

**Interactive, Inc.**  
*e.valuation for e.learning*

**Documenting Outcomes from  
Henrico County Public School's  
Laptop Computing Initiative:  
2005-06 through 2007-08**

**Final Technical Report  
Monday, November 24, 2008**

**Prepared for the  
Henrico County Public Schools  
Board of Education**



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<b>HCPS Laptop Analysis RESPONDENTS BY ROLE BY YEAR</b>				
	2005-06	2006-07	2007-08	Totals
<b>Students (82)*</b>	6,797	8,268	8,275	23,340
<b>Teachers (141)</b>	796	765	685	2,246
<b>Administrators (66)</b>	37	137	130	304
<b>Parents (26)</b>		3,436		3,436
<b>Graduates (30)</b>		94		94
<b>Totals</b>	<b>7,630</b>	<b>12,700</b>	<b>9,090</b>	<b>29,420</b>

\* Parentheses indicate number of items in each questionnaire

In our experience of 30 years of working with more than 200 school and education groups, Henrico's assistance has been truly professional, truly exemplary and truly grounded in the interests of learners and teachers.

This report is the responsibility of Interactive, Inc., a firm specializing in the evaluation of learning technologies. The Henrico County public schools required vendors bidding on the County's laptop initiative to support a multi-year analysis of outcomes. Interactive, Inc.'s three-year program of research and evaluation was supported by a contract from Dell Computers, Inc. but was otherwise independent of that company.

The analysis, interpretation and recommendations are the sole responsibility of Interactive, Inc.

# **Documenting Outcomes from Henrico County Public School's Laptop Computing Initiative: 2005-06 through 2007-08 Final Technical Report**

## **1.0 SUMMARY**

This reports the three-year outcomes of a large-scale, sustained 1-to-1 laptop initiative with positive results for student achievement, study habits and future preparation and for teacher instructional practices, student assessment and productivity.

Interactive, Inc. was asked to study the student, teacher, administrator and other outcomes associated with the one-to-one laptop computing initiative in the nine high schools of the Henrico County Public School system. This reports the results of a mixed methods longitudinal population study of students, teachers and building administrators with quantitative and qualitative data. Interactive, Inc. is a national "gold standard" program evaluation firm listed on the US Department of Education's *Registry of Outcomes Evaluators*.

### **1.1 Is laptop use related to student achievement?**

For the three years of the laptop study (2006 – 2008) and across ten curriculum areas, there are SOL test score gains associated with laptop use.

Table 1 (below) shows the all-topics, all-years average score gain when two non-significant score declines are included for Algebra I and Algebra II in 2008. In the first table, we included those changes, even though they are not statistically significant because of the continuing interest in the pattern of Algebra and laptops. With Algebra, that average is 18.0 points of improvement.

Table 2 shows the same relationships---test score changes associated with amounts of laptop use---only for those curriculum topics and years where the relationship is statistically significant. That all-topics, all-year summary score is 20.7 points in a 300-point range (SOL scores range from approximately 300-600). In this final report, Interactive, Inc. summarizes the relations between laptop use and student achievement over the lifetime of this study. Table 2 shows that the 20.7 gain is composed of changes (positive and negative) for all subjects for all three years and is an "all years, all subjects" summary gain. (In section 2.1 below, we report the individual years.)

Although Algebra has been a consistent, if understandable exception to the positive relations, in each of the three years, there have never been fewer than five curriculum topics where laptop use is positively related to test scores. And those score increases are in core areas of the sciences, history and reading.

The table below (Table 1) summarizes the three-year history of changes in SOL scores and includes the non-statistically significant Algebra changes for 2008 (marked with a \*).

<b>1. Summary SOL Score Changes Associated with Amounts of Laptop Use by Students By Topic, By Year 2005-06 – 2007-08 (Significant and non-significant)</b>				
	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>Three year summary</b>
<b>Biology</b>	+32.84	+28.34	+30.24	+91.42
<b>World History I</b>	+19.29	+34.88	+21.22	+75.39
<b>Chemistry</b>		+11.68	+26.24	+37.92
<b>US History</b>	+12.75		+16.50	+29.25
<b>Reading</b>		+16.60	+11.22	+27.82
<b>Earth Science</b>	+17.39		+14.06	+31.45
<b>World History II</b>		+15.57		+15.57
<b>Writing</b>	+10.66	-11.63	-10.12	-11.09
<b>Algebra I</b>	-26.21	-20.52	-8.37*	-55.1
<b>Algebra II</b>	-22.91	-21.07	-13.83*	-57.81
<b>Total</b>	<b>5</b>	<b>5</b>	<b>6</b>	<b>Mean = +18.48</b>

\*Indicates that this score is not statistically significant.

The table below (Table 2) summarizes the same three-year history using only areas where the changes are statistically significant.

<b>2. Summary SOL Score Changes Associated with Amounts of Student Laptop Use By Topic, By Year 2005-06 to 2007-08 (Statistically significant only)</b>				
	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>Three year summary</b>
<b>Biology</b>	+32.84	+28.34	+30.24	+91.42
<b>World History I</b>	+19.29	+34.88	+21.22	+75.39
<b>Chemistry</b>		+11.68	+26.24	+37.92
<b>US History</b>	+12.75		+16.50	+29.25
<b>Reading</b>		+16.60	+11.22	+27.82
<b>Earth Science</b>	+17.39		+14.06	+31.45
<b>World History II</b>		+15.57		+15.57
<b>Writing</b>	+10.66	-11.63	-10.12	-11.09
<b>Algebra I</b>	-26.21	-20.52		-46.73
<b>Algebra II</b>	-22.91	-21.07		-43.98
<b>Total</b>	<b>5</b>	<b>5</b>	<b>6</b>	<b>Mean = +20.7</b>

Note: Geometry is not included in the table because the relationship to laptop use is not uni-directional. For some use intervals, there is a positive relation and for some not. Geometry is included in the detailed discussion in Section 2.0 below.

Values in the table above indicate areas in which reported levels of laptop use are significantly related to changes in SOL scores. The row on the bottom reports the number of subject areas in which levels of laptop use are significantly associated with increases in SOL scores. The column on the far right contains significant changes in SOL scores for all three years of the initiative combined. The mean value for all years and all subjects (+20.7) captures the average increase in SOL scores that is related to higher levels of laptop use for the total, all years, all topics of the three-year laptop initiative.

## 1.2 How are teachers using laptops?

1.2.1 The Contributions of laptops HCPS high school teachers have had personal laptops for three years in connection with this initiation (and for five years prior to that) and the teachers' conviction that laptops have "made a positive difference in my teaching" has not varied over that time.

Teachers have increased their professional use of laptops each year. They continue to use their laptops more each year than previously for... (2008 Mean response)

1. Communicating with other teachers (3.69)
2. Checking student attendance, information or grade administration (3.68)
3. Communicating with administrators (3.66)
4. Communicating with parents (3.51)
5. Planning lessons (3.48)
6. Assessing students on an interim or formative schedule and (3.14)
7. Presenting instruction with content-specific software (2.86).

The 40-year history of school improvement concludes that curriculum and other initiatives are not often widely adapted. In contrast, Henrico teachers have consistently described the laptop initiative as widespread among their faculty colleagues. One signal of the district's professional development support is that in 2008 compared to 2006, teachers are significantly more likely to say they have been part of a group working on new ways to use their laptops. There has also been noticeable growth in the use of laptops to communicate with homes.

1.2.2 Laptops and assessing student progress. Data-driven instruction is a pillar of modern school improvement but impractical in the absence of technology. One remarkable gain is in the teachers' use of laptops to "assess individual students". Significantly more teachers now endorse online assessment. The percent of teachers who said they could show others how to use their computers for assessment jumped from 43% in 2006 to 56% in 2008. And, the final data in this Henrico assessment revolution is the growth in the number of teachers who are using their laptops "to analyze more quiz data, assessment data this year." On this evidence, district resources, policies and professional development---taken together---are changing assessment practice in a positive direction.

At the end of this three-year initiative, teachers strongly agree (as they did at the beginning in 2006) that their school's administration is supportive of their work with laptops. There is a similar pattern of agreement that they have the "classroom support to implement the skills I learned from professional development".

1.2.3 Laptops and changes in teaching practice. Experts in how adolescents learn generally emphasize "active learning". Teachers have reported that they are doing less "direct instruction" and more coaching during each year of this initiative. (Students have also reported parallel changes in the instructional practices of their teachers.) And, teacher familiarity with finely grained student performance data and their implications---plus the availability of ubiquitous computers---is supporting changes in instruction. Teachers have steadily agreed that...

- Individual computers have made small group assignments more possible
- Laptops have made small group instruction more feasible and that
- Individualized instruction "is practical for me".

That level of agreement about small group and individual attention is all the more remarkable because these are high school teachers who, as a matter of course, see very large numbers of students.

The proportion of teachers who have websites has more than doubled in a single year from 22% in 2007 to 70% in 2008 and more than half the teachers "update the website often" (54%). The fraction of teachers who post their syllabi online has gone up from less than half in 2006 (43%) to 61% in 2008.

Computers come close to defining the world in which Henrico's high school graduates will live and individual, ubiquitous (take-home) laptops help bridge students to that world. As they did in 2006, HCPS teachers "...try to think ahead to what my students will do after they graduate and give tasks and assignments with the laptops that resemble those future demands".

1.2.4 Laptop contributions to student learning. Teachers agree that computers are useful to their students. These specific endorsements have strengthened over this laptop initiative for almost half of the following student-related items (2008 Mean response):

- find out about ideas/information (3.34)
- present information (3.31)
- express ideas in writing (2.93)
- communicate electronically with others (3.17)
- learn to work independently (3.12)
- measure what they have learned (2.95)
- analyze information (2.94)
- learn to work collaboratively (2.93) and
- catch up with what they have not learned (2.90).

Laptops are not omnibus problem solvers, equally able to fix every needy area of schooling nor have they been promoted that way. Teachers doubt that laptops have

made a fundamental difference in students desire to learn or their interest in their classes.

1.2.5 The Laptops In 2006, teachers 'strongly agreed' that their computers were reliable: after two years of wear and tear, that opinion is now in the 'agree' range. There have been similar changes from "strong agree" to "agree" about (1) the reliability of internet connections and (2) getting help "...in a reasonable amount of time".

### **1.3 What are students doing with laptops?**

1.3.1 Frequency of student laptop use. One major question about laptops is their impact over time. Because of HCPS's extraordinary cooperation, this analysis is founded on data from 1800 students who have had laptops for all three of their high school years.

In the first year, students reported laptop use every day at school and in the third year they were still using them every day. Students continue to take their laptops back and forth between home and school and they use them at home three or four days per week. Laptop use between classes and during free periods has gone up significantly from 2006. There has also been a big increase in Henrico students being "part of a group that worked on new ways to use laptops".

1.3.2 Student identification of laptop benefits. Students' conclusions have remained positive and strong. They have always concluded that, "Laptops have had a positive effect on my attitudes toward school". And, after three years, students continue to believe that school is more fun with the laptops and that they are more interested in school because of the laptops. Students identify a range of benefits from their laptops. Listed in order of student unanimity, Henrico students agreed that because of the laptops, they were (Mean 2008 value)...

1. Learning more (3.20)
2. Getting better grades (2.66)
3. Turning in more assignments on-time (2.65)
4. Taking more interest in class (2.65)
5. Taking more responsibility for work (2.60)
6. Behaving better (2.50) and
7. Cooperating more with other students (2.51).

For history, science and "electives" laptop use has remained high and constant at 3-4 days/week. And students told us how they were using their laptops for study skills and rated their helpfulness in various topics. In the order from most-to-least helped by computers, students chose the following (per cent choosing):

- History (76%)
- Science (72%)
- English (69%)
- Electives (66%) and
- Math (37%).

Everyone involved with schooling has reason to expect that schools will equip graduates with the skills that they need in a world of global and increasingly digital competitiveness. From the beginning in 2006, HCPS students have agreed that they are “more likely to do well after I graduate because of the laptop”. In the first year’s baseline report, Interactive, Inc. noted the relative inattention to skills that were recommended by the national *21<sup>st</sup> Century Skills Partnership*. In 2008, students report a change---their homework now requires them “...to go to local business websites, collect data from businesses or other community groups or otherwise use technology outside the school”. Students continue to report more group work as a result of the laptops and group, team and cooperative work is a hallmark of *21<sup>st</sup> Century Skills Partnership* preparation.

Those changes, along with the growth already noted (problem solving, research, communication, independent work and teamwork) suggest that Henrico’s teachers and students are engaging the workforce and personal/professional demands of the future more closely.

Four out of five Henrico students report that they have access to an additional computer at home along with Internet connections. Those proportions have remained stable over the lifetime of this analysis.

#### **1.4 Conclusion**

Henrico’s investment in laptops has been unusually successful. To test that success, those interested in school policy may wish to ask, “What do we want to accomplish?” For example:

- Find new ways to engage adolescents?
- Power achievement?
- Connect graduates to jobs in the 21<sup>st</sup> Century?
- Bridge schools and homes?
- Adopt new practices for teaching and learning that are widespread and last?

This report discusses three years of evidence that supports what Henrico students, teachers, administrators and parents have accomplished from one the largest and carefully sustained deployments of individual laptops in the United States.



## 2.0 STUDENT ACADEMIC PERFORMANCE AND LAPTOP USE

### 2.1 SOL Achievement and amounts of laptop use by subject matter

To test the difference that individual laptops may make, we asked if the amount of laptop use is related to SOL scores. Students reported how often they used laptops (“every day”, “once or twice a week”, etc.) and we compared those amounts of use to their test scores using an analysis of variance (ANOVA) and post-hoc Bonferonni comparisons.

In 2008, more laptop use is associated with higher test scores -- Biology, World History I, Chemistry, US History, Reading and Earth Science -- and in Writing, laptop use is not associated with higher tests scores. Because the SOL writing test is not taken on computers<sup>1</sup>, teachers feel obligated to reproduce test conditions in their teaching and that minimizes laptop use.

For the three years of the laptop study (2006 – 2008) and across ten curriculum areas, there are SOL test score gains associated with laptop use.

Table 3 (below) shows the all-topics, all-years average score gain when two score declines are included for Algebra I and Algebra II in 2008. In the first table, we included those changes, even though they are not statistically significant because of the continuing interest in the pattern of Algebra and laptops. With Algebra, that average is 17.48 points of improvement.

Table 4 shows the same relationships---test score changes associated with amounts of laptop use---only for those curriculum topics and years where the relationship is statistically significant. That all-topics, all-year summary score is 20.7 points in a 300-point range (SOL scores range from approximately 300-600). In this final report, Interactive, Inc. summarizes the relations between laptop use and student achievement over the lifetime of this study. Table 2 shows that the 20.7 gain is composed of changes (positive and negative) for all subjects for all three years and is an “all years, all subjects” summary gain. (In section 2.1 below, we report the individual years.)

Although Algebra has been a consistent, if understandable exception to the positive relations, in each of the three years, there have never been fewer than five curriculum topics where laptop use is positively related to test scores. And those score increases are in core areas of the sciences, history and reading.

The table below (Table 3) summarizes the three-year history of changes in SOL scores and includes the non-statistically significant Algebra changes for 2008 (marked with a \*).

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<sup>1</sup> The state’s concern is apparently that student use of “spell check” and “grammar check” would compromise the integrity of the test.

<b>3. SOL Score Changes Associated with Amounts of Laptop Use by Students By Topic, By Year 2005-06 – 2007-08 (Significant and non-significant)</b>				
	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>Σ</b>
<b>Biology</b>	+32.84	+28.34	+30.24	+91.42
<b>World History I</b>	+19.29	+34.88	+21.22	+75.39
<b>Chemistry</b>		+11.68	+26.24	+37.92
<b>US History</b>	+12.75		+16.50	+29.25
<b>Reading</b>		+16.60	+11.22	+27.82
<b>Earth Science</b>	+17.39		+14.06	+31.45
<b>World History II</b>		+15.57		+15.57
<b>Writing</b>	+10.66	-11.63	-10.12	-11.09
<b>Algebra I</b>	-26.21	-20.52	-8.37*	-55.1
<b>Algebra II</b>	-22.91	-21.07	-13.83*	-57.81
<b>Total</b>	<b>5</b>	<b>5</b>	<b>6</b>	<b>Mean = +18.48</b>

\*Indicates that this score is not statistically significant.

The table below (Table 4) summarizes the same three-year history using only areas where the changes are statistically significant. This table reports changes in SOL scores related to responses to the question “How much do you use your laptop computer in English,” “...in Math,” “...Science” and “...History?” for three consecutive academic years. For each academic year, significant increases in SOL scores were associated with higher levels of reported computer use in five SOL subjects for 2005-06, five SOL subjects in 2006-07 and six SOL subjects in 2007-08. Higher levels of student laptop use across the three years are related to a mean 20.7 point increase in SOL scores.

<b>4. SOL Score Changes Associated with Amounts of Student Laptop Use By Topic, By Year 2005-06 to 2007-08 (statistically significant changes in scale score)</b>				
	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>Σ</b>
<b>Biology</b>	+32.84	+28.34	+30.24	+91.42
<b>World History I</b>	+19.29	+34.88	+21.22	+75.39
<b>Chemistry</b>		+11.68	+26.24	+37.92
<b>US History</b>	+12.75		+16.50	+29.25
<b>Reading</b>		+16.60	+11.22	+27.82
<b>Earth Science</b>	+17.39		+14.06	+31.45
<b>World History II</b>		+15.57		+15.57
<b>Writing</b>	+10.66	-11.63	-10.12	-11.09
<b>Algebra I</b>	-26.21	-20.52		-46.73
<b>Algebra II</b>	-22.21	-21.07		-43.98
<b>Total</b>	<b>5</b>	<b>5</b>	<b>6</b>	<b>Mean = +20.7</b>

Note: Geometry is not included in the table because the relationship to laptop use is not uni-directional. For some use intervals, there is a positive relation and for some not. Geometry is included in the detailed discussion in Section 2.0 below.

Values in the table above indicate areas in which higher reported levels of laptop use are significantly related to increases in SOL scores. The row on the bottom reports the number of subject areas in which higher levels of laptop use are significantly associated with increases in SOL scores. The column on the far right contains significant gains in SOL scores for all three years of the initiative combined. The mean value for all years and all subject (+20.7) captures the average increase in SOL scores that is related to higher levels of laptop use for the extent of the laptop initiative.

Interactive, Inc. searched for relationships between laptop use and achievement in the following steps. First, we have information from students about how much or how little they used laptops in each year of this study, for each curriculum area. Students reported their weekly use of laptops in one of four intervals: (1) “none”; (2) “1-2 days”; (3) “3-4 days”; or (4) “every day”.

Second, we asked whether or not the interval of use reported by each student was associated with that student’s test scores in that curriculum area. [To examine relationships, we conducted an analysis of variance (ANOVA) and post-hoc Bonferonni comparisons.]

The following tables display comparisons within individual years between each reported level of laptop use and SOL scores in each subject. The middle columns indicate the intensity of use (by intervals of the numbers of days a week) that is significantly related to test score changes. For example, for Biology, every day use is preferable to any other intensity. For the first year of this laptop initiative, positive changes in five curriculum topics ranged from 13 to 33 points. Scaled SOL scores for the three years range from 278-600.

Please note: The lower portions of the three annual tables which follow report directional relationships even though the changes are not statistically significant. For example, in Algebra in 2007-08, the use of laptops continues to be negatively associated with achievement scores. However, the strength of that relationship is no longer statistically significant, which is, in effect progress. We report these non-significant numbers for whatever guidance they may offer HCPS. That is particularly important since we believe that the diminution of the negative relationship reflects the attention of the district and its teachers to the improvement consequences derived from this evaluation.

<b>5. SOL Score Changes Associated with Reported Levels of Student Laptop Use, by SOL Subject: Academic Year 2005-06</b> (Listed from most-to-least increases in SOL scores)					
<b>SOL Subject</b>	<b>Are higher scores associated with more laptop use?</b>	<b>Amounts of laptop use compared</b>	<b>SOL point differences associated with laptop use</b>	<b>p</b>	<b>n</b>
Biology	Yes	Everyday > None & 1-2 days/wk	32.84	.001	1568
World History I	Yes	Everyday > 1-2 days/wk & None	19.29	.05	1291
Earth Science	Yes	3-4 days/wk & Everyday > None	17.39	.05	1561
US History	Yes	Everyday > 1-2 days/wk	12.75	.01	1380
Writing	Yes	3-4 days/wk > 1-2 days/wk	10.66	.04	1629
Algebra I	No	None > 1-2 days/wk & Everyday	-26.21	.001	1168
Algebra II	No	None > 3-4 days/wk	-22.91	.001	1118
<b>Non-significant comparisons</b>					
<b>SOL Subject</b>		<b>Amounts of laptop use compared</b>	<b>SOL point differences associated with laptop use</b>	<b>p</b>	<b>n</b>
World History II		Everyday > Not at all	+16.36	.11	1237
Reading		Not at all > Everyday	-9.31	1.00	1344
Chemistry		Everyday > Not at all	+14.86	.07	1019
Geometry		Not at all > Everyday	-2.82	.72	1303

<b>6. Pearson Correlations: SOL Scores and self-reported levels of laptop use, by SOL subject, 2005-06</b> (Listed from highest to lowest statistical significance)			
<b>SOL subject</b>	<b>r</b>	<b>p</b>	<b>n</b>
Biology	.211	.001	1568
World History I	.107	.001	1291
Algebra II	-.101	.001	1118
Algebra I	-.126	.001	1168
World History II	.073	.010	1237
US History	.068	.012	1380
Earth Science	.060	.018	1560
Chemistry	.055	.081	1019

Reading	-.034	.217	1344
Geometry	-.032	.249	1303
Writing	.025	.306	1629

In the second year of the initiative, the number of curriculum areas with positive associations between laptop use and achievement scores increased: Biology continued as a top performer and World History made big gains (from 19.29 points in 2006 to 34.88 points in 2007).

<b>7. SOL Score Changes Associated with Reported Levels of Student Laptop Use, by SOL Subject : Academic Year 2006-07</b> (Listed from most-to-least increases in SOL scores)					
<b>SOL Subject</b>	<b>Are higher scores associated with more laptop use?</b>	<b>Amounts of laptop use compared</b>	<b>SOL point differences associated with laptop use</b>	<b>p</b>	<b>n</b>
World History 1	Yes	Everyday > 1-2 days/wk, 3-4 days/wk & None	34.88	.001	1728
Biology	Yes	Everyday > None & 1-2 days/wk	28.34	.001	2290
Reading	Yes	Everyday > 1-2 days/wk	16.6	.001	1993
World History II	Yes	Everyday > None	15.57	.05	1684
Chemistry	Yes	Everyday > None	11.68	.03	1409
Writing	No	None > Everyday	-11.63	.04	2361
Algebra I	No	None > 1-2 days/wk & Everyday	-20.52	.001	1493
Algebra II	No	None > 3-4 days/wk & Everyday	-21.07	.001	1499
<b>Non-significant comparisons</b>					
<b>SOL Subject</b>		<b>Amounts of laptop use compared</b>	<b>SOL point differences associated with laptop use</b>	<b>p</b>	<b>n</b>
Geometry		Not at all > Everyday	-10.9	.07	1957
US History		Everyday > Not at all	+10.35	.25	2043
Earth Science		Everyday > Not at all	+4.5	1.00	1925

<b>8. Pearson Correlations: SOL Scores and self-reported levels of laptop use, by SOL subject, 2006-07</b> (Listed from highest to lowest statistical significance)			
<b>SOL subject</b>	<b>r</b>	<b>p</b>	<b>n</b>
Biology	.173	.001	2290
World History I	.156	.001	1728

Reading	.096	.001	1993
Chemistry	.093	.001	1409
Algebra II	-.130	.001	1499
Algebra I	-.132	.001	1493
Geometry	-.065	.004	1957
Writing	-.057	.005	2361
World History II	.059	.015	1684
US History	.048	.031	2043
Earth Science	.022	.345	1925

For the third year, achievement in Biology and World History continues to be associated with laptop use. The additional topics listed reflect teachers in those subjects learning how to incorporate laptop use in their teaching.

In the next table, there are two associations listed for Geometry. Where laptops are used for one or two days a week compared to no use at all, there is a gain. Where they are used for one or two days a week compared to three to four days a week, there is a negative relation. That suggests that, for Geometry, there may be a kind of “Goldilocks Effect”, i.e., there can be too much, too little and just right amounts of use.

<b>9. SOL Score Changes Associated with Reported Levels of Student Laptop Use, by SOL Subject: Academic Year 2007-08</b> (Listed from most-to-least increases in SOL scores)					
<b>SOL Subject</b>	<b>Are higher scores associated with more laptop use?</b>	<b>Amounts of laptop use compared</b>	<b>SOL point differences associated with laptop use</b>	<b>p</b>	<b>n</b>
Biology	Yes	Everyday > 1-2 days/wk & None	30.23	.001	2297
Chemistry	Yes	Everyday > 1-2 days/wk & None	26.24	.001	1459
World History I	Yes	Everyday > 1-2 days/wk, 3-4 days/wk & None	21.21	.001	1653
US History	Yes	Everyday > 1-2 days/wk & None	16.50	.001	1936
Earth Science	Yes	Everyday > 1-2 days/wk	14.06	.001	1904
Reading	Yes	3-4 days/wk > 1-2 days/wk	11.22	.03	1878
Writing	No	1-2 days/wk > 3-4 days/wk	-10.12	.05	2330
Geometry	Yes & No	1-2 days/wk > None; 1-2 days/wk > 3-4 days wk	9.84; -11.54	.01; .02	2031
<b>Non-significant comparisons</b>					
<b>SOL Subject</b>		<b>Amounts of laptop</b>	<b>SOL point</b>		

	<b>use compared</b>	<b>differences associated with laptop use</b>	<b>p</b>	<b>n</b>
World History II	Not at all > Everyday	-7.06	1.00	1786
Algebra I	Not at all > Everyday	-8.37	.32	1448
Algebra II	Not at all > Everyday	-13.83	.17	1524

**10. Pearson Correlations: SOL Scores and self-reported levels of laptop use, by SOL subject, 2007-08**  
**(Listed from highest to lowest statistical significance)**

SOL subject	r	p	n
Biology	.184	.001	2297
Chemistry	.158	.001	1459
World History I	.142	.001	1653
US History	.110	.001	1935
Earth Science	.086	.001	1903
Algebra I	-.059	.024	1448
Algebra II	-.057	.027	1524
Reading	.048	.038	1878
Writing	-.025	.232	2329
Geometry	.024	.278	2031
World History II	-.022	.359	1786

The three annual tables indicate that “everyday” use is associated with gains in the curriculum topics listed. And, in the first year, there were only three instances of everyday use; in the second year there were four; and in the fourth year were five. As Henrico’s teachers have learned to make more consistent use of the laptops to support teaching and learning, the number of curriculum topics that are impacted has grown.

## 3.0 TEACHER RESULTS

### 3.1 Amounts of laptop use and applications

#### 3.1.1 Increasing laptop use

Teachers have increased their professional use of laptops each year of this initiative. For example, there has been a steady increase in the use of laptops for lesson planning in 2006, 2007 and 2008.

HCPS high school teachers have had personal laptops since 2001. The first year of this Dell-based intervention was 2006. In 2006, teachers thought that laptops had “made a positive difference in my teaching” (TQ 9<sup>2</sup>). The 2006 ‘most enthusiastic’ rating has not diminished for 2008. Similarly, at the end of every year of this analysis, teachers have reported that they are using their laptops “more this year than last” (TQ 8). During the first two years of the laptop initiative, teachers credited the devices with boosting their morale, although that effect has not continued for this the third year (TQ 48,  $-0.14, p = .05^3$ )

Each year, we asked teachers whether or not it was accurate to say that, “I now use my laptop much more for...” a range of professional functions. They continue to use their laptops more each year than previously for the following functions.

1. Communicating with other teachers (TQ 6)
2. Checking student attendance, information or grade administration (TQ 4)
3. Communicating with administrators (TQ 7)
4. Communicating with parents (TQ 5,  $+0.17, p = 0.2$ )
5. Lesson planning (TQ 3,  $+0.20, p = .005$ )
6. Looking at interim student assessments (TQ 2)
7. Presenting instruction with content-specific software (TQ 1)

The functions above are listed by the strength of the teachers’ agreements about how much their use has increased year-over-year. In 2008, three of the top four functions deal with communications. The growth in teacher-parent communications is particularly noticeable. The utility of laptops for lesson-planning was confirmed by teachers’ strong agreement that the devices are useful for computer-related lesson planning (TQ 61).

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<sup>2</sup> (TQ) indicates “teacher questionnaire and the numbers refer to the item. (SQ) is student questionnaire and (AQ) indicates the administrators questionnaire.

<sup>3</sup> Where differences between values reported in the first and third year are statistically significant, we report the size of the difference after the questionnaire item number. “*p*” indicates the confidence interval. In this case, there are five chances in 100 that the reported effect could have been identified by mistake.

Almost half of Henrico’s secondary school teachers (48%) take their laptops back and forth to school daily, up from 2006’s 38%. The average teacher takes the laptop home three or four days a week.

11. Frequency of Teachers Taking Laptops Home: 2008	
Frequency	Percent (N)
Every day	48 (332)
3-4 days/week	17 (115)
1-2 days/week	22 (152)
Not at all	13 (93)
<i>Total</i>	<i>100 (692)</i>

HCPS teachers have consistently described the laptop initiative as widespread among their faculty colleagues. [That is, over all three years, they rejected the statement, “I use computers much more than my colleagues in school” (TQ 46)]. In this case, the consistency and unanimity of laptop use among the faculties is attributable to how the program was launched and how it has been supported, particularly with professional development. In 2008 compared to 2006, teachers are significantly more likely to say they have been part of a group working on new ways to use the laptops (TQ 47, +0.24,  $p = 0.007$ ).



### 3.1.2 Teacher applications of laptops

We asked teachers to tell us how often they were using their laptops for different professional tasks. Teachers had a “never” option but there were no functions for which “never” described the Henrico average response. Instead, more than half the responses were in the “often” range and two functions (“posting homework assignments” and “assessing individual students”) moved from “sometimes” to “often” over the last three years. (The items below are listed from most-to-least frequently chosen for 2008.)

The most remarkable gain is, “assess individual students” which moved from “sometimes” to “often” between 2006 and 2008. Teachers were asked to compare student assessment with paper-based tests versus online and individualized tests. Significantly more teachers endorsed online assessment in 2008 than in 2006 (TQ 76,

+0.05,  $p = 0.02$ ). Earlier evaluations commented on the relative infrequency with which HCPS teachers were more efficient with student assessment by using technology. On this evidence, district resources, policies and professional development---taken together---are changing assessment practice in a positive direction.

### Laptops are often used to...

- print handouts (TQ 51)
- find teaching resources online (TQ 52, +.09,  $p = 0.09$ )
- develop lesson plans (TQ 49, +.09,  $p = 0.019$ )
- post homework assignments (TQ 54, +0.21,  $p = 0.001$ ) and
- assess individual students (TQ 50, +0.22,  $p = 0.001$ ).

### Laptops are sometimes used to...

- keep my plan book (TQ 53)
- exchange lesson plans with other teachers (TQ 55, 0.14,  $p = 0.01$ ) and
- get professional help (TQ 56).

The proportion of teachers who have websites has more than doubled in a single year from 22% in 2007 to 70% in 2008 (TQ 120) and more than half the teachers “update the website often” (54%). The fraction of teachers who post their syllabi online has gone way up from less than half in 2006 (43%) to 61% in 2008 (TQ 121).

Two related areas show declines from 2007 to 2008. The first is often ‘posting homework assignments on a website’ (TQ 125)---down from 86% in 2007 to 53% in 2008---and often ‘posting due dates on a website’ (TQ 126)---down from 87% in 2007 to 54% in 2008. The difference between teachers creating and maintaining websites and teachers declining to use those websites for homework-related purposes is probably a function of their concern for fairness---not all students have access to the Internet at home.

The list below displays the importance teachers assigned (in 2008) to laptops for different curriculum topics. Teachers are agreed that laptops are helpful for “reading,” “writing,” “math,” “social studies” and “science” and strongly agreed that they are helpful for “other subjects”. “My laptop computer is useful for instructional technology for...”

1. Other topics (TQ 66)
2. Math (TQ 63)
3. Social Studies (TQ 64)
4. Science (TQ 65)
5. Reading (TQ 61)
6. Writing (TQ 62)



Computers come close to defining the world in which Henrico’s high school graduates will live and individual laptops help bridge students to that world. As they did in 2006, HCPS teachers “...try to think ahead to what my students will do after they graduate and give tasks and assignments with the laptops that resemble those future demands”

(TQ 17). Similarly the high school teachers continue to "...assess students based on laptop projects that relate to the outside world" (TQ 24). In earlier reports, we noted that, on average, teachers do not make research assignments "that have to be completed in the community at least once a week" (TQ 16). That is also the case for 2008.

Given the consistent upward trajectory that describes HCPS teachers' use of technology, it is not a surprise that their estimates of online resources compared to paper-and-pencil systems have remained positive. The responding teachers agreed that compared to conventional print, online resources made the following things easier.

- finding hints for better teaching (TQ 77)
- carrying paper files to/from school and home (TQ 78) and
- individualizing instruction (TQ75).

### 3.1.3 Laptops, instruction, assessment and grouping

Teachers have reported more coaching during each year of this initiative (TQ 10). During the first year, they did not believe that the laptops were affecting the amount of direct instruction that they were doing (TQ 11). Beginning in the second year and continuing to this third year, teachers credit the student's individual laptops with reducing the amount of direct instruction that they, the teachers do. (In the first two years, students reported less direct instruction and more coaching by teachers.) Experts in how adolescents learn generally emphasize "active learning". On the questionnaire for the teachers, we explained the two items as less "lecturing to the whole class" and more "being with students while they work". Both practices are supported by research about effective teaching and both have grown with the introduction of the laptops. School districts have tried to affect changes in teaching practice by "in-service workshops" and other conventional means. The efforts have been better intentioned than effective, witness the unchanged reality of teaching practice in most American schools. In the Henrico instance, the fact that every student had a laptop has forced the teachers to re-engineer their instruction. And they have.

Most Henrico teachers have not assigned web searches as homework, probably because they cannot be certain that all students will have access to the web at home. For 2008, there is evidence that a few more teachers do make web-based homework assignments although most teachers do not (TQ 15). In 2008, just as in 2006, Henrico teachers do not discount homework simply because it is done on a computer (TQ 18).

We have already remarked the increasing number of teachers who embrace computer-related technology as a way to make frequent, interim assessment practical ("Teacher applications of laptops", above). In 2006 teachers said they were not using their laptops to do more quizzes. In 2008, that had changed positively with most teachers reporting "giving more quizzes this year" because of laptop availability (TQ 25,  $+0.35$ ,  $p = 0.001$ ). And, teachers are more likely in 2008 than 2006 to believe that laptops are helpful in "testing or assessing" students (TQ 21,  $+0.23$ ,  $p = 0.006$ ) and in assessing students based on the SOLs (TQ 23,  $+0.27$ ,  $p = 0.005$ ).

From the first year, teachers have believed that the laptops help align their teaching to the *Virginia Standards of Learning* (TQ 12,  $-0.21$ ,  $p = 0.02$ ) a slight decline in the average positive assessment from respondents but within the same, unchanged response category). And, the final data in this Henrico assessment revolution is the growth in the number of teachers who are using their laptops “to analyze more quiz data, assessment data this year” (TQ 26,  $+0.19$ ,  $p = 0.026$ ).

The average Henrico teacher is not, however, changing “the way I group students for instruction” (TQ 28). Teachers report that they are not using laptops for weekly quizzes (TQ 22). They continue in the belief (probably a well-founded belief) that they know their “...students without adding a lot of quizzes and assessments” (TQ 20).

Teacher familiarity with those finely grained data and their implications---plus the availability of ubiquitous computers in the hands of students---is supporting changes in instruction. Teachers have remained consistently agreed that...

- Individual computers have made small group assignments more possible (TQ 19)
- Laptops have made small group instruction more feasible (TQ 37) and
- Individualized instruction “is practical for me” (TQ 36).

But they do not report that they have changed the way they group students for instruction (TQ 27) or that they are using their laptops “to change instructional groupings more frequently than last year” (TQ 28)

It is not enough for a school to have one or two excellent teachers. Children graduate to other teachers or, in a high school, move among different specialized teachers. Additionally, the culture of a school can start or stop most initiatives. The data in the next table are a proxy for estimating the size of the group that has embraced 1-to-1 computing in Henrico’s high schools. The bigger the fraction of the faculty, the more likely 1-to-1 computing has become an integral part of teaching and learning for the division’s high schools.

## 12. Teacher Self-Reported Expertise Compared to Other Teachers by Remedial, Assessment and Presentation Applications (2008 %s)

For assessment applications

- 47% believe themselves to be more advanced in laptop use than other teachers (TQ 30b)
- 56% have shown other teachers how to do things with their laptops (TQ 31b)

For remedial applications:

- 36% believe themselves to be more advanced in laptop use than other teachers (TQ 30a)
- 37% have shown other teachers how to do things with their laptops (TQ 31a)

For presentation applications

- 58% believe themselves to be more advanced in laptop use than other teachers (TQ 30c)

- 57% have shown other teachers how to do things with their laptops (TQ 31c)

The remarkable change is in the proportion of teachers confident in their mastery of computer applications for assessment. The percent of teachers who said they could show others how to use their computers for assessment jumped from 43% in 2006 to 56% in 2008. The percent of teachers who thought they were ahead of their colleagues in using computers for student assessment grew from 40% in 2006 to 47% in the current year.

Teachers continue to believe that “The education contribution of computers is worth the time I have to spend troubleshooting batteries, software, application access” (TQ 102) and they believe that there is “...enough good software” to support their instruction (TQ 108).

#### 3.1.4 Teachers and time savings

Teachers remain strongly convinced that online grade reporting saves time (TQ 42) and that online student assessment saves time (TQ 41).

#### 3.1.5 Laptop effects on students

Teachers agree that computers are useful to students for helping them to ... (ordered most-to-least as endorsed in 2008)

- find out about ideas/information (TQ 70)
- present information (TQ 72, +0.05,  $p = 0.43$ )
- express ideas in writing (TQ 67)
- communicate electronically with others (TQ 69)
- learn to work independently (TQ 74)
- measure what they have learned (TQ 68, +0.14,  $p = 0.046$ )
- analyze information (TQ 71)
- learn to work collaboratively (TQ 73, +0.3,  $p = 0.001$ ) and
- catch up with what they have not learned (TQ 66, +0.15,  $p = 0.021$ ).

For every item, teacher agreement about the value of laptops has remained stable and positive. Teachers are strongly agreed about the value of student computers for research and presenting information (the first two items above). The teachers' favorable opinions have strengthened over this ubiquitous computing initiative for almost half of these student-related items.

#### 3.1.6 Teachers, laptops and different types of students

Teachers (and administrators) would like to see a practical way for laptops to work with different learning styles (TQ 31). And they believe that is happening. For example, they agree that laptops are helping students who are:

- visual learners (TQ 32)
- bi-lingual students (TQ 35)
- kinesthetic learners (TQ 34) and
- auditory learners (TQ 33).

We also asked teachers if they thought individual laptops had made a positive difference with the achievement of special education students and bi-lingual students: their agreement remained unchanged and supportive from 2006 to 2008 (TQ 93 and 92).

In both 2006 and 2008, teachers thought that students with more computer knowledge are moving faster than those with less (TQ 107).

### 3.2 The Limits of laptops

Laptops are not an omnibus problem solver, equally able to fix every needy area of schooling. For example, teachers doubt that laptops have made a fundamental difference in students desire to learn or their interest in their classes. The table below lists the areas of student behavior, identified by teachers as beyond the impact of a laptop computer. The first items on the list are those where teachers are most in agreement that computers have not made a difference (2008).



<b>13. Teacher Identification of Areas of Student Performance Beyond the Reach of the Ubiquitous Computing, 1-to-1 Initiative</b>
“Laptops have not made a difference in students...”
<ul style="list-style-type: none"> <li>• attendance (TQ 100)</li> <li>• behavior (TQ 98)</li> <li>• grades (TQ 99)</li> <li>• responsibility they feel for their work (TQ 96)</li> <li>• desire to learn (TQ 87)</li> <li>• quality of assignments they turn in (TQ 88)</li> <li>• ability to express themselves in writing (TQ 90)</li> <li>• interest in my class (TQ 97) and</li> <li>• cooperation with each other (TQ 95).</li> </ul>

Note: During 2006-07, teachers had positive assessments of four of those items -- (1) “Quality of assignments they turn in”, (2) “Cooperation”, (3) “Ability to express themselves in writing”, and (4) “Depth and breadth” of their research.

In 2006, teachers disagreed that laptops were making a “positive difference in the achievement of failing students” (TQ 91) and they disagreed that laptops were bridging the performance gap between lower and higher achieving students (TQ 94). That has not changed for 2008.

When we listened to focus groups early in the distribution process in 2006, teachers were concerned that laptops might give students “unrealistic ideas about learning”. That concern had not been confirmed on previous web-surveys but for 2008, it has re-

surfaced (TQ 103,  $+0.14$ ,  $p = 0.028$ ). Similarly, teachers agree that “laptops encourage unrealistic expectations for what I have time to do as a teacher” (TQ 109). As we have noted consistently over the successive evaluation reports, teachers are concerned that laptops “distract students from my direct instruction, they pay less attention” (TQ 101). Their students do not agree.

The teachers’ dissatisfaction with student inattention to acceptable use policies is a problem unchanged from the first year (TQ 106). Relatedly, teachers have gotten even more adamant since 2006 that they “...determine when student laptops are open and used” (TQ 13,  $+0.21$ ,  $p = 0.001$ ).

For the first two years of this study, the average teacher response was that “getting students to bring laptops to class is a problem” (TQ 104,  $+0.54$ ,  $p = 0.001$ ). For this, the third year, the average teacher reports that it has become a problem. Henrico teachers remain evenly split about whether or not laptops have allowed students to bring fewer books to class (TQ 38).

### **3.3 The Context of infrastructure, professional development and skill levels**

#### 3.3.1 Teachers and the technology infrastructure of their classrooms

Over the three years of this project, the fraction of teachers reporting reliable internet connections in their classrooms has been nearly unanimous and constant---95%, 96% and 94% (TQ 128).

LCD projectors are a boost to teachers’ ability to present material and compel attention. Teachers strongly agree that LCDs would “encourage more use of laptops for presentation and instruction” (TQ 111). The classroom installed base for LCD projectors has increased from 23% to 27% to 42% over the three years (TQ 131). Currently, eight percent of classrooms have an Interactive White Board (TQ 129), up from seven per cent in 2006.

Forty-two percent of teachers have an LCD projector in their classrooms, 16% have a digital camera and 8% have an Interactive (Internet-connected) White Board (TQs 131, 130 and 129). Presentation technologies (especially Interactive White Boards) are popular among the teachers that have them. But in the absence of Interactive White Boards, HCPS teachers have found alternative presentation platforms. Seventy-two percent have used televisions (TQ 138); 76% have used LCD projectors (TQ 136); and only 8% have used Interactive White Boards (TQ 137, the same per cent as report their availability in their classrooms).

In 2006, teachers were ‘strongly agreed’ that their computers were reliable: after two years of wear and tear, that opinion is now in the ‘agree’ range (TQ 57,  $-0.40$ ,  $p = 0.001$ ). There have been similar changes from “strongly agree” to “agree” about (1) the reliability of internet connections (TQ 58,  $-0.29$ ,  $p = 0.001$ ) and (2) getting help “...in a reasonable amount of time” (TQ 59,  $-0.28$ ,  $p = .0.001$ ).

HCPS teachers belief from 2006, that “all textbooks and resources should be available on student laptops” (TQ 110) has remained unchanged for 2008.

### 3.4 Teachers, school support, professional development and other help

Teachers strongly agree in 2008 (as they did in 2006) that their school’s administration is supportive of their work with laptops (TQ 13). There is a similar pattern of agreement that they have the “classroom support to implement the skills I learned from professional development” (TQ 113). In 2006, teachers wanted more laptop-related professional development; in 2008, they agree that they “have had all the professional development I need to use the laptops” (TQ 112).

We asked teachers where they turned for help when they had a problem. Teachers were consistent in reaching out for assistance (TQ 121) although they did not report using the HCPS/Dell help line (TQ 117). The following sources are all used “sometimes” (listed from most-to-least frequently used) --- (1) other teachers (TQ 116); (2) “an Instructional Technology Resource Trainer, Technology Trainer” (TQ 118); (3) a “TST” (TQ 119); and (4) a student (TQ 120). The sources of help have remained consistent over the three years of this initiative.

In the first and current year’s of the laptop initiative, teachers have reported that they are expected to participate in technology related professional development (TQ 114,  $+0.11$ ,  $p = 0.046$ ).

Teachers expressed their preferences for professional development by different types (TQ 115).

<b>14. Teacher Preferences for Type of Professional Development (% choosing) 2008</b>	
Type	Percent (N)
Individual help	34 (237)
Group session	29 (198)
Online training	24 (170)
Planning period training	13 (87)
Total	100 (692)

### 3.5 Teacher self-identified computer-related skill levels

Teachers judged their own expertise about several computer-related skills. The values are unchanged from 2006, i.e., Henrico teachers have remained consistently agreed or strongly agreed about their various computer-related skills. Henrico teacher strengths with presentation software, spreadsheets and websites contrast with other jurisdictions that have not made the same progress in building faculty capability. (The “spreadsheets” item is probably a proxy for the ability faculties to manipulate student

interim assessment data.) The exceptions are teaching aids and content-specific applications such as those connected to particular textbooks”. Both declined from 2007 teacher self-estimates.

<b>15. Teacher Self-Identified Computer-Related Skills by Function (most-to-least agreement)</b>
They agree strongly that they can <ul style="list-style-type: none"> <li>• use an internet search engine (TQ 83)</li> </ul>
They agree that they are skillful with <ul style="list-style-type: none"> <li>• copying/moving files (TQ 82)</li> <li>• presentation software (TQ 80)</li> <li>• spreadsheets (TQ 79)</li> <li>• creating and maintaining a website (TQ 84)</li> <li>• desktop publishing (TQ 81)</li> </ul>
They disagree that they are good at <ul style="list-style-type: none"> <li>• using content specific applications/software (TQ 85)</li> <li>• using teaching aids such as QUIA, Beyond Books, etc. (TQ 86)</li> </ul>

Compared to last year (2007), teachers are using their laptops more to present material and to assess or diagnose students. For 2008, teachers thought that they and their students had equivalent computer skills (TQ 40): for the first year, they thought there was a disparity.

### 3.6 Demographics of responding teachers

The average number of years that the responding teachers had been in the profession was 12 (TQ 146) with 9 of those years at HCPS (TQ 147, both unchanged from 2006). The largest group of responding teachers report graduate schooling beyond the Masters degree level.

<b>16. Teachers by Amount of Post-Secondary Education (%)</b>	
	% (N)
31+ Graduate Credits	40 (293)
0-30 Graduate Credits	35 (255)
Bachelors	26 (191)
<i>Total</i>	<i>100 (739)</i>

### 3.7 Teacher Random-interval Survey Results

The conventional way to study computer use has been limited to asking people to recall what they were doing at different intervals. We have used that method in this analysis but we have buttressed it with queries that were announced by an audible “ping” on the laptop and that requested attention to a very brief web-survey of what the respondent was doing at that moment. In order to get the best picture of computer use across the school day and year, we randomly selected days and times to “ping” the laptops. The

initial randomly-generated schedule was then modified with the cooperation of HCPS to reflect school vacation days, testing periods and other school priorities and realities. From teachers in 2006-07, we had a total of 10,792 individual responses from between February 5, 2007 and April 6, 2007 and a total of 6,144 responses in 2007-08 from between February 1, 2008 and March 21, 2008. The following sections each contain tables first for 2006-07, then for 2007-08.

### 3.7.1 Teacher laptop use

Teacher use their laptops more than do students. At any point in the instructional day, an average of 42% of HCPS teachers are using their laptops. That is almost twice the computer use in connection with the West Virginia statewide initiative. Twenty-two percent of West Virginia's specially trained (elementary school) teachers reported technology use at the sampled moments of the school day compared to one percent of that state's untrained teachers.

<b>17. Amount of Laptop Use In School by Teachers (2006-07)</b> (% responses to random interval surveys)	
	Percent (N)
Yes	43(4592)
No	57(6200)
<i>Total</i>	<i>100 (10792)</i>

<b>18. Amount of Laptop Use In School by Teachers (2007-08)</b> (% responses to random interval surveys)	
	Percent (N)
Yes	41 (2538)
No	59(3606)
<i>Total</i>	<i>100 (6144)</i>

### 3.7.2 Self-reported teacher activity

Teachers told us what they were doing at the moment of each query. Compared to 2006-07, teachers were doing more "helping small groups" and "whole group lecturing," and less "planning, clerical and research" activities.

<b>19. Teacher eLearning (with or without a laptop)Survey Teacher Activity (2006-07)</b>	
What are/were you doing? (check all that apply)	% Yes [N]
1d. I was planning, doing clerical or research	<b>20</b> [2117]
1e. I was doing something else/other instructional	<b>19</b> [2047]
1f. I was doing something else/non-instructional	<b>18</b> [1962]
1a. I was lecturing to the whole group/demonstration	<b>17</b> [1876]

1b. I was helping small groups/individuals	<b>16</b> [1748]
1g. I was absent/not in class	<b>13</b> [1362]
1c. I was leading class discussion	<b>10</b> [1081]

<b>20. Teacher eLearning (with or without a laptop) Survey Teacher Activity (2007-08)</b>	
	<b>2007-08 % Yes (2006-07 value) [N]</b>
What are/were you doing? (check all that apply)	
1d. I was planning, doing clerical or research	<b>18</b> (20) [1079]
1e. I was doing something else/other instructional*	<b>18</b> (19) [1132]
1f. I was doing something else/non-instructional	<b>18</b> (18) [1095]
1a. I was lecturing to the whole group/demonstration	<b>21</b> (17) [1293]
1b. I was helping small groups/individuals	<b>19</b> (16) [1167]
1c. I was leading class discussion	<b>11</b> (10) [1167]

Compared to 2006-07, teachers reported less reporting/clerical tasks and slightly less diagnosing/assessing in 2007-08.

<b>21. Teacher eLearning Survey – Teacher Computer Use (2006-07)</b>	
If you are/were using a laptop, what are/were you working on? (check all that apply)	<b>% Yes [N]</b>
4c. I was reporting, doing clerical tasks or administrative tasks on my laptop	<b>19</b> [1948]
4d. I was planning or researching instruction on my laptop	<b>11</b> [1089]
4a. I was working on/making a presentation on my laptop	<b>9</b> [931]
4b. I was diagnosing/assessing/testing students on my laptop	<b>7</b> [668]
4e. I was doing something else on my laptop	<b>6</b> [572]

<b>22. Teacher eLearning Survey – Teacher Computer Use (2007-08)</b>	
If you are/were using a laptop, what are/were you working on? (check all that apply)	<b>% Yes (2006-07 value) [N]</b>
4c. I was reporting, doing clerical tasks or administrative tasks on my laptop	<b>15</b> (19)[914]
4d. I was planning or researching instruction on my laptop	<b>11</b> (11)[685]
4a. I was working on/making a presentation on my laptop	<b>11</b> (9) [659]
4e. I was doing something else on my laptop	<b>7</b> (6) [411]
4b. I was diagnosing/assessing/testing students on my laptop	<b>6</b> (7) [364]

## 4.0 STUDENT RESULTS

One major question about laptops is their impact over time. Because of HCPS's extraordinary cooperation, we have data from 1800<sup>4</sup> students who had laptops in Year 1 and Year 3 of the study. The data in this section report the experiences of that large group of students over the three years of this study.

### 4.1 Amounts and applications

#### 4.1.1 Frequency of laptop use

In the first year, students reported laptop use every day at school and in the third year they were still using them every day (SQ 10,  $-0.44$ ,  $p = 0.001$ , a slight decline that remains within the "every day" interval)<sup>5</sup>. And, students continue to take their laptops back and forth between home and school (SQ12,  $-0.12$ ,  $p = 0.001$ , again a slight decline but within the "every day" interval). The use of HCPS-provided laptops, at home, is also unchanged with students reporting at-home use three or four days a week (SQ 13,  $-0.39$ ,  $p = 0.001$ ).

Laptop use between classes and during free periods went up significantly from 2006 (3-4 days a week) to 2008 (every day) (SQ 11,  $+0.24$ ,  $p = 0.001$ ). Students still believe that they, not the teachers should determine when to use their laptops in school (SQ 28,  $+0.15$ ,  $p = 0.001$ ) and the teachers are even more adamant than they were in first year that controlling student laptop use is the teachers' responsibility.

Students have never believed that the laptops have reduced the burden of books that they carry (SQ 58,  $+0.23$ ,  $p = 0.001$ ) and their teachers agree.

There has been a big change in Henrico students being "part of group that worked on new ways to use laptops" (SQ 64,  $+0.55$ ,  $p 0.001$ ). In the first year, most students said "no": last year, most students said "yes".

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<sup>4</sup> The number of respondents is generalized from the differing numbers of students who responded to any particular Year 1 and/or Year 3 question. The N's reflect the general size of the surviving cohort, they are always substantial and they range from 1518 to 1879.

<sup>5</sup> One side effect of the relatively large sample sizes is that small changes in the distribution of responses frequently meet the test of statistical significance. That is the case here where 64 of the 82 variables have statistically significant changes between Year 1 and Year 3. Statistical significance is not the same as policy or practical significance and only a few of the otherwise "significant" differences signal changes in response category, for example, from "never" to "sometimes" or from "1-2 days/week" to "3-4 days/week". In every case, if there are interpretable differences, we report the size of the change and the probability that it may have occurred by chance. Where ever the numeric change pushed the response into a different category, that too is noted in the text.

At the end of the first year, most Henrico students thought that they were using their laptops about as much as everyone else. Now, at the end of the third year, the average student believes that she or he is using their laptop more than others (SQ 63, +0.55,  $p = 0.001$ ). In the first and third years, the average of student reports indicates that they are using the laptop “in ways that other students don’t” (SQ 53) and they continue to agree that they have “shown other students how to do things with their laptops” (SQ 54, -0.06,  $p = 0.009$ ).

## 4.2 Laptops effects on students

### 4.2.1 Students’ estimates of positive differences from laptops

Students identify a range of differences that laptops make for them. Listed in order of student unanimity, Henrico students agreed that they are:

1. Learning more because of the laptop (SQ51<sup>6</sup>)
2. Getting better grades (SQ74, -0.10,  $p = 0.001$ )
3. Turning in more assignments on-time (SQ75, -0.17,  $p = 0.001$ )
4. Taking more interest in class (SQ72, -0.18,  $p = 0.001$ )
5. Taking more responsibility for work (SQ71, -0.17,  $p = 0.001$ )
6. Behaving better (SQ73, -0.14,  $p = 0.001$ ) and
7. Cooperating more with other students (SQ70, -0.12,  $p = 0.001$ ).

Students’ conclusions about the benefits that laptops bring to their learning have remained strong and positive. They have consistently concluded that “Laptops have had a positive effect on my attitudes toward school” (SQ 65, -0.07,  $p = 0.005$ ). And, after three years, students continue to believe that school is more fun with the laptops (SQ 32, -0.26,  $p = 0.001$ ) and that they are more interested in school because of the laptops (SQ 31, -0.21,  $p = 0.001$ ). At the beginning, 10<sup>th</sup> graders thought that laptops helped with ‘on-time assignments’ and now that those students are seniors, they still feel that way. And they believe that laptops do help with “How well I do in writing assignments” (SQ 69, +0.13,  $p = 0.001$ ).

There are three changes from earlier years. Students now conclude that the laptops have not made a difference in the quality of homework they turn in (SQ 67, -0.44,  $p = 0.001$ ) or with the amount of research they do (SQ 68, +0.33,  $p = 0.001$ ). And, students now agree that, “Having a laptop has not made a difference in how much I want to learn” (SQ 66, +0.65,  $p = 0.001$ ).

## 4.3 Laptop use by curriculum area

There are three areas where laptop use has remained high and constant at 3-4 days/week:

- History (SQ 17, +0.06,  $p = 0.045$ )
- Science (SQ 16, -0.28,  $p = 0.001$ ) and

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<sup>6</sup> This reports student responses for the two years in which this question was asked, 2006 and 2007.

- Electives (Q 15,  $-0.09$ ,  $p = 0.008$ ).

In the first year, laptops were not much used for English. That has changed from the first year's weekly student-reported average of 1-2 days/week to 2008's, 3-4 days/week (SQ 14). Students report that laptop use for Math has declined from the first year's 1-2 days/week to the current average student report of 'not at all' (SQ 15,  $-0.16$ ,  $p = 0.001$ ). Both changes are consonant with HCPS attention to the implications of previous year's evaluation reports where Interactive, Inc. commented on (1) the relative disuse of laptops in English and (2) the apparently negative relation between laptop use and some Mathematics topics.

#### 4.4 Laptop contributions to various study skills

Students told us how they were using their laptops for study skills and rated their helpfulness in various topics. To estimate the students' top choices for the curriculum topics most helped by the laptops, we averaged their "yes's", by function within each topic. In the order from most-to-least helped by computers, students chose the following:

- History (76%)
- Science (72%)
- English (69%)
- Electives (66%) and
- Math (37%).



The rankings in the table below compare students' "most-to-least" helpful assessments of computers by subject and by study function. The rankings have been reasonably stable across the three years of this study. And the areas where students find their laptops to be most helpful are the same areas where more laptop use is associated with higher SOL scores.

In every year, students concluded that their laptops were least helpful in Math. Interactive, Inc.'s 2007 comment on that pattern is repeated below:

The rankings are similar to last year with Math applications at the bottom of the list. The likely explanations remain the relative disadvantage of a QWERTY<sup>7</sup> keyboard for recording math symbols and the wish of teachers to see the steps students use in solving problems. If we asked students similar questions about another e-technology---graphing calculators for higher math---we would probably have more positive answers.

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<sup>7</sup> These letters appear on the upper left-hand side of American English computer keyboards. The location of the letters on a keyboard was designed a hundred years ago to reduce the clashing of letter-symbol arms on manual typewriters. The convention does not recognize letter frequencies or patterns in English and is to that extent inefficient.

<b>23. Student 2008 (2006) Rankings of Laptop Contributions to Various Study Functions by Subject</b>				
Rank/Function	Study	Take notes	Prepare presentations	Organize Information
Most helpful	Science (History)	History (History)	English (History)	History (History)
2 <sup>nd</sup>	History (Science)	Science (English)	History (English)	Science (English)
3 <sup>rd</sup>	English (English)	English (Science)	Electives (Science)	English (Science)
4 <sup>th</sup>	Electives (Electives)	Electives (Electives)	Science (Electives)	Electives (Electives)
5 <sup>th</sup>	Math (Math)	Math (Math)	Math (Math)	Math (Math)

From the beginning to date, students have believed that homework done on the computer is just as important as paper and pencil assignments (SQ 36, +0.10,  $p = 0.001$ ).

At its best, schoolwork involves analysis, research, evaluation, communication and both independent and team work. Students take their laptops back and forth from school to home so we asked students about the relation between laptops and those activities both in school and at home. Ideally, the homework assigned by teachers parallels and extends their in-class expectations. There are 14 values in the table below. Students report consistent expectations at school and at home and those expectations have remained the same over these three years of their schooling career or, in two instances, they have grown stronger.

It is also worth noting that several of the attributes being developed with computers are related to 21<sup>st</sup> Century skills, e.g., research, communication, independent work, teamwork and problem solving (see next section).

24. Student Opinions about Skills Developed by Laptops At School and Home Compared, 2008 to 2006 Listed from Most-to-Least Agreement by "In Class" 2008 Rating		
"Working with laptops in class/at home involves...	In Class	At Home
...taking notes SQ 43/50 (class/home)	Strongly agree changed from Agree (-0.09, $p = 0.001$ )	Agree: No change
...communicating (doing Power Points, adding pictures and sound to make a presentation better) SQ 40/47	Agree: No change	Agree: No change (-0.05, $p = 0.030$ )
...research skills on the internet (finding resources and applying them) SQ 38/45	Agree: No change (0.10, $p = 0.001$ )	Agree: No change
...working independently and without much direction from adults SQ 41/48	Agree: No change	Agree: No change (-0.07, $p = 0.006$ )
...working with other students in a team SQ 42/49	Agree: No change (-0.06, $p = 0.006$ )	Agree: Changed from Disagree
...evaluation skills (figuring out which facts or ideas are accurate and which are not) SQ 39/46	Agree: No change (-0.06, $p = 0.021$ )	Agree: No change
...problem-solving (getting a set of facts and having to figure out your own answer) SQ 37/44	Agree: No change	Agree: No change <sup>a</sup>

<sup>a</sup>In 2007, students did not agree that problem-solving was a common requirement of computer use at home. The 2008 response registers higher by teachers of students.

#### 4.5 Laptops and 21<sup>st</sup> Century study skills

Everyone involved with schooling has reason to expect that schools will equip graduates with the skills that they need to be successful in a world of global and increasingly digital competitiveness. From the beginning in 2006, HCPS students have agreed that they are "more likely to do well after I graduate because of the laptop" (SQ 52, -0.15,  $p = 0.001$ ).

In first year's baseline report, Interactive, Inc. noted the relative inattention to skills that were recommended by the national *21<sup>st</sup> Century Skills Partnership*. In 2008, students report a change---their homework now requires them "...to go to local business websites, collect data from businesses or other community groups or otherwise use technology outside the school" (SQ 34, +0.39,  $p = 0.001$ , this is a shift from disagree to agree). Students continue to report more group work as a result of the laptops (SQ 59) and group, team and cooperative work is a hallmark of *21<sup>st</sup> Century Skills Partnership* preparation.

Students doubt that their homework is related to what they will be doing after they graduate (SQ 35). In 2007, students had a more positive conclusion about the job-relevance of their homework. We noted then that Henrico's teachers reported that they were trying "...to think ahead to what my students will do after they graduate and give tasks and assignments with the laptops that resemble those future demands".

Those changes, along with the growth already remarked (problem solving, research, communication, independent work and teamwork) suggest that Henrico's teachers and students are engaging the workforce and personal/professional demands of the future more closely. One unchanged area for all three years is web searches as part of homework. Students have not reported those searches in any year (SQ 33), an omission that may be explained by teacher sensitivity to the uncertain availability of at-home Internet access for some students (Note: one Henrico student in five does not have at-home access to a family computer).

#### **4.6 Students rate their teachers' use of laptops**

In each of the previous two years, students were successively more certain that when "we use laptops, my teachers lecture less and walk around the room more, helping students more". This year, the average response of HCPS students changed from "agree" to "disagree" (SQ 30,  $-0.16$ ,  $p = 0.001$ ). Over each of the three years, students have agreed that teachers assign more group projects when the students are using laptops (SQ 29).

We asked students if, "...everyone is taught the same way at the same time". In the first and third years, they said "Yes". Last year (2007) they disagreed signaling their belief that was some more individual or small group instruction (SQ 56). For each of the three years, students have reported that everyone gets the same homework assignments (SQ 57,  $-0.06$ ,  $p = 0.002$ ).

Students have reported a steady, three-year increase in teacher use of *Power Point*, (SQ 24,  $-0.07$ ,  $p = 0.002$ ), interactive white boards and LCD projector presentations (SQ 24,  $+0.09$ ,  $p = 0.001$ ).

Students continue to report that the laptops do not distract them from their teachers (SQ 76,  $+0.13$ ,  $p = 0.001$ ).

There has been a shift in the students' beliefs about their own computer mastery compared to that of their teachers. In 2006, they thought they knew more than the teachers: now, they believe teachers know more than they do about computers (SQ 60,  $+0.23$ ,  $p = 0.001$ ) although they still report, as they did in 2006, that they have shown a teacher how to do things with the laptop (SQ 55,  $+0.10$ ,  $p = 0.001$ ). The teachers are more modest and believe that, "My students and I are equally competent with computers" (TQ 40).

During the first and third years of this study, students did not believe that teachers were using their computers to communicate with parents: in 2007, they thought they were (SQ 26). Students do not believe that there has been any change in teachers use of computers to get in touch with them, the students, outside of class (SQ 27,  $+0.24$ ,  $p = 0.001$ ). For themselves, they do not use their laptops to get in touch with teachers (SQ 61,  $-0.13$ ,  $p = 0.001$ ) but they do now use them to get in touch with other students (SQ 62,  $-0.16$ ,  $p = 0.001$ ).



#### 4.6.1 “No problems”

Consistently, across all three years, students reported no problems with: (1) acceptable use policies (SQ 80); (2) mute settings (SQ 78, +0.23,  $p = 0.001$ ); or (3) laptop sleep modes (SQ 79, +0.22,  $p = 0.001$ ). During the first two years of the laptop program, students reported that “...troubleshooting batteries, software, application access” was not a problem: for 2008, they thought those things were difficulties (SQ 77, +0.30,  $p = 0.001$ ).

### **4.7 The Context of infrastructure and skill levels**

#### 4.7.1 Students computer-related skill levels

For each of the three years of this analysis, the ‘most-to-least’ list of computer skills students thought themselves expert at has not changed.

1. Making *Power Point* presentations (SQ 5, +0.5,  $p = 0.019$ )
2. Creating multi-media presentations---sound, pictures, full-motion video (SQ 2, +0.17,  $p = 0.001$ )
3. Using spreadsheets to plot graphs (SQ 6)
4. Sharing their own content on a blog---artwork, photos, videos, writing (SQ 8, +0.15,  $p = 0.001$ ), and
5. Using a database to produce a list of addresses (SQ 7, +0.09,  $p = 0.001$ ).

The list of things students do not think themselves competent at has also not changed---“computer programming with Logo, Pascal, Basic” (SQ 3, +0.05,  $p = 0.05$ ); getting rid of viruses (SQ 1); or creating web pages (SQ 4, -0.06,  $p = 0.016$ ).

### **4.8 Computer use at home**

Four out of five Henrico students report that they have access to an additional computer at home along with Internet connections. Those proportions have remained stable over the lifetime of this analysis (SQ 81 and 82).

<b>25. Student Reports of At-Home Computer and Internet Availability by Year (%s reporting)</b>			
	2008	2007	2006
Computer at-home	82	79	81
Internet at-home	81	84	82

#### 4.9 Student Random-interval Survey Results

We used the same procedure with the students as we did with teachers in supplementing the self-report end-of-year questionnaire data and the results of our interviews and observations. In fact, the schedule of audible pings was the same for teachers and students: they happened simultaneously. In 2006-07, we sent 40 surveys between February 6, 2007 and April 7, 2007 and had 5,514 responses. In 2007-08, we sent 38 surveys between February 1, 2008 and March 21, 2008 and had 8,943 responses. The following sections each contain tables first for 2006-07, then for 2007-08.

##### 4.9.1 Student Laptop Use

In both 2006-07 and 2007-08, an average of 40% of HCPS students report using their laptop at any moment. That exceeds the computer use rate reported by (elementary) students in West Virginia (35%) who were supported by intensive assistance from the state department of education. The state wide average for computer use in all West Virginia schools is less than half of the HCPS use (18%<sup>8</sup>).

<b>26. Amount of Laptop Use In School by Students (2006-07)</b> (% responses to random interval surveys)	
	Percent (N)
Yes	40 (3172)
No	60(4783)
<i>Total</i>	<i>100 (7955)</i>

<b>27. Amount of Laptop Use In School by Students (2007-08)</b> (% responses to random interval surveys)	
	Percent (N)
Yes	39 (3181)
No	61(5058)
<i>Total</i>	<i>100 (8239)</i>

##### 4.9.2 Student Laptop Use by Class

By looking at the overall number of students who responded to the sequence of 38 inquiries indicating how they were using their laptops over the seven week course of the survey, we can get an idea about where laptops are used most. In 2006-07, the most

<sup>8</sup> C.f., Mann, D., and J. Becker, (2007) THE RESULTS OF PROFESSIONAL DEVELOPMENT ABOUT TECHNOLOGY: A Report of West Virginia's Statewide Technology Model Schools Program, Interactive, Inc., Ashland, Virginia. Report of a grant awarded to the West Virginia Department of Education from the US Department of Education, PR Award # S318A040014, the Evaluating State Educational Technology Program (ESTEP).

laptop use continues to be in Social Studies (and there is substantially more in 2007 than 2006). There is also more use in P.E./Health. Math use declined.

<b>28. Student Laptop Use by Curriculum Topic (2006-07)</b> (Random Interval Data)			
	Was the student using his/her laptop?		
Curriculum topic*	<b>2006-07 % Students using a laptop</b>	Students using a laptop (N)	Students responding per class (Total N)
Social Studies	<b>58</b>	614	1060
Science	<b>49</b>	489	997
English	<b>44</b>	465	1061
Foreign Language	<b>42</b>	260	619
Career & Technical Education	<b>41</b>	138	333
Other	<b>39</b>	867	2244
P.E./Health	<b>28</b>	109	391
Math	<b>22</b>	208	930
Lunch	<b>7</b>	22	320
<i>Total</i>	<i>40</i>	<i>3172</i>	<i>7955</i>

\*Not including absent students

Compared to the previous year, 2007-08, Social Studies use declined, but it remains the curriculum area with the most laptop use. Science and English use declined although both remained higher than the all-topic average. Foreign Language and Math use increased.

<b>29. Student Laptop Use by Curriculum Topic (2007-08)</b> (Random Interval Data)			
	Was the student using his/her laptop?		
Curriculum topic*	<b>2007-08 % Students using a laptop (2006-07 value)</b>	Students using a laptop (N)	Students responding per class (Total N)
Social Studies	<b>55 (58)</b>	584	1057
Foreign Language	<b>47 (42)</b>	285	613
Science	<b>45 (49)</b>	455	1021
Career & Technical Education	<b>42 (41)</b>	175	414
English	<b>41 (44)</b>	422	1031
P.E./Health	<b>33 (28)</b>	108	324
Math	<b>26 (22)</b>	246	966
Lunch	<b>10 (7)</b>	49	493
<i>Total</i>	<i>39</i>	<i>2324</i>	<i>5919</i>

\*Not including absent students

#### 4.9.3 Teacher activity as reported by students

Students told us what their teacher was doing at the moment of the survey: The pattern remained stable in 2007-08 with small increases in “other,” “lecturing” and “discussion” and a small decline in “working at his/her desk.”

<b>30. Student eLearning Survey – Teacher Activity (2006-07)</b>	
“My teacher was...	<b>2006-07 % Yes [N]</b>
2d. working at his/her desk	<b>35</b> [2805]
2e. doing something else (“other”)	<b>29</b> [2326]
2a. lecturing/demonstrating	<b>28</b> [2259]
2c. leading a class discussion	<b>18</b> [1443]
2b. helping small groups or individuals	<b>13</b> [991]

<b>31. Student eLearning Survey – Teacher Activity (2007-08)</b>	
“My teacher was...	<b>2007-08 % Yes (2006-07 value) [N]</b>
2d. working at his/her desk	<b>32</b> (35) [2636]
2e. doing something else (“other”)	<b>32</b> (29) [2665]
2a. lecturing/demonstrating	<b>30</b> (28) [2492]
2c. leading a class discussion	<b>19</b> (18) [1521]
2b. helping small groups or individuals	<b>13</b> (13) [1058]

#### 4.9.4 Self-reported student activity

The third item on the survey asked, “What are/were you [the student] doing?” The rank order of student activities is unchanged from 2006-07 to 2007-08, but there are small increases in “listening to the teacher” and “working in a small group” and a large increase in “doing something else.”

<b>32. Student eLearning Survey – Classroom Activity (2006-07)</b>	
	<b>2006-07 % Yes [N]</b>
3a. I was working on my own	<b>45</b> [3541]
3c. I was listening to the teacher	<b>32</b> [2561]
3d. I was doing something else (“other”)	<b>12</b> [2477]
3b. I was working in a small group	<b>12</b> [962]

<b>33. Student eLearning Survey – Classroom Activity (2007-08)</b>	
	<b>2007-08 % Yes (2006-07 value) [N]</b>
3a. I was working on my own	<b>42 (45) [3446]</b>
3c. I was listening to the teacher	<b>34 (32) [2820]</b>
3d. I was doing something else ("other")	<b>34 (12) [2765]</b>
3b. I was working in a small group	<b>13 (12) [1061]</b>

Finally, we captured uses of the laptops (“If yes, what are/were you working on?”). Internet research remains the most common use and all values remain unchanged except for a small increase in “doing something else.” Note: “listening to music” accounts for 3 percent of student laptop use.

<b>34. Student eLearning Survey – Student Computer Use (2006-07)</b>	
	<b>2006-07 % Yes [N]</b>
5c. I was researching/using the internet	<b>15 [1190]</b>
5f. I was doing something else ("other")	<b>12 [931]</b>
5a. I was taking notes	<b>11 [883]</b>
5d. I was reading onscreen text	<b>10 [775]</b>
5b. I was working on a presentation	<b>6 [445]</b>
5e. I was listening to music	<b>3 [270]</b>

<b>35. Student eLearning Survey – Student Computer Use (2007-08)</b>	
	<b>2007-08 % Yes (2006-07 value) [N]</b>
5c. I was researching/using the internet	<b>15 (15) [1242]</b>
5f. I was doing something else ("other")	<b>13 (12) [1052]</b>
5a. I was taking notes	<b>11 (11) [895]</b>
5d. I was reading onscreen text	<b>10 (10) [800]</b>
5b. I was working on a presentation	<b>6 (6) [455]</b>
5e. I was listening to music	<b>3 (3) [207]</b>

## 5.0 ADMINISTRATOR RESULTS

In schools, computers landed on administrators desks first. In general, they have the longest and deepest experience with computer use. One consequence is that virtually all school administrators cannot imagine their work without computers and virtually all school administrators have long since become fluent and comprehensive users. For the various administrative functions measured below, HCPS administrators began as enthusiastic and comprehensive users and that has not changed. (Or, from the measurement perspective, there is a ceiling effect on administrator computer use: computers have already been enthusiastically and completely adopted.)

### 5.1 Amounts and Applications

#### 5.1.1 Increasing laptop use

The administrative group has not changed in their use of laptops<sup>9</sup> for functions critical to school improvement like looking at interim assessments and communicating with teachers (AQ 4 and AQ 1).

They continue to report “strong agreement” that “I now use my laptop much more for...

1. “communicating with other administrators” (AQ 3)
2. “administering the business of the school---scheduling, budgets, personnel, etc.” (AQ 5)
3. “looking at interim assessments, student attendance” (AQ 4) and
4. “communicating with parents” (AQ 2).

About half of the administrators take their laptops home about half the time (AQ 64).

#### 5.1.2 Principals’ estimates of teachers’ attitudes about laptops

In 2006, administrators agreed that their teachers were enthusiastic about laptops for students and that has not changed (AQ 7). The average estimate of teacher enthusiasm (AQ 6) and of the effect on morale (AQ 27) has dropped a category from “strong agree” to “agree”. The administrators also report that “most teachers have learned or invented new ways to use the laptops” (AQ 9).

Administrators continue to want more professional development for their teachers (AQ 60) although they also report that the teachers have sufficient classroom support to implement laptop-related instructional changes (AQ 61) and that there is enough quality

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<sup>9</sup> For the 2008 web survey, we had outstanding cooperation with web survey responses from more than 100 HCPS administrators. Because the first year’s analysis was built on responses from about 35 administrators (and because of the inevitable churn in incumbents and assignments) we did not have enough matched pairs to test for statistical significance between the first and third year’s groups.

software to support instruction augmented with laptops (AQ 57). Asked if “All textbooks and resources should be available on student laptops”, they agree (AQ 59).

#### 5.1.3 Principals on teachers’ applications of laptops

We asked the building administrators how teachers were using their laptops. In 2006, administrators disagreed that teachers were maintaining class websites: that has turned around so that most teachers are now credited with websites (AQ 12).

#### 5.1.4 Principals on 21<sup>st</sup> Century skill applications for students

We asked again about some of the 21<sup>st</sup> Century skills development. About half the administrators believe that “Many teachers try to think ahead to what my students will do after they graduate and give tasks and assignments with the laptops that resemble demands of later employment” (AQ 15) and that “Many teachers make research assignments that require students to collect data from or study businesses and/or community institutions at least once a week” (AQ 11). They continue to credit laptops with increasing student collaboration (AQ 24) and cooperation (AQ 46).

#### 5.1.5 Principals on teachers use of laptops for instruction, assessment and grouping

The practice of monitoring what students do and do not know, at multiple points during the school year is an important addition to school improvement and one not logistically feasible except with technology. In 2006, administrators said that laptops had not helped teachers with testing or assessment. They now believe that laptops are making assessment more feasible (AQ 16) and particularly with SOL data (AQ 14 and 17). And, most of the principals agreed that teachers were changing their instructional grouping because of assessment information (AQ 18).

#### 5.1.6 Principals and time savings

Two of the items on which the HCPS site administrators most agree deal with time saved as a result of laptops---online grade reporting (AQ 26) and online student assessment (AQ 25).

### **5.2 Laptop Effects on Students**

#### 5.2.1 Principals estimates of how laptops help students

From the beginning, administrators have been generally agreed about the positive effects of individual laptops on students. They thought that the laptops had made a positive difference in the following (items are arranged in descending order of 2008 unanimity among the respondents):

1. Depth and breadth of research (AQ 40)
2. Quality of assignments (AQ 39)
3. Achievement of special education/IEP students (AQ 44)
4. Achievement of bilingual students (AQ 43)
5. The gap between higher and lower achieving students (AQ 45)

6. Desire to learn (AQ 38)
7. Interest in class (AQ 48)
8. Writing ability (AQ 41)

Two areas have changed. Administrators now disagree that “individual laptops... have made a positive difference in achievement of failing students” (AQ 42) and they disagree that “individual laptops have made a positive difference in grades” (AQ 50).

#### 5.2.2 Laptops and different types of students

One other, near consensus item describes the search of the principals for “a practical way for laptops to work with the different learning styles in the classes in this school” (AQ 22).

### **5.3 The Limits of Laptops**

Administrators also continue to conclude that getting students to bring laptops to class is a problem (AQ 54) but that acceptable use policy is not a problem (AQ 55).

Administrators do not believe that laptops have made a difference in (1) sense of personal responsibility (AQ 47); (2) behavior (AQ 49); or (3) attendance (AQ 51). They ended this three year study period believing that laptops distract students from direct instruction (AQ 52). The administrators do not agree that laptops have given students unrealistic ideas about learning (AQ 53).

### **5.4 The Context of infrastructure, Professional Development and Skill Levels**

Administrator conclusions about the availability of laptop help (AQ 30) and the reliability of Internet connections (AQ 29) have remained positive and unchanged. Opinions about laptop reliability have gone from the most positive interval to a positive interval (AQ 28).

#### 5.4.1 Principals computer-related skills

The biggest growth among administrators by computer-related function is with “spread sheets”. They went from agreeing to “strongly agreeing” that they were good at data manipulation and that supports the growth in assessment-related skills earlier reported for teachers. Building administrators rated their other skills from highest to lowest (2008) as follows:

1. Using a search engine (AQ 35)
2. Copying/moving files (AQ 34)
3. Content-specific applications and software (AQ 37)
4. Presentation software (AQ 32)
5. Desk-top publishing (AQ 33)

## 6.0 PARENT RESULTS FROM 2006-07

Parents are the child's first teachers and they are Henrico taxpayers. More than 3,000 parents responded to the district's request that they complete a brief web survey about their own and their child's experience with the laptops.

The average Henrico home with children has two computers in addition to the district-provided laptop. For 90% of families, only the high school student uses the laptop: in 10% of the cases, the laptop is used by another family member. That means that the HCPS program is supporting additional computer use by at least 700 family members without additional cost to the district.

Ninety-eight percent of all parents have allowed their children to take part in the laptop program. Eighty-two percent think the school has done a good job of integrating laptops into instruction. Eighty-one percent are satisfied with the Internet security filtering, 78% believe the laptops are reliable.

Eighty percent of Henrico parents go online to look at their child's homework or grades. Most parents ( $\geq 80\%$ ) also feel that the laptops and HCPS's technology-supplemented schooling will help their child in either paid employment or further education. Half of parents who responded feel that the laptops have helped their children in their current studies: half said that if their child went to a school without a laptop program that would "make a difference in achievement". Half the parents think that the laptops have improved their child's attitude to school. Twenty-three percent believe that laptops have made a difference in attendance.

Henrico parents report an average of three days or more of (HCPS) computer use at home and, for homework, for more than an hour a day.

The table below shows why parents opted out of the program.

<b>36. Parent Explanations for Opting out of Laptop Program</b>	
Reason for opting out of program	% Choosing (N)
Did not want my child exposed to influences related to computers	48 (23)
Program cost	21 (10)
Religious reasons	15 (7)
None of the above	15 (7)
Did not believe laptops would be helpful	2 (1)
<i>Total</i>	101(48)

Most of the parents surveyed believed that their children will be in college or university study five years from the date of the survey. Half the survey respondents were college graduates, a quarter have graduate degrees. A third of the respondents were engaged in management or professional work. Almost 70% identified themselves as White. About a fourth of the respondents had children in one of the grade levels, 9 to 12 (responses from parents of seniors were the smallest proportion).

## 7.0 CLASS OF 2006 GRADUATE RESULTS

To test the “stickiness” of the high school laptop experience once students had graduated, in December 2006 we mailed invitations to take a web-survey to the Class of 2006. We had responses from 90+ members of that class.

### Graduates’ advantages

- Students have always agreed that because of the laptops they are “more likely to do well after I graduate”
- 72% of HCPS graduates, now in college, thought their computer skills were better than other students
- For the graduates in the work force, 77% believe their computer skills are better than their co-workers

Ninety-four percent said they had a laptop while they were in the Henrico schools: 93% said they had laptops for all four of their high school years, 5% for 3 years, and 2% for 2 years. Ninety-five percent said they had Internet access at home during high school. That compares with 99% reporting Internet access in their current post-secondary schooling and 98% where they are now living. Thirty-nine percent said they had “Internet access at work.”

Ninety percent of the respondents said they are enrolled in college full time, 2% part-time. None are in the military. Nine percent report full-time paid employment and 26% report part-time paid employment. We asked the graduates what they thought they would be doing in five years: two-thirds said they would still be in higher education, one-third said paid employment.

The graduates report frequent computer use regardless of their current work or study status.

<b>37. 2006 Graduates Computer Use by Location</b>	
Location of computer use: “I use a computer at...	Frequency (Mean) [N]
work”	3-4 Days/Week (2.38) [29]
in my classes”	3-4 Days/Week (2.06) [70]
at home for my homework”	Everyday (2.72) [85]

We asked graduates to reflect on their experience with computer-related technology in HCPS. Eighty-seven percent acknowledged they had been trained in word processing and 67% in spreadsheets, tables and graphs. Asked what was missing in the HCPS computer-related education, here is what they said.

<b>38. Graduates Identification of Areas of Computer-Related Learning That Were Missing from the HCPS Experience</b>	
<b>Missing component</b>	<b>% reporting</b>
Online banking	52% Yes (93)
Blogs and discussion boards	45% Yes (93)
Database development and management	44% Yes (93)
Website development	44% Yes (93)
Multimedia presentations	24% Yes (93)

## 8.0 COMMENTARY: Interpreting the relation between student laptops and the goals of the Henrico Public Schools

**8.1 Introduction:** The core task set for Interactive, Inc. was to document and analyze student, teacher, and administrator changes in connection with HCPS's laptop initiative. In earlier sections, we have reported the data and the conclusions that can be derived from those data.

This section addresses some issues of school policy that are related to the questions about which we gathered and analyzed data but the issues in this section are, strictly speaking, beyond that inquiry. While the entire report is the sole responsibility of Interactive, Inc., the opinions expressed in this section are the special responsibility of the author<sup>10</sup>.

At the end of this analysis of three year's of experience with one of the country's largest and most intensive deployments Henrico has a record of accomplishments that is not typical of computer initiatives in other jurisdictions.

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<sup>10</sup> Interactive, Inc. was chosen because of its experience in doing large scale scientific evaluations of learning technology. Currently, the firm...

- Is in the third year as the state-wide "super-evaluator" for all federal technology expenditures in the state of New York
- Is completing the sixth year of state wide analyses of *NCLB* Title II D ("Enhancing Education Through Technology") projects in West Virginia
- Has completed a three-year analysis for the US Department of Education documenting the relation between technology-related professional development and student achievement
- Has completed the education technology plan for all 700 schools in the United Arab Emirates
- Has completed additional learning technology studies for 8 big cities and several American states
- Has completed outcomes studies for private firms Including IBM, Sun Microsystems, Texas Instruments, Scholastic and Houghton-Mifflin

The principal author of this study, Dale Mann has been identified as one of the ten most influential persons working in education technology in the United States. He is also an emeritus professor at Columbia University's Teachers College and its School for International and Public Affairs.

The conclusions in this section are in that national and multi-national context.

## 8.2 The Uniqueness of the HCPS 1-to-1 program.

Why has Henrico succeeded? First, Henrico moved “at scale” and that large-scale commitment made a number of things possible. While HCPS committed to one laptop for every teacher and every student, other jurisdictions have done only “pilot projects” (laptops for a single school or for one grade in one school).

Ubiquitous computing projects are complicated and protracted. They require lots of support but it is not economical to provide a critical mass of support to small scale and isolated projects. Without that comprehensive assistance, teachers have quickly returned to teacher-talk, print-delivered instruction.

Other factors that have denied other places Henrico’s success include changes in leadership, changes to budgets<sup>11</sup>, inadequate libraries of software and applications and fragmented, *laissez faire* adoption policies (i.e., some schools can opt out, some principals have other priorities, some teachers omit to participate).

A lack of critical mass and a lack of consistency kills innovation. Until the Bloomberg/Klein administration, the public schools of New York “had one of everything and committed to nothing”. That is, at least one school somewhere among New York’s one thousand buildings would be the City’s solitary lighthouse doing whatever innovation was in vogue but there never was any single thing that all of the one thousand schools were required to do.

Henrico has been more successful than other places because it never permitted the “implementation fallacy”. It would have been possible, even likely, to put 7,000 laptops in the hands of as many students and hope that they and the teachers would spontaneously discover useful things to do with them. The 40-year history of “implementation” studies documents that the most common explanation for the apparent failure of most innovations is that they were never, in fact implemented. No program implementation, no follow-through, no consistent and required use = no results. Laptop

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<sup>11</sup> Consider the following from a report funded by the Milken Family Foundation: “Imagine that you are required to increase reading scores by 1 month in grade-level gains. There are two known methods: (a) reduce class sizes from 21 to, say, 15 students per class, a technique that requires hiring more adults; or (b) add instructional technology. According to an analysis from Lewis C. Solmon, both methods will yield the same outcome—a month’s increment of learning. But the teacher method is more than seven times more expensive than the technology method. “The total cost figures . . . translate into \$636 per student per year for class size reduction and \$86 for BS/CE [computers]” (Solmon, 1999, p. 49). *Solmon, L. C. (1999). Afterword. In D. Mann, C. Shakeshaft, J. Becker, & R. Kottkamp, The West Virginia story: Achievement gains from a statewide comprehensive instructional technology program* (p. 49). Santa Monica, CA: Milken Family Foundation.

implementations that have had their peak at the launch party photo op have not been successful.

Henrico's initiatives with laptops has been cumulative since the year 2000.

Then there is the matter of how the high school laptop program got launched. There are schools where teachers are asked and schools where teachers are told. Without appropriate inclusion, teacher resistance is formidable if not fatal to "improvement". Evidence from the first year of this analysis documented how much teachers appreciated the collaborative and inclusive methods use to launch this program. As a result, laptops have had a consistent positive impact on faculty morale.

At the same time, laptops were never oversold and were never promoted as "magic feathers" or "silver bullets". They were always one initiative of several complementary and inter-locking curriculum initiatives that were to make teaching stronger and learning better.

And, the Board insisted that the laptop vendor, Dell Computers, support an independent, yearly analysis of outcomes to inform a improvement cycle. Very few school districts have mixed-methods, multi-year outcomes analysis. And those that do, are not often guided by the evaluation results. Henrico has been different. At the end of the first year, Interactive, Inc. made seven recommendations. The table below summarizes those recommendations and HCPS developments.

<b>39. HCPS Evidence-Based Changes to the Laptop Program 2006-2008</b>	
<b>2005-06 Evaluation Report Recommendations</b>	<b>Subsequent Program Developments</b>
1. Professional development: make it more targeted on teacher needs	ITRT's have been re-organized by curriculum specialties. And professional development has been connected more directly to teacher classroom practice.
2. Student interim assessment should be emphasized	Consistent gains over each of the two succeeding years in assessment data collection, analysis and application
3. Generalize from high-use, high-success areas to others	Over time, English teachers have been added to the high user group. The average Henrico teacher now reports being part of a group to create new applications for laptops.
4. Capitalize on teacher-developed best practices	These have been harvested by the ITRT's and are reflected in the professional development schedule.
5. Trust that teachers will naturally increase their use as they discover the benefits of laptops	The continuous increases in laptop use by teachers indicates that this dynamic is at work (and it is amplified by systematic professional development)
6. Low cost incentives for	The data on use and results indicates that this

increased teacher us	was not necessary
7. School-home-school communications	Teacher web-site creation and maintenance, online grade reporting, ConnectEd.com
8. 21 <sup>st</sup> Century Skills	HCPS has had several substantial gains in this area, for example, not only more use but more demanding and challenging use from teachers to students

There are important and consistent signals that more use of technology is associated with student performance. And there are documented benefits in productivity, motivation and communication in addition to test scores, for students, teachers, administrators and schools.

### **8.3 The Multiple benefits of a single intervention**

Most of the time, districts send teachers away to a workshop about a better way to teach fractions. Or they commission in-service training about how to do assessment. Or, districts buy equipment to promote exercise or textbooks to grow content skills. Most of the time, single interventions have single benefits. In the case of the laptops, that singular addition has levered documented change in the work of teachers and students. Laptops are not a 'silver bullet' but they do provide an arsenal that can move several dimensions of school practice.

The laptops have

- Changed classroom teaching in ways that were not otherwise possible, e.g., less direct instruction, more coaching, more project-based learning
- Increased attention to individual students and small groups of students through, for example, interim assessments
- Increased communication among teachers and administrators
- Improved student achievement in core curriculum areas
- Improved student study skills---note-taking, organizing and presenting material
- Connected students to their employment and academic futures, e.g., 21<sup>st</sup> Century skills.

There are few if any policy alternatives available to schools that can deliver the range, significance and stability of this 1-to-1 laptop initiative.

## APPENDIX A: Methods

This report is based on quantitative and qualitative data. The quantitative data include Virginia state-required “SOL” end-of-year tests forwarded by the school district for analysis. Quantitative data also included; (1) annual (and in one year pre- post) web-survey self-report responses from students, teachers and administrators; (2) web-survey responses from parents and HCPS graduates (for 2006-07); and (3) random interval self-report responses from students and teachers who were prompted by an audible laptop “ping” to complete very brief five-item web-surveys about what they were doing at the moment of the query. That data collection was repeated each year with about 40 queries sent at random intervals over a seven week period in the spring.

Qualitative data included twice-a-year visits to each school with interviews from building administrators, teachers and students and with classroom observations.

The data have been analyzed using descriptive statistics. We report the average (mean) responses of students, teachers or administrators. Where possible, we report and compare same-student, same-teacher responses from the first year (2005-06) and the third year (2007-08).

Questionnaire responses were recorded for each student, teacher and administrator with the following values based on each item’s possible responses:

1	Strongly disagree	Not at all	Never	No
2	Disagree	1-2 days/week	Sometimes	Yes
3	Agree	3-4 days/week	Often	
4	Strongly agree	Every day		

These values were used to find the mean responses to questionnaire items. In the case of factors, we take the average of the responses to the items that make up the factor.

For reporting purposes, the means are rounded to the nearest tenth on a Likert (agree/disagree) scale. Response intervals for the Likert and other response formats have been coded as follows:

1.00-1.74	Strongly disagree	Not at all
1.75-2.49	Disagree	1-2 days/week
2.50-3.24	Agree	3-4 days/week
3.25-4.00	Strongly agree	Every day

1.00-1.66	Never
1.67-2.33	Sometimes
2.34-3.00	Often

1.00-1.49	No
1.50-2.00	Yes

EOY questionnaire response rates by group, for each year are:

	2005-06	2006-07	2007-08	Totals
<b>Students (82)*</b>	6,797	8,268	8,275	23,340
<b>Teachers (141)</b>	796	765	685	2,246
<b>Administrators (66)</b>	37	137	130	304
<b>Parents (26)</b>		3,436		3,436
<b>Graduates (30)</b>		94		94
Totals	7,630	12,700	9,090	29,420

\* Parentheses indicate number of items in each questionnaire

In 2006-07 we analyzed responses from more than 3,000 Henrico parents and about 100 graduates of the Class of 2006.

Gain scores to measure longitudinal changes in teacher and student web-survey responses from 2006 to 2008 were calculated using paired sample t-tests at a 95% confidence level. These gain scores reflect changes in responses of the same teachers and students across the life of the study.

Gain scores to measure changes in administrator web-survey responses were calculated by subtracting all respondent means in 2006 from all respondent means in 2008 for each survey item. No statistical tests were performed as there were an insufficient number of matching pairs from both years' response sets.

Changes in SOL achievement scores for each year and curriculum area were compared by reported levels of laptop use (as indicated in student web-survey responses) using analysis of variance (ANOVA) and post-hoc Bonferonni at a 95% confidence level

Random-interval student and teacher surveys were sent out 40 times each year between the months of February and April. These brief surveys captured unique data about what the respondent was doing at that moment. Data were reported based the percentage of respondents who answered "Yes" to each item.

Web survey analyses do not include those who responded with "Not applicable (N/A)" And random-interval survey analyses do not include students and teachers who were "absent."

Web-surveys are in Appendices B through F.

Data are available for secondary analysis on permission of HCPS and Dell.

## APPENDIX B: Student Web-Survey



Dear Student:

The Henrico County Public Schools is conducting a multi-year study of laptop use and Interactive, Inc., a national firm that specializes in e-learning, is conducting the analysis.

We need your help, experience and insight. There are no right or wrong answers to the questions and all answers will be confidential: no individuals will be identified. The survey should take about 30 minutes to complete. Thanks in advance for your help and best wishes for your success!

Sincerely,

Fred S. Morton, IV  
Henrico County Public Schools

Dale Mann, Ph.D., Managing Director  
Interactive, Inc.

**Directions:** For each section, choose the radio button that best describes your response to the item.

Please tell us how much you agree/disagree with the following statement for each item that completes it below:

I am an expert at...

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
1. Using software to find and get rid of computer viruses	①	②	③	④	⑤
2. Creating a multi-media presentation (with sound, pictures, video)	①	②	③	④	⑤
3. Creating a computer program (e.g., in Logo, Pascal, Basic)	①	②	③	④	⑤
4. Constructing a Web page	①	②	③	④	⑤
5. Creating a presentation (e.g., using MS PowerPoint)	①	②	③	④	⑤
6. Using a spreadsheet to plot a graph	①	②	③	④	⑤
7. Using a database to produce a list of addresses	①	②	③	④	⑤
8. Sharing your own content (writing, artwork, photos, videos) on a blog?	①	②	③	④	⑤

Please tell us how often you do the following things:

	Not at all/ NA	1-2 days/ week	3-4 days/ week	Every day	N/A
9. At school, <u>last</u> year (2006-07), I used a <u>laptop</u> computer	①	②	③	④	⑨
10. At school, <u>this</u> year (2007-08), I used a <u>laptop</u> computer	①	②	③	④	⑨
11. At school, <u>this</u> year (2007-08), I used my laptop during free periods	①	②	③	④	⑨
12. I take my laptop home	①	②	③	④	⑨
13. At home, <u>this</u> year, I used my laptop	①	②	③	④	⑨

Please tell us how often you use your laptop in...

	Not at all/ NA	1-2 days/ week	3-4 days/ week	Every day	N/A
14. English	①	②	③	④	⑨
15. Math	①	②	③	④	⑨
16. Science	①	②	③	④	⑨
17. History	①	②	③	④	⑨
18. Another elective course	①	②	③	④	⑨

The laptop has helped me...

(Please answer YES or NO in all categories and for all subjects)

The laptop has helped me in...	(A) ...Study			(B) ...Take notes			(C) ...Prepare presentations			(D) ...Organize information		
	No	Yes	N/A	No	Yes	N/A	No	Yes	N/A	No	Yes	N/A
19. English	①	②	⑨	①	②	⑨	①	②	⑨	①	②	⑨
20. Math	①	②	⑨	①	②	⑨	①	②	⑨	①	②	⑨
21. Science	①	②	⑨	①	②	⑨	①	②	⑨	①	②	⑨
22. History	①	②	⑨	①	②	⑨	①	②	⑨	①	②	⑨
23. Another elective course	①	②	⑨	①	②	⑨	①	②	⑨	①	②	⑨

Please tell us how much you agree/disagree with each of the following statements:  
Compared to last year, my teachers use computers MORE for...

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
24. Power Points, etc.	①	②	③	④	⑨
25. White board and LCD projector presentations	①	②	③	④	⑨

26. Communicating with my parents	①	②	③	④	⑨
27. Communicating with me outside of class	①	②	③	④	⑨

Please tell us how much do you agree/disagree with the following statements:

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
28. I think I should be allowed to determine when to use my laptop at school for school work	①	②	③	④	⑨
29. When we use laptops, my teachers assign more group projects	①	②	③	④	⑨
30. When we use laptops, my teachers lecture less and walk around the room helping students more	①	②	③	④	⑨
31. When we use laptops, I am more interested in school	①	②	③	④	⑨
32. Being at school is more fun with the laptops	①	②	③	④	⑨

Please tell us how much you agree/disagree with the following statements about how **you are supposed to be using your laptop:**

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
33. My teachers assign Internet searches as part of homework at least once a week	①	②	③	④	⑨
34. I have had homework that required me to go to local business websites, collect data from businesses or other community groups or otherwise use technology outside the school	①	②	③	④	⑨
35. The homework we have seems related to what I will be doing after I graduate	①	②	③	④	⑨
36. Homework done on computers seems less important than paper and pencil homework	①	②	③	④	⑨

Please tell us how much you agree/disagree for each of the following statements:  
When you think about the work you are asked to do with your laptop **in class**, does it involve?

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
37. Problem-solving (getting a set of facts and having to figure out your own answer)	①	②	③	④	⑨
38. Research skills on the Internet (finding resources and applying them)	①	②	③	④	⑨

39. Evaluation skills (figuring out which facts or ideas are accurate and which are not?)	①	②	③	④	⑨
40. Communication (doing Power Points, adding pictures and sound to make a presentation better)	①	②	③	④	⑨
41. Working independently and without much direction from adults	①	②	③	④	⑨
42. Working with other students in a team	①	②	③	④	⑨
43. Taking notes	①	②	③	④	⑨

Please tell us how much you agree/disagree with the following statement for each item that completes it below:

When you think about the work you are asked to do with your laptop **at home/for homework**, does it involve?

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
44. Problem-solving (getting a set of facts and having to figure out your own answer)	①	②	③	④	⑨
45. Research skills on the Internet (finding resources and applying them)	①	②	③	④	⑨
46. Evaluation skills (figuring out which facts or ideas are accurate and which are not?)	①	②	③	④	⑨
47. Communication (doing Power Points, adding pictures and sound to make a presentation better)	①	②	③	④	⑨
48. Working independently and without much direction from adults	①	②	③	④	⑨
49. Working with other students in a team	①	②	③	④	⑨
50. Taking notes	①	②	③	④	⑨

Please tell us how much do you agree/disagree with the following statements:

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
51. I am more likely to complete online classwork/homework assignments than paper/pencil assignments	①	②	③	④	⑨
52. I'm more likely to do well after I graduate because of the laptop	①	②	③	④	⑨
53. I am using my laptop in ways that other students don't.	①	②	③	④	⑨
54. I have shown other students how to do things with their laptops	①	②	③	④	⑨
55. I have shown a teacher how to do	①	②	③	④	⑨

things with their laptops					
56. In my classes, everyone is taught the same way at the same time	①	②	③	④	⑨
57. In my classes, everyone gets the same homework assignments	①	②	③	④	⑨
58. I still carry the same amount of paper books to my class	①	②	③	④	⑨
59. I do more school work with other students because of the laptop	①	②	③	④	⑨
60. My teacher knows more than I do about laptops	①	②	③	④	⑨
61. I do not use my laptop to communicate with my teachers	①	②	③	④	⑨
62. I do not use a laptop to communicate with other students	①	②	③	④	⑨
63. I use my laptop much more than other students in this school	①	②	③	④	⑨
64. I have been part of a group that worked on new ways to use laptops	①	②	③	④	⑨
65. Laptops have had a positive effect on my attitudes toward school	①	②	③	④	⑨

Please tell us how much you agree/disagree with each of the following statements:

Having a laptop has **not** made a difference in...

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
66. How much I want to learn	①	②	③	④	⑨
67. The quality of the homework I turn in	①	②	③	④	⑨
68. The amount of research I do	①	②	③	④	⑨
69. How well I do in writing assignments	①	②	③	④	⑨

Having a laptop **has** made a **positive** difference in...

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
70. How much I cooperate with other students	①	②	③	④	⑨
71. The responsibility I feel for my work	①	②	③	④	⑨
72. My interest in my classes	①	②	③	④	⑨
73. My behavior	①	②	③	④	⑨
74. My grades	①	②	③	④	⑨
75. The number of assignments I turn in on-time	①	②	③	④	⑨

Please tell us how much do you agree/disagree with the following statements:

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
76. Laptops distract me from the teacher, I pay less attention	①	②	③	④	⑤
77. I have to spend a lot of time troubleshooting batteries, software, application access	①	②	③	④	⑤
78. Getting laptops set to mute is a problem	①	②	③	④	⑤
79. Bringing laptops to class in the sleep mode is a problem	①	②	③	④	⑤
80. Complying with acceptable use policies is <u>not</u> a problem for me	①	②	③	④	⑤
81. I have a computer at home other than the laptop I get from the school	①	②	③	④	⑤
82. I have an Internet connection at home	①	②	③	④	⑤

Please feel free to write any additional comments regarding this survey, the laptops or technology in your school/classrooms:

## APPENDIX C: Teacher Web-Survey



**Interactive, Inc.**  
e.valuation for e.learning

Dear Teacher:

The Henrico County Public Schools is conducting a multi-year study of laptop use and Interactive, Inc., a national firm that specializes in e-learning, is conducting the analysis.

Thanks for your help in the last two years. We hope again to have your experience and insight. There are no right or wrong answers to the questions and all answers will be confidential: no individuals will be identified. Thanks in advance for your help and best wishes for your success!

Sincerely,

Fred S. Morton, IV  
Henrico County Public Schools

Dale Mann, Ph.D., Managing Director  
Interactive, Inc.

**Directions:** For each section, choose the radio button that best describes your response to the item.

Please tell us how much do you agree/disagree with the following statement for each item below: This year, **I use my laptop more for...**

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
1. Presenting instruction with content-specific software	①	②	③	④	⑤
2. Looking at student interim assessments	①	②	③	④	⑤
3. Lesson planning	①	②	③	④	⑤
4. Checking student attendance, information or grade administration	①	②	③	④	⑤
5. Communicating with parents	①	②	③	④	⑤
6. Communicating with other teachers	①	②	③	④	⑤
7. Communicating with administrators					
8. Communicating with students	①	②	③	④	⑤

Please tell us how much do you agree/disagree with the following statements:

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
9. I am using my laptop more this year than last	①	②	③	④	⑤

10. My laptop has made a positive difference in my teaching	①	②	③	④	⑨
11. I am doing <u>less</u> direct instruction (lecturing to the whole class) this year	①	②	③	④	⑨
12. I am coaching more this year (being with students while they work)	①	②	③	④	⑨
13. The laptop has made no difference in my ability to align my teaching to Virginia standards	①	②	③	④	⑨
14. I determine when student laptops are open and used	①	②	③	④	⑨
15. This school's administration supports my work with laptops	①	②	③	④	⑨

Please tell us how much do you agree/disagree with the following statements:

	<b>Disagree Strongly</b>	<b>Disagree</b>	<b>Agree</b>	<b>Agree Strongly</b>	<b>N/A</b>
16. I assign web-based activities using laptops for homework at least once a week	①	②	③	④	⑨
17. I make assignments that require students to collect data from or study businesses and/or community institutions at least once a week	①	②	③	④	⑨
18. I try to think ahead to what my students will do after they graduate and give tasks and assignments with the laptops that resemble those future demands	①	②	③	④	⑨
19. Homework done on computers is <u>less</u> important than paper and pencil homework	①	②	③	④	⑨
20. Individual computers have made small group assignments more possible	①	②	③	④	⑨

Please tell us how much do you agree/disagree with the following statements:

	<b>Disagree Strongly</b>	<b>Disagree</b>	<b>Agree</b>	<b>Agree Strongly</b>	<b>N/A</b>
21. I know the academic standing of my students without adding a lot of quizzes and assessments	①	②	③	④	⑨
22. Laptops do not help me assess or test students	①	②	③	④	⑨
23. I use laptops to assess students based on quizzes at least once a week	①	②	③	④	⑨

24. I use my laptop to assess students based on SOL state tests	①	②	③	④	⑨
25. I assess students based on laptop projects that relate to the outside world	①	②	③	④	⑨
26. I use the laptops to give more quizzes this year	①	②	③	④	⑨
27. I use my laptop to analyze more quiz data, assessment data this year	①	②	③	④	⑨
28. I have changed the way I group students for instruction	①	②	③	④	⑨
29. I use my laptop to change instructional groupings more frequently than last year	①	②	③	④	⑨

Please tell us if the following statements apply to you:

	(A) Remediation		(B) Assessment		(C) Presentation	
	No	Yes	No	Yes	No	Yes
30. I am more advanced in laptop use than other teachers for...	①	②	①	②	①	②
31. I show other teachers how to do things with their laptops for...	①	②	①	②	①	②

Please tell us how much do you agree/disagree with the following statements:

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
32. I would like to see a practical way for laptops to work with the different learning styles in my classes	①	②	③	④	⑨
33. Laptops help students who are visual learners	①	②	③	④	⑨
34. Laptops help students who are auditory learners	①	②	③	④	⑨
35. Laptops help students who are kinesthetic learners	①	②	③	④	⑨
36. Laptops help bi-lingual students	①	②	③	④	⑨
37. Individualized instruction is not practical for me	①	②	③	④	⑨
38. Laptops have made small group instruction more feasible	①	②	③	④	⑨
39. Students still bring the same amount of paper books to my class	①	②	③	④	⑨
40. Student-to-student collaboration has increased with laptops	①	②	③	④	⑨

41. My students and I are equally competent with computers	①	②	③	④	⑤
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Please tell us how much do you agree/disagree with the following statements:

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
42. When students take assessments online, that saves me time	①	②	③	④	⑤
43. Online grade reporting saves me time	①	②	③	④	⑤
44. I do not use my laptop to communicate with other teachers	①	②	③	④	⑤
45. I use computers much more than my colleagues in this school	①	②	③	④	⑤
46. I have been part of a group that worked on new ways to use laptops	①	②	③	④	⑤
47. Laptops have had a positive effect on faculty morale	①	②	③	④	⑤

Please tell us how often you have used your laptop this year to...

	Never	Sometimes	Often
48. Develop lesson plans	①	②	③
49. Assess individual students	①	②	③
50. Print handouts	①	②	③
51. Find teaching resources online	①	②	③
52. Keep my plan book	①	②	③
53. Post homework assignments	①	②	③
54. Exchange lesson plans with other teachers	①	②	③
55. Get professional help	①	②	③

Please tell us how much do you agree/disagree with the following statements:

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
56. My computer is reliable	①	②	③	④	⑤
57. My Internet connection is reliable	①	②	③	④	⑤
58. I can get help with hardware-related technology when I need it/within a reasonable amount of time	①	②	③	④	⑤
59. I can get instructional help related to technology when I need it/within a	①	②	③	④	⑤

reasonable amount of time					
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Please tell us how much do you agree/disagree with the following statement for each item below: **My laptop computer is useful for...**

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
60. developing a computer-related lesson	①	②	③	④	⑤
61. instructional technology for Reading	①	②	③	④	⑤
62. instructional technology for Writing	①	②	③	④	⑤
63. instructional technology for Math	①	②	③	④	⑤
64. instructional technology for Social Studies	①	②	③	④	⑤
65. instructional technology for Science	①	②	③	④	⑤
66. instructional technology for other subjects	①	②	③	④	⑤

Please tell us how much do you agree/disagree with the following statement for each item below: **Computers are useful for helping my students...**

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
67. Catch up with what they have not learned	①	②	③	④	⑤
68. Express ideas in writing	①	②	③	④	⑤
69. Measure what they have learned	①	②	③	④	⑤
70. Communicate electronically with others	①	②	③	④	⑤
71. Find out about ideas/information	①	②	③	④	⑤
72. Analyze information	①	②	③	④	⑤
73. Present information	①	②	③	④	⑤
74. Learn to work collaboratively	①	②	③	④	⑤
75. Learn to work independently	①	②	③	④	⑤

Please tell us how much do you agree/disagree with the following statement for each item below: **Compared to paper/pencil systems, do you think online resources might...**

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
76. Make it easier to individualize instruction	①	②	③	④	⑤
77. Make it easier to assess students	①	②	③	④	⑤

78. Give me more teaching hints	①	②	③	④	⑤
79. Save time carrying paper files to/from school and home	①	②	③	④	⑤

Please tell us how much do you agree/disagree with the following statement for each item below: **I am good at...**

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
80. Spreadsheets	①	②	③	④	⑤
81. Presentation software	①	②	③	④	⑤
82. Desktop publishing	①	②	③	④	⑤
83. Copying/moving files	①	②	③	④	⑤
84. Using an Internet search engine	①	②	③	④	⑤
85. Creating and maintaining a website	①	②	③	④	⑤
86. Using content specific applications/software	①	②	③	④	⑤
87. Using teaching aides such as QUIA, Beyond Books, etc.	①	②	③	④	⑤

Please tell us how much do you agree/disagree with the following statement for each item below: **Individual laptops for students have made a positive difference in students:**

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
88. Desire to learn	①	②	③	④	⑤
89. Quality of assignments they turn in	①	②	③	④	⑤
90. Depth and breadth of the research they do	①	②	③	④	⑤
91. Ability to express themselves in writing	①	②	③	④	⑤
92. Achievement of failing students	①	②	③	④	⑤
93. Achievement of bilingual students	①	②	③	④	⑤
94. Achievement of Special Education/IEP students	①	②	③	④	⑤
95. Bridging the achievement gap between lower and higher achieving students	①	②	③	④	⑤

Please tell us how much do you agree/disagree with the following statement for each item below: **Individual laptops have made a positive difference in...**

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
96. How well students cooperate with each	①	②	③	④	⑤

other					
97. The responsibility they feel for their work	①	②	③	④	⑨
98. Their interest in my class	①	②	③	④	⑨
99. Their behavior	①	②	③	④	⑨
100. Their grades	①	②	③	④	⑨
101. Their attendance	①	②	③	④	⑨

Please tell us how much do you agree/disagree with the following statements:

	<b>Disagree Strongly</b>	<b>Disagree</b>	<b>Agree</b>	<b>Agree Strongly</b>	<b>N/A</b>
102. Laptops distract students from my direct instruction, they pay less attention	①	②	③	④	⑨
103. The educational contribution of computers is not worth the time I have to spend troubleshooting batteries, software, application access	①	②	③	④	⑨
104. Laptops have given students unrealistic ideas about what learning is about	①	②	③	④	⑨
105. Getting students to bring laptops to class is a problem	①	②	③	④	⑨
106. The length of time the laptop batteries hold a charge is a problem	①	②	③	④	⑨
107. Student compliance with acceptable use policies is <u>not</u> a problem	①	②	③	④	⑨
108. Students with more computer knowledge are moving faster than those with less	①	②	③	④	⑨
109. There is not enough good software	①	②	③	④	⑨
110. Laptops encourage unrealistic expectations for what I have time to do as a teacher	①	②	③	④	⑨
111. All textbooks and resources should be available on student laptops	①	②	③	④	⑨
112. Permanent LCD projectors in each classroom would encourage more use of laptops for presentation and instruction	①	②	③	④	⑨

And please tell us how much do you agree/disagree with the following statements:

	<b>Disagree Strongly</b>	<b>Disagree</b>	<b>Agree</b>	<b>Agree Strongly</b>	<b>N/A</b>
113. I have had all the professional development I need to use the laptops	①	②	③	④	⑨
114. I have had classroom support to implement the skills I learned from professional development	①	②	③	④	⑨

115. There is an expectation at my school that I will participate in technology professional development activities	①	②	③	④	⑤
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Please answer the following question with one of the supplied types of training:

	Group Session	Individual Help	Planning Period Training	Online Training
116. What type of professional development suits you best?	①	②	③	④

Please tell us how frequently you go to each of the following sources when you need help with technology:

	Never	Sometimes	Often
117. Other teachers	①	②	③
118. The HCPS/Dell helpline	①	②	③
119. Instructional Technology Resource Teacher Technology trainer	①	②	③
120. TST	①	②	③
121. A student	①	②	③
122. No one	①	②	③

I....

	No	Yes
123. have a website(s) for my class(es)	①	②
124. post my class(es)' syllabus online	①	②

Please tell us how frequently you do each of the following activities:

	Never	Sometimes	Often
125. Post homework assignments on a school or class website	①	②	③
126. Post due dates and project dates through a school or class website	①	②	③
127. Update my class(es)' website	①	②	③

Check any of the items below that are located in your classroom:

	No	Yes
128. A reliable Internet connection	①	②
129. A Smartboard or an interactive white board	①	②
130. A digital camera	①	②
131. An LCD projector	①	②

For those Items that are not located in your classroom, indicate the level of access to each:

	No access	Occasional Access	Access Anytime
132. A reliable Internet connection	①	②	③
133. A Smartboard or an interactive white board	①	②	③
134. A digital camera	①	②	③
135. An LCD projector	①	②	③

In order to display content to the class from a laptop, I have used...

	No	Yes
136. An LCD Projector	①	②
137. An interactive whiteboard	①	②
138. A television	①	②

**Teacher and student best practices**

136. If you have developed a laptop related lesson, unit or continuing practice that you would like to share, please tell us about it.  
 Topic:  
 Grade level:  
 Practice or idea:  
 Required materials and time:  
 Results or outcomes for you or students:  
 May we contact you if your idea is selected to be shared more widely? Yes/No

137. If a student or group has developed a best practice that might be shared more widely, please nominate that person:  
 Name:  
 Brief description of idea:

	Not at all	1-2 days per week	3-4 days per week	Every day
138. I take my laptop home...	①	②	③	④

139. What is your highest degree?

- Bachelors
- 0-30 Graduate Credits
- 31+ Graduate Credits

140. How many years have you been a teacher?

141. How many years have you been a teacher in HCPS?

## APPENDIX D: Administrator Web-Survey



**Interactive, Inc.**  
*e.valuation for e.learning*

Dear Administrator:

The Henrico County Public Schools School Board has approved a multi-year study of laptop use in the district and Interactive, Inc. a national firm specialized in e-learning, will conduct the study.

We need your help, experience and insight. As with the previous two years' query, there are no right or wrong answers to the questions and all answers will be confidential: no individuals will be identified. Thanks in advance for your help and best wishes for your success!

Sincerely,

Fred S. Morton, IV  
 Henrico County Public Schools

Dale Mann, Ph.D., Managing Director  
 Interactive, Inc.

**Directions:** For each section, choose the radio button that best describes your response to the item.

Please tell us how much do you agree/disagree with the following statement for each item below: **This year, I use my laptop more for...**

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
1. Communicating with teachers	①	②	③	④	⑤
2. Communicating with parents	①	②	③	④	⑤
3. Communicating with other administrators	①	②	③	④	⑤
4. Looking at student interim assessments, attendance, etc.	①	②	③	④	⑤
5. Administering the business of the school (scheduling, budgets, personnel, etc.)	①	②	③	④	⑤

Please tell us how much do you agree/disagree with the following statements:

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
6. Most teachers in this school are	①	②	③	④	⑤

	enthusiastic about their laptops					
7.	Most students in this school are enthusiastic about their laptops	①	②	③	④	⑨
8.	Most teachers in this school are enthusiastic about the students having laptops	①	②	③	④	⑨
9.	Most teachers have learned new ways to use laptops during this year	①	②	③	④	⑨
10.	Some teachers have invented new ways to use laptops during this year	①	②	③	④	⑨
11.	Many teachers make assignments that require students to collect data from or study businesses and/or community institutions at least once a week	①	②	③	④	⑨
12.	Most of my teachers have class websites	①	②	③	④	⑨
13.	Most of my teachers post class syllabi online	①	②	③	④	⑨
14.	Most of my teachers post and update assignments for their students online	①	②	③	④	⑨
15.	Many teachers try to think ahead to what my students will do after they graduate and give tasks and assignments with the laptops that resemble those future demands	①	②	③	④	⑨

Please tell us how much do you agree/disagree with the following statements:

		<b>Disagree Strongly</b>	<b>Disagree</b>	<b>Agree</b>	<b>Agree Strongly</b>	<b>N/A</b>
16.	Laptops do not help teachers assess or test students	①	②	③	④	⑨
17.	Most teachers are using laptops to assess students based on SOL state tests	①	②	③	④	⑨
18.	Because of assessment data, most teachers have changed the way they group students for instruction	①	②	③	④	⑨
19.	Most teachers make the most use of their laptops for remediation	①	②	③	④	⑨
20.	Most teachers make the most use of their laptops for assessment	①	②	③	④	⑨
21.	Most teachers make the most use of their laptops to present teaching material	①	②	③	④	⑨
22.	I would like to see a practical way for laptops to work with the different learning styles in the classes in this school	①	②	③	④	⑨

23.	Laptops have made small group instruction more feasible	①	②	③	④	⑤
24.	Student-to-student collaboration has increased with laptops	①	②	③	④	⑤

Please tell us how much do you agree/disagree with the following statements:

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A	
25.	When students take assessments online, that saves time	①	②	③	④	⑤
26.	Online grade reporting saves time	①	②	③	④	⑤
27.	Laptops have had a positive effect on faculty morale	①	②	③	④	⑤

Please tell us how much do you agree/disagree with the following statements:

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A	
28.	My computer is reliable	①	②	③	④	⑤
29.	My Internet connection is reliable	①	②	③	④	⑤
30.	I can get help with technology when I need it/within a reasonable amount of time	①	②	③	④	⑤

Please tell us how much do you agree/disagree with the following statement for each item below: **I am good at...**

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A	
31.	Spreadsheets	①	②	③	④	⑤
32.	Presentation software	①	②	③	④	⑤
33.	Desktop publishing	①	②	③	④	⑤
34.	Copying/moving files	①	②	③	④	⑤
35.	Using an Internet search engine	①	②	③	④	⑤
36.	Creating and maintaining a website	①	②	③	④	⑤
37.	Using content specific applications/software	①	②	③	④	⑤

Please tell us how much do you agree/disagree with the following statement for each item below: **Individual laptops for students have made a positive difference in students’:**

	Disagree	Disagree	Agree	Agree	N/A
--	----------	----------	-------	-------	-----

		Strongly			Strongly	
38.	Desire to learn	①	②	③	④	⑤
39.	Quality of assignments they turn in	①	②	③	④	⑤
40.	Depth and breadth of the research they do	①	②	③	④	⑤
41.	Ability to express themselves in writing	①	②	③	④	⑤
42.	Achievement of failing students	①	②	③	④	⑤
43.	Achievement of bilingual students	①	②	③	④	⑤
44.	Achievement of Special Education/IEP students	①	②	③	④	⑤

Please tell us how much do you agree/disagree with the following statement for each item below:  
**Individual laptops have made a positive difference in...**

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A	
45.	Bridging the achievement gap between lower and higher achieving students	①	②	③	④	⑤
46.	How well students cooperate with each other	①	②	③	④	⑤
47.	The responsibility they feel for their work	①	②	③	④	⑤
48.	Students' interest in class	①	②	③	④	⑤
49.	Students' behavior	①	②	③	④	⑤
50.	Students' grades	①	②	③	④	⑤
51.	Students' attendance	①	②	③	④	⑤

Please tell us how much do you agree/disagree with the following statements:

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A	
52.	Laptops distract students from direct instruction, they pay less attention	①	②	③	④	⑤
53.	Laptops have given students unrealistic ideas about what learning is about	①	②	③	④	⑤
54.	Getting students to bring laptops to class is a problem	①	②	③	④	⑤
55.	Student compliance with acceptable use policies is <u>not</u> a problem	①	②	③	④	⑤
56.	Students with more computer knowledge are moving faster than those with less	①	②	③	④	⑤
57.	There are not enough quality	①	②	③	④	⑤

educational software titles available for teachers					
58. Laptops encourage unrealistic expectations for what teachers have time to do	①	②	③	④	⑨
59. All textbooks and resources should be available on student laptops	①	②	③	④	⑨
60. Teachers have had all the professional development they need to use the laptops	①	②	③	④	⑨
61. Teachers have had classroom support to implement the skills they learn from professional development	①	②	③	④	⑨

**Teacher and student best practices**

62. If you have developed a laptop related lesson, unit or continuing practice that you would like to share, please tell us about it.  
 Topic:  
 Grade level:  
 Practice or idea:  
 Required materials and time:  
 Results or outcomes for you or students:  
 May we contact you if your idea is selected to be shared more widely? Yes/No

63. If a teacher, student or group has developed a best practice that might be shared more widely, please nominate that person:  
 Name:  
 Brief description of idea:

	Not at all- N/A	1-2 days per week	3-4 days per week	Every day
64. I take my laptop home...	①	②	③	④

65. What is your highest degree?

- Bachelors
- 0-30 Graduate Credits
- 31+ Graduate Credits

66. How many years have you been an administrator?

67. How many years have you been an administrator in HCPS?



## APPENDIX E: Parent Web-Survey



### Parent Technology Survey (2006-2007)

Dear Parent:

The Henrico County Public School's School Board (HCPS) has approved a multi-year study of laptop use in the District and Interactive Inc., a national firm that specializes in e-learning, will conduct that study.

We need your help, experience and insight. If you have more than one child in high school, please consider only **one** child's experiences when answering the questions.

There are no right or wrong answers to the questions below and all answers will be confidential: no individuals will be identified. The survey should take about 15 minutes to complete. Thanks in advance for your help and best wishes for your success!

Sincerely,

Fred S. Morton, IV  
Henrico County Public Schools

Dale Mann, Ph.D., Managing Director  
Interactive, Inc.

**Directions:** For each section, choose the radio button that best describes your response to the item.

	1	2	3	4	N/A
1. How many computers do you have in your home ( <b>not</b> including the HCPS laptop)>	①	②	③	④	⑤

	No	Yes
2. Do you have internet access at home?	①	②

	No	Yes
--	----	-----

3. Does your child participate in the HCPS laptop program (If yes, survey skips to questions 5)	①	②
--	---	---

4. If you child opted out of the laptop program, would you please tell us why?

- ① Program cost
- ② Don't believe laptops will be helpful
- ③ Don't want my child exposed to influences
- ④ Religious reasons
- ⑤ None of the above

**\* If question 4 is answered, survey skips to question 9.**

Are you satisfied with the

	No	Yes	Don't know
5. HCPS laptop's internet security/filters on your child's computer	①	②	③
6. HCPS laptop's reliability	①	②	③
7. support your child's school gives to instructional laptop use	①	②	③

Do you .....

	No	Yes	Don't know
8. or other people in your house use the HCPS laptop	①	②	③
9. believe that the laptop will help your child after graduation in further study	①	②	③
10. believe that the laptop will help your child after graduation in paid employment	①	②	③

Has the laptop made a positive difference with your child's ...

	No	Yes	Don't know
11. grades	①	②	③
12. attitudes in/towards school	①	②	③
13. attendance at school	①	②	③

Would ...

	No	Yes	Don't know
14. you mind if your child went to a school without an individual laptop program	①	②	⑨
15. your child's achievement in school be different if they went to a school without an individual laptop program	①	②	⑨

How often does your child use ...

	Rarely	Sometimes	Most school days	Every school day	N/A
16. the HCPS laptop at home	①	②	③	④	⑨
17. the home computer	①	②	③	④	⑨

On an average day, how long does your child use the ...

	Not at all	Less than 1/2 hour	1/2 to 1 hour	1 to 2 hours	More than 2 hours
18. HCPS laptop for homework	①	②	③	④	⑨
19. home computer for homework	①	②	③	④	⑨

Do you ...

	No	Yes
20. go online to access your child's grades and homework	①	②

21. 5 years from now, my child will be

- ① in paid employment
- ② studying in college/university
- ③ in the military
- ④ in technical school
- ⑤ other
- ⑨ Don't know

22. The school that my child attends is

- ① Deep Run

- ② Freeman
- ③ Godwin
- ④ Henrico
- ⑤ Hermitage
- ⑥ Highland Springs
- ⑦ Tucker
- ⑧ Varina
- ⑨ VA Randolph Community

## 23. My child is in grade

- ① 9
- ② 10
- ③ 11
- ④ 12

## 24. Your highest education level

- ① Some high school
- ② High school graduate
- ③ Some college
- ④ College graduate
- ⑤ Graduate study
- ⑥ Graduate degree
- ⑨ Prefer not to answer

## 25. Your primary occupation

- ① management
- ② professional
- ③ services
- ④ sales
- ⑤ administrative
- ⑥ farming
- ⑦ construction
- ⑧ installation
- ⑩ transportation

- ⑪ armed forces
- ⑫ education
- ⑬ production
- ⑭ other
- ⑨ Prefer not to answer

## 26. Your Race/Ethnicity

- ① Asian/Pacific Islander
- ② Hispanic
- ③ African American
- ④ Caucasian/White
- ⑤ American Indian/Alaskan Native
- ⑨ Prefer not to answer

## APPENDIX F: Graduate Web- Survey

### Technology 2006-07

#### Alumni Survey



Dear Graduate,

The Henrico County Public School's School Board (HCPS) has approved a multi-year study of laptop use in the District and Interactive Inc., a national firm that specializes in e-learning, will conduct that study.

We need your help, experience and insight. There are no right or wrong answers to the questions below and all answers will be confidential: no individuals will be identified. The survey should take about 15 minutes to complete. Thanks in advance for your help and best wishes for your success!

Sincerely,

Fred S. Morton, IV  
Henrico County Public Schools

Dale Mann, Ph.D., Managing Director  
Interactive, Inc.

**Directions:** For each section, choose the radio button that best describes your response to the item.

1.	<b>No</b>	<b>Yes</b>
Did you have a laptop while at HCPS?	①	②

2.	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>N/A</b>
How many years did you have a laptop?	①	②	③	④	⑤

3.	<b>No</b>	<b>Yes</b>
While you were in high school, did you have internet access at home?	①	②

Do you currently have internet access...

	No	Yes
4. at home	①	②
5. at school	①	②
6. at work	①	②

I am currently (answer = 1 if left blank, 2 if checked)

	No	Yes
7. enrolled in college as a full-time student		
8. enrolled in college as a part-time student	①	②
9. employed full time	①	②
10. employed part time	①	②
11. in the military	①	②
12. Other	①	②

13. If you selected other, please specify:

My computer and/or technology skills

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
14. are better than those of my co-workers	①	②	③	④	⑤
15. are better than other students at my college / in my classes	①	②	③	④	⑤
16. were a factor in being hired for my current job	①	②	③	④	⑤

	Disagree Strongly	Disagree	Agree	Agree Strongly	N/A
17. Technology and/or laptop use at HCPS has helped me outside of school.	①	②	③	④	⑤

I use a computer and/or technology ....

	1-2 days per week	3-4 days per week	Everyday	Not at all	N/A
18. at work	①	②	③	④	⑨
19. in my classes	①	②	③	④	⑨
20. at home for my homework	①	②	③	④	⑨

21. 5 years from now, I will be

- ① in paid employment
- ② studying in college/university
- ③ in the military
- ④ in technical school
- ⑨ Don't Know

In order to prepare you for college and/or the work force, choose which technology-related applications you felt were absent from your high school education? (Choose all that apply.)

	No	Yes
22. Blogs and discussion boards		
23. Multimedia presentations	①	②
24. Online banking	①	②
25. database development and management	①	②
26. Web-site development	①	②
27. Excel charts and graphs	①	②
28. Word processing skills	①	②
29. Other (please specify)	①	②

30. If you selected other, please specify: