per grade level per school, we compared programs and accounted for individual school differences.
2. Given that the 8-hour school day access is most consistently in 6<sup>th</sup> grade, we also compared student achievement data in Math and ELA across program implementation just at the 6<sup>th</sup> grade level.
3. Using data provided we examined trends or growth over time (2007-2010) for student achievement data at the program level (also accounting for individual school differences).

To compare student achievement data at the program level, a series of Analysis of Variance (ANOVA) were performed on the ELA and Math student achievement data. Specifically, average test score per grade level was used as the dependent variable, and school and program implementation/laptop access were the independent variables. What this means is that we were

able to control for the different school dynamics when grouping schools by program. A follow up Bonferroni post hoc was used to compare mean test scores from each program to the others.

To compare just the 6<sup>th</sup> grade data we also completed an ANOVA but did not account for individual schools.

To determine growth in test scores, a pair of 3 (treatment) X 4 (test year) repeated measures ANOVA was calculated, with academic year as the repeated measure and ELA and math scores as the dependent variables.

## 21<sup>st</sup> Century Learning Environment Analysis

In order to explore potential differences between the Laptops for Learning program implementation models and non-laptop schools and to guide future decisions about the program a survey adapted from the CEO forum School Technology and Readiness (STaR) chart was used.

The STaR chart is a tool that was developed (and is no longer available) by the CEO Forum with the goal of guiding schools in decision making to provide a 21<sup>st</sup> century learning environment. The STaR chart is a matrix that details different scenarios representative of different levels of technology in areas of access, content/focus for learning, and professional development. To complete the STaR chart, users identify which scenario best represents the current conditions at their school site or grade level/department. We modified the chart to be more current. For example, we deleted questions about availability of drill and practice software and added questions about availability of learning management systems. The survey is provided as the Appendix.

We provided an electronic copy of the survey to all schools in the District, requesting that at schools with 1:1 programs administrators and a teacher/teachers at each grade level involved in the program complete the chart separately. We requested individual completion for two reasons: 1) to allow for triangulation of results and 2) to gain a holistic perspective for completion of the school technology profile. We requested for schools where there is no laptop program to have only the administrator complete the survey.

Completed charts were returned to us and we collated responses to create a school technology profile. For each section (i.e., Access and Professional Development) we profile schools and classrooms as low, mid, high, or target level. Profiles in which Access or Professional Development were ranked as high or target level indicates a higher degree of readiness for 21st century teaching and learning. Readiness only indicates Access to technology and appropriate Professional Development; it does not indicate successful use of the technology. Readiness, however, is a necessary precursor to the implementation of 21st century teaching and learning.

## Findings

Findings of the evaluation will be reported according to the question being addressed.

### Student Achievement

Student achievement data is presented in three different ways:

1. Program level
2. 6<sup>th</sup> grade only
3. Growth over time by program

### Math and ELA comparisons by program

Table 1 shows means and standard deviations for Math and ELA test scores at the program level (24/7 access, school day access, no laptops). It is clear from Table 1 that the 24/7 access to laptops results in higher average test scores for Math and Language Arts than for school day access or no access.

		ELA				Math			
Program		2010	2009	2008	2007	2010	2009	2008	2007
24/7	<i>M</i>	411.79	405.5	393.07	371.38	452.73	444.18	434.28	402.81
	<i>SD</i>	(15.67)	(15.55)	(17.59)	(27.28)	(33.50)	(41.12)	(34.97)	(41.18)
school day	<i>M</i>	347.18	343.22	334.76	325.26	375.48	358.82	348.32	337.50
	<i>SD</i>	(20.28)	(2.71)	(7.96)	(5.35)	(22.80)	(28.66)	(14.41)	(12.84)
no laptops	<i>M</i>	372.80	365.28	357.10	352.61	406.18	395.89	383.66	377.34
	<i>SD</i>	(30.10)	(28.02)	(29.31)	(27.66)	(37.72)	(37.76)	(37.82)	(33.96)

Table 1. Prog level means & standard dev.

However, we are all aware that individual schools have unique student populations and this must be considered if making conclusions about program impact. Looking specifically at the data for 2010, we completed ANOVAs to determine if there were significant differences between schools within each program. The ANOVAs showed that the differences between schools in ELA test scores were marginally significant,  $F(2, 68) = 3.03, p = .055, \text{partial } \eta^2 = .082$ . Consequently a Bonferroni adjusted post hoc analysis was performed to control for individual school differences. The Bonferroni adjusted post hoc tests indicated that students with 24/7 laptop access still had significantly higher ELA test scores than students with school day access or no access,  $p < .001$ , even when controlling for school. Students with school day access had lower ELA test scores than those with no laptop access,  $p < .01$ . These findings suggest that the 24/7 laptop access resulted in higher ELA test scores than the school day access or no laptop access.

When looking at Math test scores for 2010, ANOVAs showed that there were robust significant differences between schools in Math test scores,  $F(16, 68) = 9.45, p = .001, \text{partial } \eta^2 = .70$ .

Like the ELA scores, this is to be expected due to the unique population at each school. When individual school was controlled for, there were no significant differences in 2010 Math scores,  $F(2, 66) = 1.56, ns$ . These findings suggest that the effect of schools had more of an impact on Math test scores than the laptop access.

We must remember that this analysis is for 2010 only and does not take into consideration number of years for which the students have been part of a laptop program or not. In summary, for 2010 on ELA standardized tests students who have 24/7 laptop access out perform students with school day access or no laptop access. The differences between test scores for Math for students with 24/7 access, school day access and no laptop access are not statistically significant.

## 6<sup>th</sup> grade data

We chose to examine 6<sup>th</sup> grade data as its own set of data because this was a grade level in which all three laptop programs (24/7 access, school day access, and no laptops) were represented across multiple schools.

Analysis of the 2010 data indicates that students with 24/7 laptop access had statistically significantly higher ELA and Math test scores than 6<sup>th</sup> grade students with school day access,  $p < .05$ . However, the difference between 24/7 access and students with no laptops was not statistically significant for 6th grade Math or ELA. Differences between school day access and no laptop access were also not statistically different. Because we did not have individual student data, we did not have the power to find significant differences between 24/7 access and no laptop access, however there is practical significance as evidenced by the higher average scores across student laptop access.

Figure 1 contains three graphs. These graphs represent the average ELA and Math student achievement data for the different models of laptop access at the 6<sup>th</sup> grade level.

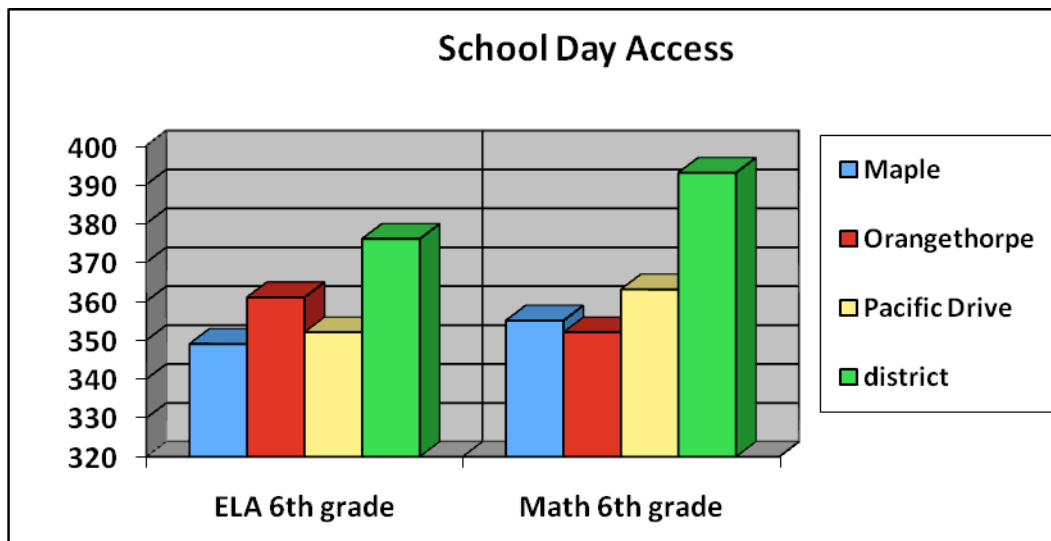
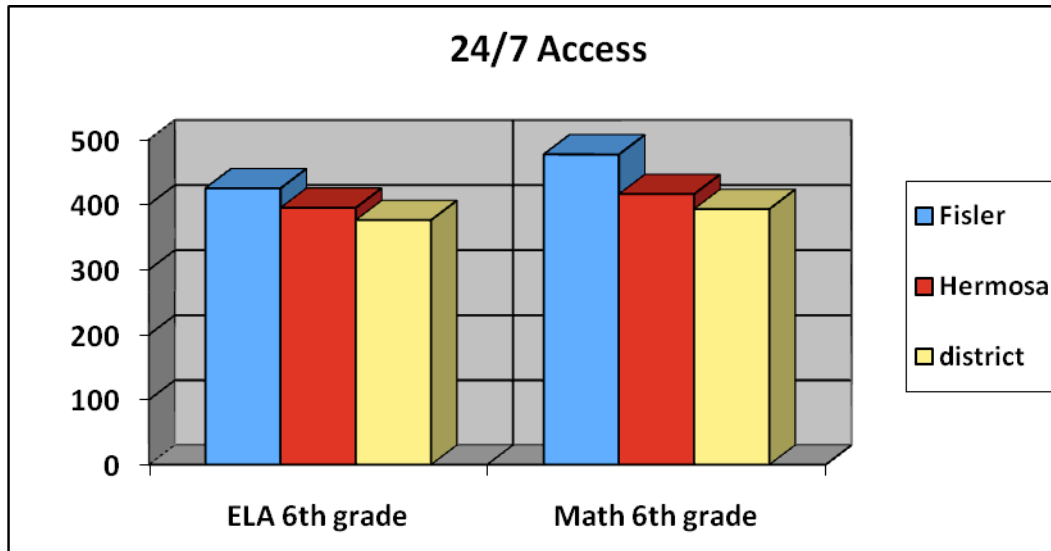
The first graph shows the two schools (Robert C. Fidler and Hermosa Drive) at which all students in 6<sup>th</sup> grade have 24/7 laptop access. From this, we can see that both schools have higher average test scores than the district as a whole, implying that the laptop program has a positive impact on student achievement. We must remind you that these are the average student scores and do not control for external factors such as school or classroom.

The second graph shows the three schools (Maple, Orangethorpe, and Pacific Drive) at which all students in 6<sup>th</sup> grade have school day laptop access. From this we can see that the 6<sup>th</sup> grade students at these schools on average did not perform as well as the 6<sup>th</sup> grade students in the District (data includes the 24/7 access schools) as a whole. There are many possible explanations for this.

The third graph shows the non-laptop school average test score data for ELA and Math in comparison to the District. It is clear from this that individual school impacts student performance on standardized tests, with some schools (Acacia, Beechwood, Laguna Road, Sunset Lane, and to a lesser extent Fern Drive and Golden Hill) performing higher than the

District average. It is for this reason that when we examined data at the program level that we controlled for individual school factors.

In summary, at the 6<sup>th</sup> grade level data analysis showed similar practical results to data analysis at the program level. Students with 24/7 laptop access out performed students with school day access or no laptop access in the area of ELA and Math in 6th grade. Students with school day access did not show higher achievement in ELA or Math than students with no laptop access.



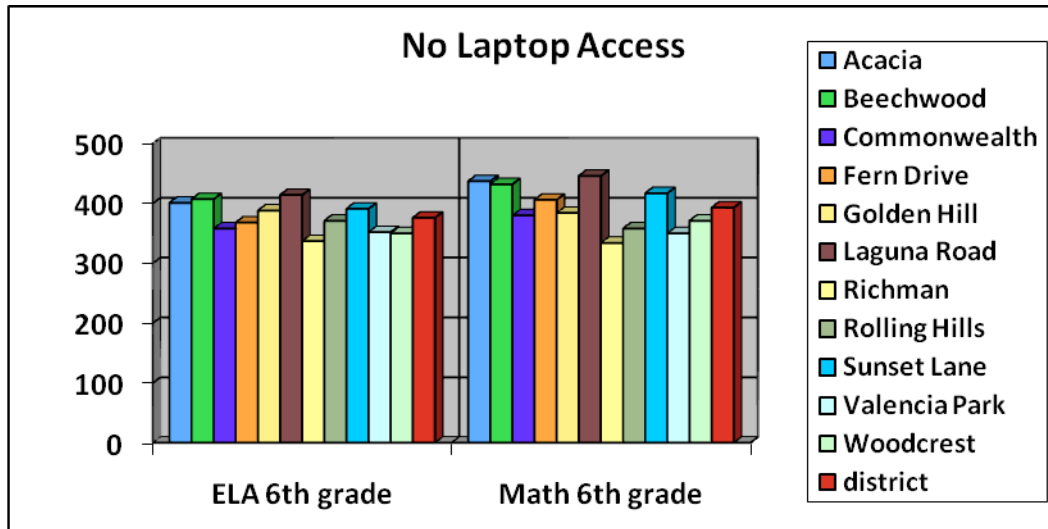


Figure 1. 6<sup>th</sup> grade average test scores for 2010

### Growth Over Time by Program

Repeated measures ANOVA were calculated to determine growth in Math and ELA test scores over time for the three programs (24/7, school day, no laptops).

Figure 2 shows growth over time for ELA test scores by program/laptop access and by district.

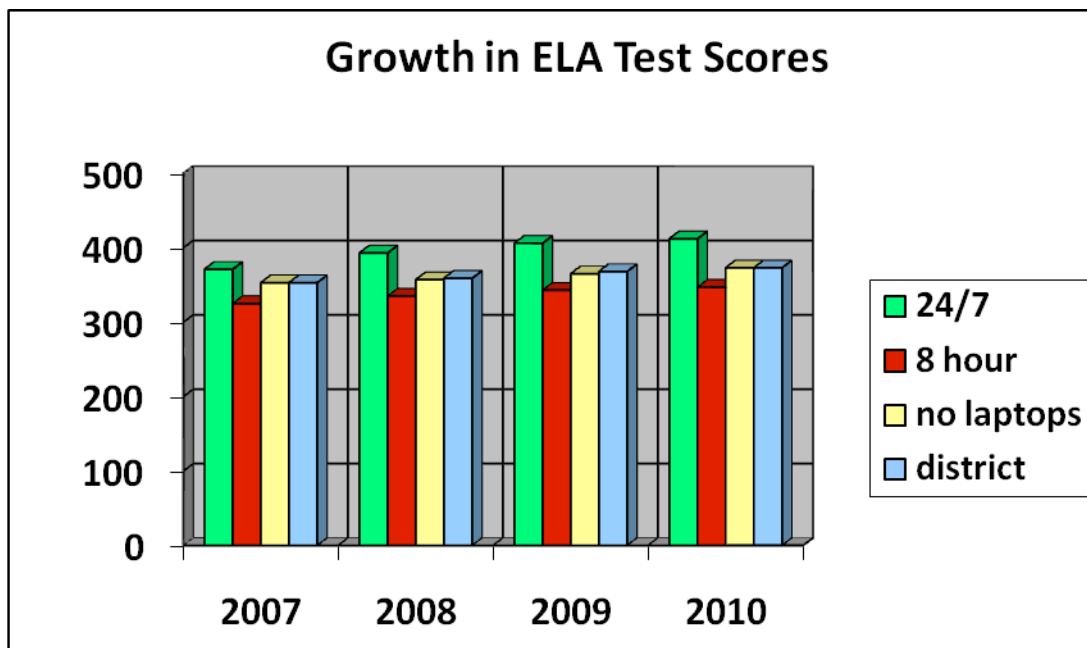
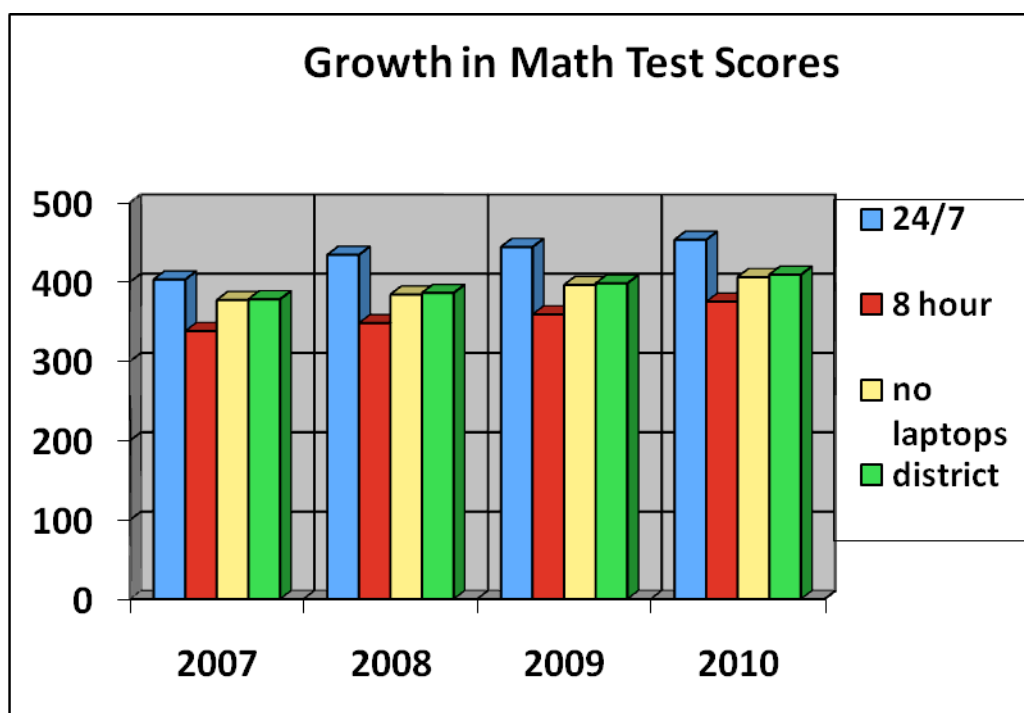


Figure 2. Growth in ELA test scores from 2007 to 2010

This figure shows average raw test score by laptop access. Visual representation shows that there was steady growth in ELA test scores for all programs and the District as a whole. By completing repeated measures ANOVA, we were able to determine if there were statistical differences between programs and the District.

ELA test scores improved between 2007 to 2010,  $F(3, 66) = 39.61, p < .001, \text{partial } \eta^2 = .643$ . The interaction between school and academic year,  $F(48, 197) < 1, ns$ , was not significant indicating that all schools made similar growth in ELA test scores. The interaction between laptop access and academic year was marginally significant,  $F(6, 132) = 2.07, p = .06, \text{partial } \eta^2 = .07$ , indicating that growth in ELA test scores differed by laptop access. Bonferroni adjusted post hoc tests revealed that students with 24/7 access showed greater growth in ELA scores than students with school day access,  $p < .001$  or no laptop access,  $p < .001$ . Students with no laptop access showed greater growth in ELA test scores than students with school day access,  $p < .001$ .

Figure 3 shows growth over time for Math scores by laptop access and for the District as a whole.



**Figure 3. Growth in Math test scores from 2007 to 2010**

This figure shows average raw test score by program/laptop access. Visual representation shows that there was steady growth in Math test scores for all programs and the District as a whole. By completing repeated measures ANOVA, we were able to determine if there were statistical differences between programs and the District.

To determine growth over time in student achievement for Math, a second series of repeated measures ANOVA was conducted. The second repeated measures ANOVA revealed that Math

test scores improved between 2007 to 2010,  $F(3, 64) = 20.12, p < .001, \text{partial } \eta^2 = .49$ , a moderate effect size. There were no interactions between school and academic year,  $F(48, 191) < 1, ns$ , or between laptop access and academic year,  $F(6, 128) < 1, ns$ . These findings suggest that all schools and all programs (24/7 access, school day access, no access) made similar growth in Math test scores from 2007-2010.

In summary, students with 24/7 laptop access showed statistically significant more growth in ELA achievement from 2007 to 2010 when compared to the District as a whole and to students with school day laptop access or no laptop access. Students with school day laptop access did not show statistically significant more growth than non-laptop students in ELA achievement. With regards to Math student achievement growth from 2007 to 2010, all students regardless of laptop access showed similar growth.

## 21<sup>st</sup> Century Readiness

Teachers and administrators were given 10 days to complete the survey and return it. A reminder was sent out after the initial time frame to promote a greater return rate. Surveys were accepted until May 21<sup>st</sup> when data analysis began. Table 2 shows return of surveys by school.

School	Surveys returned by grade level
Acacia	Administrator, K, 1, 2, 3, 5, 6
Beechwood	Administrator
Commonwealth	Administrator
Golden Hill	Administrator, K-6
Hermosa Drive	3-6
Orangethorpe	Administrator, K-6
Parks JHS	Administrator, electives, science, math, sped,
Richman	Administrator, K-6
Robert C. Fisler	Administrator, K-8
Sunset Lane	Administrator, 2, 6
Valencia Park	Kindergarten, 3, 4, 6
Woodcrest	1, 3, 4

**Table 2. Returned surveys by school and grade level**

Given the limited amount of data we have access to, we are not in a position to make conclusive statements about the district as a whole.

The 21<sup>st</sup> century readiness survey is divided into two sections:

- Access
  - Computers
  - iPod Touch/ iPad
  - LCD projector
  - Interactive whiteboard
  - Tools for creation
  - Simulation software
  - Research beyond browsers
  - Web 2.0
  - Learning Management System
- Professional Development
  - Content
  - Practice

We will report findings based on these two main sections: Access and Professional Development.

**Access**

Because we cannot report a District profile, we will report by levels of Access (low, mid, high, target). For schools at which both teachers and administrators completed and returned surveys some schools had greater consistency across surveys than others. We are not in a position to speculate why this occurred. We will, therefore, use an average rating based on all surveys returned for each school. For example, if an administrator rated something as low level access but teachers rated it as high level access, we report this as mid level access. We should note that this example is extremes, and although there were inconsistencies they were usually only one level apart.

Tables 3 through 6 show the average reported access to various 21<sup>st</sup> Century teaching or learning tools by individual schools.

**Low Level Access**

<b>Computer ratio in a lab</b>	<b>iPad or iPod Touch</b>	<b>LCD proj.</b>	<b>Interactive W'board</b>	<b>Tools for creation</b>	<b>Tools for simulation</b>	<b>Res. beyond Web</b>	<b>Web 2.0</b>	<b>Learning Mgmt. System</b>
O'thorpe (low/mid)	Nicolas S'set Ln Parks Val. Pk W'crest Golden Hill.	Nicolas Acacia Golden Hill (lower grades) Hermosa (lower grades)	O'thorpe Val.Park Parks JHS Richman C'wealth	C'wealth	O'thorpe (Low/mid) Sunset Ln Parks JHS B'wood C'wealth	O'thorpe H'mosa B'wood Golden Hill	O'thorpe	O'thorpe (low/mid) Nicolas Val. Park

**Table 3. Schools reporting average low level access to 21<sup>st</sup> century tools**

**Mid Level Access**

<b>Computer ratio in a lab</b>	<b>iPad or iPod Touch</b>	<b>LCD proj.</b>	<b>Interactive W'board</b>	<b>Tools for creation</b>	<b>Tools for simulation</b>	<b>Res. beyond Web</b>	<b>Web 2.0</b>	<b>Learning Mgmt. System</b>
B'wood	H'mosa	Val. Park Parks	B'wood	C'wealth		S'set Ln C'wealth W'crest	H'mosa (lower) Nicolas S'set Ln Parks G. Hill (lower)	H'mosa (lower) Parks G. Hill (lower)

**Table 4. Schools reporting average mid level access to 21<sup>st</sup> century tools**

High Level Access

Computer ratio in a lab	iPad or iPod Touch	LCD proj.	Interactive W'board	Tools for creation	Tools for simulation	Res. beyond Web	Web 2.0	Learning Mgmt. System
C'wealth Golden Hill	R'man	O'thorpe Nicolas Acacia R'man C'wealth W'crest G. Hill	Sunset Lane W'crest	O'thorpe Nicolas Parks R'man W'crest	R'man W'crest	Nicolas R'man	R'man C'wealth W'crest	Sunset Ln R'man

Table 5. Schools reporting average high level access to 21<sup>st</sup> century tools

Target Level Access

Computer ratio in a lab	iPad or iPod Touch	LCD proj.	Interactive W'board	Tools for creation	Tools for simulation	Res. beyond Web	Web 2.0	Learning Mgmt. System
S'set Lane Val. Park	Fisler Acacia G.Hill (upper) H'mosa (upper)	Fisler H'mosa	Fisler H'mosa G. Hill (upper)	Fisler H'mosa Acacia B'wood G. Hill	Fisler H'mosa Acacia	Fisler Acacia	Fisler H'mosa Acacia B'wood G. Hill Val. Pk	Fisler Acacia B'wood G. Hill (upper) W'crest C'Wealth

Table 6. Schools reporting average target level access to 21<sup>st</sup> century tools

We need to make it clear that we are not equating access with use. For example, if a school reports providing access to a learning management system, this does not indicate the degree with which the system is being used. Returned surveys indicate that access to different technologies range across schools and across technologies.

The data indicate that some schools have greater consistency in access across 21<sup>st</sup> century learning tools than others:

- Orangethorpe has relatively consistent LOW level access
- Richman has relatively consistent HIGH level access
- Fisler, Hermosa, Golden Hill (upper grades), and Acacia have relatively consistent TARGET level access
- District-wide the only level of consistency is with the Tools for Creating, Web 2.0, and Learning Management Systems; 9 out of 12 schools for which we have data indicate on average a High to Target level of access to these tools.
- At Nicolas, the SPED team reported consistently lower level access than the other content areas.

It is clear that the 24/7 one-to-one laptop schools report similar levels (high and target) for Access and Professional Development practices. At Fisler, both teachers and administrator

consistently reported high levels of Access. This follows the findings from the Year 4 Evaluation in which Fisler was highlighted as having technology firmly integrated into the school culture.

**Professional Development Content and Practices**

As mentioned in the previous section, we report by levels of access (low, mid, high, target) rather than giving a District profile. Similar to Access, there was limited consistency across a school in what was reported. Therefore, we have reported averages for individual schools. Some grade levels within schools did indicate low levels in Professional Development Content and Practices. Despite this, no schools fell into the Low level category.

Table 7 shows the average reported levels of Professional Development Content and Practices by individual schools.

	<b>Content of Training</b>	<b>PD Practices</b>
<b>Low Level</b>		
<b>Mid Level</b>	Nicolas JHS Golden Hill Parks JHS	Nicolas JHS Orangethorpe Golden Hill Parks JHS Commonwealth Woodcrest
<b>High Level</b>	Hermosa Drive Orangethorpe Sunset Lane Valencia Park (mid/high) Acacia Richman (mid/high) Beechwood Woodcrest	Hermosa Drive Sunset Lane Valencia Park (mid/high) Acacia Richman (mid/high) Beechwood
<b>Target Level</b>	Fisler	Fisler

**Table 7. Average school levels of access to Professional Development**

Fisler is the only school that reported Target level Professional Development content and practices, which is consistent with their level of technology Access. Based on the data, Fisler

could be considered a 21st century teaching and learning environment. Acacia, Hermosa Drive, and Richman reported a High level of Professional Development content and practices, which is aligned with what these schools reported for Access to technology. The data indicate that these schools have a high level of 21st century readiness. Golden Hill on the other hand has High and Target level Access but as a whole has only Mid level Professional Development practices. This could be a result of the fact that Golden Hill has been part of the 24/7 program at different times. Noteworthy for discussion is Orangethorpe, which has Low level Access but Mid and High level Professional Development content and practice. Although Orangethorpe has Low level Access to technology, the data indicate that Orangethorpe is focusing its Professional Development on the tools the teachers have access to. This seems to be in contrast to what is taking place at other schools reporting High level Access to technology with reported Mid level Professional Development content and practices.

Additionally, at Richman and Acacia (except 6<sup>th</sup> grade) the teachers reported a consistent level for the Professional Development content. We speculate at these two schools the Professional Development practice is working together with technology Access in a systematic approach to 21st century readiness. Richman and Acacia are the only non-laptop schools for which we have data that indicate a pattern or trend in reported technology Access and/or Professional Development practices.

As a district level, there are no clear and consistent overall patterns of Access to 21<sup>st</sup> century technology and Professional Development practices.

## Conclusions and Recommendations

Data from this evaluation suggest that 24/7 access to laptops continues to be the most successful program for affecting student achievement in Fullerton School District. When we controlled for school demographics, students with 24/7 access to laptops outperformed students with school day access or no access on ELA standardized assessments. Combining student achievement data with the data from the 21st century readiness survey, schools that have a consistent technology-rich culture demonstrated the highest level of student achievement.

We feel that the school day access only program is still too new to make definitive statements about the effectiveness of this program on student achievement.

In light of the data on the schools where the programs have been in effect for a sustained amount of time, we feel that the consistent growth in student achievement implies that before conclusions can be drawn about effectiveness, students need to have repeated exposure (over several years) to laptops. This is consistent with research that suggests that there is a definite novelty period when innovations are newly adopted. True determination of the effectiveness of an innovation requires examination of the innovation over multiple years at one school that has consistently implemented the innovation (Ellis, 2005). This has only occurred at Fisler, and to some extent at Hermosa Drive.

As a result of our analysis of the data provided to us, we have several recommendations.

First, when we consider that students with 24/7 access outperformed students with school day access, we recommend that teachers in the school day access schools review the pedagogy and integration practices of teachers at the 24/7 schools to determine ways to adapt what is being done in the 24/7 model to meet their unique school day access model. Understandably, not being able to take laptops home does not allow for continuity of learning, however there are possibly certain things that do not have an at-home component that could be implemented (e.g. use of specific applications). In essence, this is a continuation of the Year 4 evaluation recommendation in which we suggested greater collaboration ACROSS schools with similar programs. This would benefit teachers who are new to the high level of technology access as well as the veteran technology users.

Possible avenues for promoting greater collaboration include having a District-wide wiki, using the Learning Management System for teacher collaboration, including review of ‘exemplary technology teaching’ (video from colleagues) as part of the PLC meetings, and designing District-wide professional development based on student laptop access.

A second recommendation is also a continuation of the Year 4 Evaluation – Each school must have a clear scope and sequence that outlines available technology and use. The lack of cohesion across schools that made it difficult to even get a school profile for 21<sup>st</sup> century readiness highlighted that at some schools individual classrooms or grade levels had technology that others

at the school were not aware of. We understand that this lack of equal access often stems from individual teachers or grade levels applying for grants (for equipment such as iPod Touches and iPads), however we recommend schools have a systematic approach to purchasing technology to benefit ALL students at the school.

Possible avenues for addressing this are to have school tech plans that are reviewed annually. Additionally, having a school technology committee who oversees a common list of available technology could promote a systematic approach to technology purchases and professional development.

A third recommendation stems from the ability to make decisions about impact of laptop access using limited data. The District should be cautious of results from data that represents inconsistent or interrupted involvement in innovation adoption. True determination of the effectiveness of an innovation requires examination of the innovation over multiple years at one school that has consistently implemented the innovation.

A possible solution for this would be for the District to develop a clearly defined data collection system that allows for tracking of individual student data over time (and if possible into High School). Additionally, based on data from Fisler, in which students have been using laptops for multiple years that shows positive effects of laptop access on student achievement, we recommend the District remind parents of the impact of inconsistent access and to make decisions based on trends over time and not on annual data.

## References

- Ellis, A. K. (2005). *Research on educational innovations (5<sup>th</sup> ed.)*. Eye On Education: Larchmont, NY.
- Mouza, C. (2008). Learning with laptops: Implementation and outcomes in an urban underprivileged school. *Journal of Research on Technology in Education*, 40(4), 447-472.
- Trimmel, M. & Bachmann, J. (2004). Cognitive, social, motivational and health aspects of students in laptop classrooms. *Journal of Computer Assisted Learning*, 20(2), 151-158.

## Appendix

### **Fullerton School District School Technology and Readiness**

**2011**

**adapted from CEO Forum (<http://www.ceoforum.org>)**

This survey is aimed at determining your school, grade level or department's readiness for 21<sup>st</sup> Century Learning environments. It should take no longer than 10 minutes to complete.

#### **Directions:**

For each column in each table, please indicate (either by changing font color, highlighting box or placing an XX) the cell/scenario that best represents your current learning environment.

Administrators of schools with a laptop program – Please complete TWO charts:

1. Laptop program within your school
2. Remainder of school (e.g classrooms without laptop program)

Administrators of schools without a laptop program – Please complete ONE chart (for whole school)

Teachers – As a grade level or department team, please complete ONE chart

SAVE completed file as school\_gradelevel\_chart.docx (or doc)  
(Hermosa\_4GATE.doc)

**RETURN COMPLETED CHARTS VIA EMAIL TO**

**School:**

**Your position (e.g. teacher / administrator):**

**Grade level/Department:**

**Table 1: Access**

<b>Students per Laptop</b> (e.g. 90 students sharing a cart of 30 laptops would be 2-5 range)	<b>Students per Classroom Desktop</b>	<b>Students per Computer Lab Desktop</b>	<b>Students per Pod Touch or iPad</b>	<b>Classrooms with an LCD projector</b>	<b>Classrooms with an Interactive Whiteboard or Interactive projector</b>
20+	20+	20+	100+	Less than one third	Less than one third
10-20	10-20	10-20	50-99	One third – one half ceiling mounted or tabletop	One third – one half
6-10	6-10	6-10	25-49	More than half ceiling mounted or tabletop	More than half
2-5	2-5	2-5	6-25	All – ceiling mounted or tabletop	All
1	1	1	1-5	All – ceiling mounted	All

**Please list any other grade level or department level access to tools you have (e.g. digital cameras, probeware, assistive technology...):**

**Table 2: Content – AVAILABILITY not USE**

Availability of Applications for Creation	Availability of Simulation Software (including web based)	Availability of Research Resources beyond basic Internet browser (e.g. subscriptions to specific resources)	Availability of Web 2.0 tools (wikis, blogs, shared documents)	Availability of Learning Management System
No	No	No	No	No
Minimal	Minimal	Minimal	Minimal	Minimal
Some	Some	Some	Some	Some
Yes	Yes	Yes	Yes	Yes

**Table 3: Professional Development**

select box with majority of checkmarks applicable

Content of Training	Professional Development Practices
<ul style="list-style-type: none"> <li>✓ How to use basic technology tools and applications (i.e. word processors, spreadsheets, productivity applications, LCD projectors)</li> </ul>	<ul style="list-style-type: none"> <li>✓ Training occurs in isolated, short “stand-alone” sessions</li> <li>✓ Training delivered by non-teachers (technology and pedagogy are not linked or connected)</li> <li>✓ Most teachers not engaged in technology-related professional development</li> <li>✓ No long-term professional development plan in place</li> </ul>
<ul style="list-style-type: none"> <li>✓ How to use basic technology tools and applications</li> <li>✓ How to use stand-alone software</li> <li>✓ Limited introduction to the Internet</li> </ul>	<ul style="list-style-type: none"> <li>✓ Training occurs in isolated, short “stand-alone” sessions</li> <li>✓ Some teachers engaged in technology-related professional development</li> <li>✓ No long-term professional development plan in place</li> </ul>
<ul style="list-style-type: none"> <li>✓ How to integrate technology into the curriculum</li> <li>✓ How to use technology for classroom management</li> <li>✓ How to identify and use grade, age, and subject specific multi-media materials</li> <li>✓ (Training on basic technology tools and applications also available for small subset of new teachers)</li> </ul>	<ul style="list-style-type: none"> <li>✓ Training occurs in regular, consistent sessions integrated into regular school schedule</li> <li>✓ Teacher trainers provide coaching and model best practices (“train-the-trainer”)</li> <li>✓ Most teachers participate in technology-related professional development</li> <li>✓ Most teachers participate in virtual or face-to-face peer discussion groups</li> <li>✓ Most teachers have access to in-school training as well as on-line, distance learning resources</li> <li>✓ Long-term professional development plan is in place</li> </ul>
<ul style="list-style-type: none"> <li>✓ Subject of training is customized to needs of individual teacher</li> <li>✓ How to create new technology supported learning activities and lesson plans</li> <li>✓ How to identify, use, and evaluate grade, age, and subject specific multi-media materials</li> <li>✓ How to meet special, individual needs using technology</li> <li>✓ How to identify, use, and evaluate new student assessment methodologies</li> </ul>	<ul style="list-style-type: none"> <li>✓ Delivery of training is customized to needs of individual teacher</li> <li>✓ Training is one-on-one, just-in-time and on-demand</li> <li>✓ All teachers participate in on-going technology-related professional development</li> <li>✓ All teachers have access to in-school training as well as on-line, distance learning resources</li> <li>✓ All teachers engage in on-going self- assessment</li> <li>✓ Long-term professional development plan is developed with teacher participation and institutionalized</li> </ul>

