

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

Technical Report

PHASE II 2007 Data



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Technical Report of 2007, Phase Two Results

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NOTE: 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 two-year program of research and evaluation is supported by a contract from Dell Computers, Inc. but is otherwise independent of that company. The study agenda has been developed collaboratively with HCPS and the County comments on draft material for matters of fact. The analysis, interpretation and recommendations are the sole responsibility of Interactive, Inc.

This is a longitudinal study that tracks changes over time. To facilitate comparison among years, the organization of this year’s text parallels the baseline year, 2006.

Documenting Outcomes from Henrico County Public School's Laptop Computing Initiative: 2005-06 through 2007-08 Technical Report of Phase II 2007 Data

1.0 SUMMARY

Overall: One remarkable finding of this study of student, teacher and administrator use of laptops is the steady and comprehensive increase in laptop use for all three groups. DELL laptop use has increased from the launch year (2005-06) in various functions and curriculum topics. Instead of a novelty effect that has worn off, this reports evidence that the Henrico County Public Schools (HCPS) laptop initiative is growing deeper and wider for students and teachers.

To test one of the differences that laptop use may make, we examined the relation between the amount of laptop use and 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. In four curriculum topics, more laptop use is associated with higher test scores---World History, Biology, Reading and Chemistry---and in three areas, laptop use is not associated with higher tests scores---Algebra I and II and Writing. Algebra teachers are very clear that they and their students make far more use of graphing calculators in class than they do of laptops so this "laptop" relationship is understandable. Similarly, because the SOL writing test is not taken on computers, teachers feel obligated to reproduce test conditions in their teaching and that minimizes laptop use.

HCPS first made DELL laptops available to all secondary school students in 2005. At the end of 2005-06, Interactive, Inc. reported baseline descriptive data about the initiative. This report of the results of 2006-07 is the second of three scheduled reports (the final report will be available in Fall 2008). The analysis is based on responses from 8,200 students, 3,000 parents, 739 teachers and 137 administrators plus field visits, observations and interviews in the schools.

Because Henrico has made DELL laptops available to all teachers and students since 2005, it is possible to maximize their use for teaching and learning. Laptop use is significantly related to SOL scores in pivotal schooling areas and there is virtually unanimous and comprehensive documentation that laptop use has continued to grow for students, teachers and administrators.

Students: On average, across all the school day and year, 40% of HCPS students report using their laptop at any moment¹. That is up from 2006's 38%. By way of comparison, 35% of (elementary school) students in West Virginia schools supported by a special state project reported using technology at sampled moments in the school day (students in other schools averaged half

¹ Data are from the random interval web surveys.

that, about 18%). The outcome identified by the most students is worth noting---they say that because of the laptops, they are “learning more”. Where students ascribe improvements to the in-school availability of laptops, virtually every value is stronger this year than last. For example, students continue to believe that school is more fun with the laptops and that they are more interested in school because of the laptops.

When asked to rank the curriculum area where laptops helped most, students gave the #1 position to History for studying, taking notes, preparing presentations and organizing information. The curriculum topics where computer use and favorable attitudes were most clearly related to achievement are: History (11 relationships); Chemistry (7); Biology (3); Reading (2); Writing and Algebra (1 each). Last year, there were no positive relations with either Reading or Writing: both are represented this year.

The attribute of student use most often associated with improvements in scores is “Student attitude about laptop use and schoolwork”. The “student attitudes” factor includes items that register achievement-related opinions none of which would be available to schools unless students have laptops.

- I am learning more because of the laptop
- When we use laptops, I am more interested in school
- Laptops have helped with my interest in class
- Laptops have had a positive effect on my attitudes toward school
- Being at school is more fun with the laptops.

Both this year and last, students report that they are using their laptop every day at school, that they take it back and forth to school every day and that they use it at home on three or four days a week. There has been an increase in reported use between classes and during free periods---three to four days a week.

Students identified the differences that laptops make for them. Henrico students agreed that they were:

1. Learning more because of the laptop
2. Turning in more assignments on-time
3. Taking more interest in class
4. Getting better grades
5. Taking more responsibility for work
6. Behaving better
7. Cooperating more with other students

The outcome identified by the most students is worth noting---“Learning more”. Where students ascribe improvements to the in-school availability of laptops, virtually every value is more positive this year than last.

At its best, schoolwork involves analysis, research, evaluation, communication and both independent and team work. We asked students about the relation between laptops and those activities both in school and at home. Students were

even more enthusiastic about the contribution of their laptops to those functions than they had been in the launch year.

Last year, skills recommended by the *21st Century Skills Partnership* were notably absent. Students now think their homework is related to what they will be doing after they graduate and that homework requires "...me to go to local business websites, collect data from businesses or other community groups or otherwise use technology outside the school". 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.

Last year, students reported that their teachers had changed the way they did instruction (probably because of laptops in student hands). Students are even more sure this year than last, that when "we use laptops, my teachers lecture less and walk around the room more, helping students" and that they assign more group projects. Students also report this year for the first time, more differentiated instruction.

Teachers. At any point in the instructional day, between 40% and 50% of HCPS teachers are using their laptops. That is more than twice the computer use in connection with the West Virginia statewide initiative. Twenty-two percent of West Virginia's specially trained teachers reported technology use at the sampled moments of the school day compared to one percent of the state's untrained teachers.

More teachers in 2007 than 2006 agree that that has made a positive difference in their teaching and that they are using them even more than previously. Last year, teachers reported a lot of non-instructional activities: this year that has declined and, there is twice as much work with small groups or individuals. Compared to last year, teachers report using their laptops more to present material and to assess or diagnose students. Here are three functions that have increased:

1. Checking student attendance, information or grade administration
2. Communicating with other teachers, and
3. Communicating with administrators.

Last year, the students told us that teachers were doing less direct instruction because of the laptops but the teachers disagreed and saw no change. This year, both the students and the teachers agree that there is less direct instruction (lecturing the whole class) and that they are doing more coaching. Those positive trends are confirmed by the random interval survey data.

Almost half of Henrico's secondary school teachers (46%) 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.

Teachers do not think that laptops have made a difference in student's behavior, sense of responsibility, grades, desire to learn, attendance, interest, quality of homework assignments, cooperation with each other, writing ability or depth of research.

Changing instruction according to frequent student test data ("interim assessment") is still a work in progress for HCPS. But, teachers report that they are using their laptops much more "to analyze more quiz data, assessment data this year" and "to assess students based on SOL state tests". Contrary to last year, teachers now agree that

- "Individual computers have made small group assignments more possible"
- "Laptops have made small group instruction more feasible"
- "I use my laptop to change instructional groupings more frequently than last year" and
- "I have changed the way I group students for instruction"

Teachers report that the positive impact on their morale has grown. Teachers continue to believe that their Dell laptops are reliable; that their Internet connection is reliable; and that they can get help with the technology when they need it. Although in both years of this study, teachers agreed that their school's administration was supportive of their work with laptops, they now disagree that they have the "classroom support to implement the skills I learned from professional development". The latter conclusion is puzzling since there are also continuing increases in the teachers' implementation of computer-related technology in their classrooms, i.e., they are using laptops more and want more help. Last year, teachers doubted their abilities with "specific software" and "teaching aids": this year, those are sources of strength, which suggests that professional development is working. The inconsistency may reflect both growing comfort with 1-to-1 technology and a desire to learn even more about its uses.

Administrators. Administrators report that in 2006-07 they used their laptops more than in previous years including for looking at interim assessments and communicating with teachers.

The building administrators thought that the laptops had made a positive difference in the following (items are arranged in descending order of unanimity among the respondents):

1. special education/IEP student achievement
2. depth and breadth of research
3. quality of assignments completed
4. bi-lingual student achievement
5. desire to learn
6. bridging the achievement gap between lower and higher achieving students

7. ability to express themselves in writing
8. grades
9. cooperation with each other
10. achievement for failing students and
11. sense of responsibility for their work.

Parents. 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 10% of families, another family member uses the laptop. 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. 23% believe that laptops have made a difference in attendance.

Of the 48 parents who opted out of the program (and provided an explanation), about half wanted to minimize their children's exposure to the "influences related to computers" and about a fifth cited cost.

2006 HCPS Graduates. To explore the continuing effects of the high school laptop experience once students had graduated, in December 2006 we sent mailed invitations to take a web-survey to the Class of 2006. Ninety-four percent of the respondents 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. Ninety-five percent said they had Internet access at home during high school.

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.

Ninety percent of the respondents said they are enrolled in college full time, 2% part-time. Nine percent report full-time paid employment and 26% report part-

time paid employment. Regardless of their current work or study status, the graduates report that they use computers a lot.

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.

Summary and recommendations. SOL scores are one important metric for student and school performance. Laptop use is associated with higher test scores in four topic areas. Since 2005, the district has regarded individually available laptops as one important resource of the several learning tools that it deploys. In fact, the production of learning is the sum of many influences including computers. HCPS has additional school improvement initiatives underway in several areas of teaching and learning, including 1-to-1 computing. The hopeful prospect is for the cumulative impact of all those projects taken together.

We believe that the following areas should continue to have priority attention:

- Professional development about laptop integration into classroom instruction especially among topics that might benefit from 1-to-1 applications but that still have low use
- Interim assessment of student performance linked to changes in instruction during the school year
- Connecting teachers to each other through best practice sharing
- Communications from school to home and back again and
- 21st Century skills for students.

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 laptop use 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.²) and we compared those amounts of use to their test scores.

In four curriculum topics, more laptop use is associated with higher test scores---World History, Biology, Reading and Chemistry---and in three areas, laptop use is not associated with higher tests scores---Algebra I and II and Writing. Algebra teachers are very clear that they and their students make far more use of graphing calculators in class than they do of laptops so the “laptop” relationship is understandable. Similarly, because the SOL writing test is not taken on computers, teachers feel obligated to reproduce test conditions in their teaching and that minimizes laptop use. In the table below, the first “World History 1” row shows that students who used their laptops every day in World History scored higher by 34 points (of 600) than those who did not use their laptops in that course.

Table 1: Do SOL Test Scores Differ by Amount of Laptop Use and Subject Tested?					
SOL Subject	Are higher scores associated with more laptop use?	Amounts of laptop use compared	SOL point differences associated with laptop use	<i>p</i>	<i>n</i>
World History I	Yes	Every day > none	34.4	.00	815
		Every day > once or twice a week	14.4	.001	1115
		Every day > three or four times a week	11.8	.01	1180
Biology	Yes	Every day > none	28.3	.00	832
		Every day > once or twice a week	18.4	.00	1400
Reading	Yes	Every day > once/twice a week	16.6	.00	1302

² We had web survey responses from more than 8200 students, 739 teachers and 137 administrators.

Chemistry	Yes	Every day > none	11.7	.03	498
Algebra I	No	None > once or twice a week	(8.7)	.01	1194
		None > every day	(20.5)	.00	851
Writing	No	None > every day	(11.6)	.04	837
Algebra II	No	None > 3/4 days a week	(21.9)	.00	878
		None > every day	(21.1)	.001	875

World History. When SOL scores in World History 1 are compared to student responses to the question “How often do you use your laptop for History?” [(SQ17), $F^3(3, 1726) = 15.84, p = .00, \eta^2 = .03, n = 1730$], students who use their computers everyday for History scored higher compared to students who reported using their computers never, once or twice a week, or 3 to 4 times a week (34.4, 14.4 and 11.8 points higher, respectively, $p = .00, .001$ and $.01$). Laptops are clearly associated with higher student achievement in World History 1.

Biology. We asked students, “How often do you use your laptop in Science?” (SQ16) and scores on the Biology SOL, and test scores are significantly higher for every day users than for “no use” group or those who used laptops only once or twice a week. [$F(3, 2287) = 26.88, p = .00, \eta^2 = .03, n = 2291$]. Where students reported using their computer everyday in science, they scored 28.3 points higher on the Biology SOL compared to students who reported never using their laptops ($p = .00$) and 18.4 points higher than students who reported using their computers once or twice a week for science.

Chemistry is also an area where computer use is positively and significantly associated with amounts of laptop use [$F(3, 1405) = 4.27, p = .005, \eta^2 = .01, n = 1409$]. Students who reported using their laptops everyday for science scored 11.7 points higher than students who reported never using them for science ($p = .03$). These results suggest that the laptops do contribute to increases in student achievement for both Biology and Chemistry.

Reading. Finally, laptop use is related to student achievement in Reading. [$F(3, 1989) = 7.54, p = .00, \eta^2 = .01, n = 1993$]. Students who reported using their computers everyday in English scored, on average, 16.6 points more on the Reading SOL test compared to students who reported using their computers once or twice a week in English 11 ($p = .00$).

The next three areas are examples of the limits of laptop computers for some subjects and under some circumstances. The circumstances are important---for example, moving the SOL Writing test to an online and computer-based format

³ *F statistics were calculated using Analysis of Variance (ANOVA)

would not only likely prompt Henrico's English teachers to make more use of computers in this topic it would also anticipate the demands of the world of practice for students and graduates.

Algebra 1. Students who reported never using their laptops⁴ in Math scored 8.7 points higher in Algebra 1 than students who reported using their laptops once or twice a week in Math ($p = .01$) and 20.5 points higher than students who reported using their computers everyday in Math ($p = .00$). [(SQ15) $F(3,148) = 9.33$, $p = .00$, $\eta^2 = .02$, $n = 1493$].

Writing. We asked students, "How often do you use your laptop in English?" (SQ14) and then compared those answers to their Writing SOL scores. Students who reported using their computers everyday in English scored 11.63 points less on the Writing SOL compared to students who reported never using their computers in English ($p = .04$) [$F(3, 2357) = 2.78$, $p = .04$, $\eta^2 = .004$, $n = 2361$].

The State does not allow computers to be used when student writing is being tested, perhaps because the availability of 'spell check' and 'grammar check' would inflate the outcomes and perhaps because there are as yet no satisfactory ways to automate the grading or evaluation of the students' essays. As result, teachers simulate test conditions with paper and pencil lessons. It is worth noting that students are writing essays and drafting materials in several other topics, for example, History.

Algebra 2. When student responses about amounts of laptop use are compared to Algebra 2 SOL scores, significant differences also exist [$F(3,1495) = 9.13$, $p = .00$, $\eta^2 = .02$, $n = 1499$] where students who reported never using their computers in Math scored 21.9 points higher than those reported using their computers 3 to 4 times a week ($p = .00$) and 21.1 points higher than students who reported using their computers every day in Math ($p = .001$).

The Algebra results (courses 1 and 2) can be understood in the context of our interviews with teachers. First, teachers and students make frequent use of graphing calculators although we did not ask students about that technology. Thus, teachers are using technology, just not in this instance, the laptops. Second, the students and teachers thought that laptops were impractical. Teachers often require students to "show their work" and that generally means paper and pencil displays ("QWERTY" keyboards are set up for alphabetic notation not mathematical symbol notation). Adding the laptop to paper exercises requires the student to copy their work from one format to the other and that increases the chances of error.

⁴ Note: We did not ask students about their use of graphing calculators, the "TI's" from Texas Instruments.

The next table shows, within each curriculum topic, the attitudes or patterns of laptop use that student related favorably to achievement in that area.

Table 2: Student laptop use and attitudes positively related to achievement by curriculum topic (with component questionnaire items)	
Curriculum topic	Student use or attitudes (item # on student questionnaire)
World History I	I use my laptop in History (# 17)
	Amount of laptop help indicated by students (#22a-d)
	Student attitudes about the laptop use and schoolwork (#'s 31-32, 51-52, 65-69, 71-72)
	Overall computer use (#'s 11, 14-18)
Biology	I use my laptop in Science (# 16)
	Amount of laptop help indicated by students (#21a-d)
	Student attitudes about the laptop use and schoolwork (#'s 31-32, 51-52, 65-69, 71-72)
	Overall computer use (#'s 11, 14-18)
Reading	I use my laptop in English (# 14)
	Amount of laptop help indicated by students (#19a-d)
	Student attitudes about the laptop use and schoolwork (#'s 31-32, 51-52, 65-69, 71-72)
Chemistry	Student attitudes about the laptop use and schoolwork (#'s 31-32, 51-52, 65-69, 71-72)
	Overall computer use (#'s 11, 14-18)
	I use my laptop in Science (16)
	Community Use (#'s 33-35)
	Student-indicated independent laptop use (#'s 30, 41, 48)
	Amount of laptop help indicated by students (#21a-d)
	Student-indicated group assignment laptop use (#'s 29, 42, 49)

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

To understand why students like their laptops, we asked a series of questions. The attribute of student use most often associated with high scores is "Student attitude about laptop use and schoolwork" (8 instances). "Student attitudes" includes items that register:

- I am learning more because of the laptop (SQ51)
- When we use laptops, I am more interested in school (SQ31)
- Laptops have helped with my interest in class (SQ72)
- Laptops have had a positive effect on my attitudes toward school (SQ65)
- Being at school is more fun with the laptops (SQ32)
- Laptops have helped with the quality of work I turn in (SQ67)
- Laptops have helped with the amount of research I do (SQ68)
- Laptops have helped with how well I do in writing assignments (SQ69)
- Laptops have helped with the responsibility I feel for my work (SQ71)
- I'm more likely to do well after I graduate because of the laptop (SQ52)

Note, the items above are all related to achievement: none of them would be available to school improvement without the availability of individual laptops.

3.0 STUDENT QUESTIONNAIRE RESULTS

We had end-of-year questionnaire responses from 8270 HCPS secondary school students and random interval/pinging data from 168 stratified randomly selected students.

3.1 Amounts and Applications

3.1.1 Frequency of laptop use

This year, as last year, students report that they are using their laptop every day at school (SQ 11; **3.58**⁵, 3.64⁶) they take it back and forth to school every day (SQ 12, **3.87**, 3.89); and they use it at home on three or four days a week (SQ 13, **2.97**). There has been an increase in reported use between classes and during free periods---three to four days a week (SQ 10, **3.43**, 3.21). Students still believe that they, not the teachers should determine when to use their laptops in school (SQ 28, **3.23**, 3.03) and the teachers remain adamant that that is their responsibility (TQ 13, **3.51**).

Students say they still carry the same amount of books (SQ 58, **2.60**, 2.73) and their teachers agree (TQ 38, **2.61**).

Last year, the students thought that everyone was doing roughly the same things with their laptops. This year, they report more differences between their own activities and those of others. The data may signal more innovation, deeper and more mature use among HCPS students. For example, at the end of 2007, the average student said that she/he was using their laptop “much more” than others (SQ 63, **2.85**: 2.26). Last year, they thought they were about the same. And, in another departure from last year, the average student this year reports that they are using the laptop “in ways that other students don’t” (SQ 53, **2.89**, 2.45). They have also “shown other students how to do things with their laptops” (SQ 54, **2.80**, 2.83) and have been “part of group that worked on new ways to use laptops” (SQ 64, **2.89**).

3.2 Laptops Effects on Students

3.2.1 Students’ estimates of positive differences from laptops

Students identify a range of differences that laptops make for them. Listed in

⁵ “SQ” = student questionnaire; “TQ” = teacher; and “AQ” = administrator. Numbers reported after the questionnaire numbers refer to the means of the respondents’ choices on a Likert scale (‘strong agree’ to ‘strong disagree’): higher numbers indicate stronger agreement. We interpret Likert scale response intervals as follows: Disagree strongly, 1.00-1.49: Disagree, 1.50-2.49: Agree, 2.50-3.49: Agree strongly, 3.50-4.00.

⁶ **Bolded** numbers indicate current year (2006-07) values and are followed by 2005-06 values, not bolded.

order of student unanimity, Henrico students agreed that they were:

1. Learning more because of the laptop [SQ51, **2.87**, 2.77]
2. Turning in more assignments on-time [SQ75, **2.83**, 2.72]
3. Taking more interest in class [SQ72, **2.82**, 2.74]
4. Getting better grades [SQ74, **2.81**, 2.68]
5. Taking more responsibility for work [SQ71, **2.77**, 2.67]
6. Behaving better [SQ73, **2.69**, 2.55]
7. Cooperating more with other students [SQ70, **2.67**, 2.54]⁷

The outcome identified by the most students is worth noting---“Learning more”. In the results above and in the other areas where students ascribe improvements to the in-school availability of laptops, virtually every value is stronger this year than last. For example, students continue to believe that school is more fun with the laptops (SQ 32, **3.16**, 3.14); and that they are more interested in school because of the laptops (SQ 31, **2.93**, 2.85).

Students credit the laptops with making a positive difference with homework quality (SQ 67, **2.57**, 2.47); with their writing (SQ 69 **2.51**, 2.39); and with the amount of research they do (SQ 68, **2.33**, 2.22).

3.2.2 Laptop use by curriculum area

Last year, for English and Math, students reported about half as much in-class use of laptops compared to the other subjects. This year, by student reports, English is making progress.

Table 3: Student Laptop Use by Curriculum Area 2007 Compared to 2006 (Mean response values)		
Topic	2007 days/week and mean response value	2006 days/week and mean response value
History	3-4 (3.05)	3-4 (2.91)
Science	3-4 (2.80)	3-4 (2.74)
Other (Others)	3-4 (2.84)	3-4 (2.68)
English	3-4 (2.53)	1-2 (2.48)
Math	1-2 (1.90)	1-2 (1.75)

3.2.3 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. 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 QWERTY⁸ keyboard for recording math symbols and the wish

⁷ Teachers agree [TQ 95, **2.50**]

⁸ 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.

of teachers to see the steps students use in solving problems. If we asked similar questions about another e-technology---graphing calculators for higher math---we would probably have more positive answers.

Rank/Function	Study	Take notes	Prepare presentations	Organize Information
Most helpful	History	History	History	History
2 nd	Science	Science	English	Science
3 rd	Other	English	Other (tie)	English
4 th	English (down 1)	Other	Science (tie)	Other
5 th	Math ("not helpful")	Math	Math ("not helpful")	Math ("not helpful")

Students disagreed that "homework done on the computer seems less important than paper and pencil assignments" (SQ 36, **2.36**, 2.10).

At its best, schoolwork involves analysis, research, evaluation, communication and both independent and team work. We asked students about the relation between laptops and those activities both in school and at home. There are 14 values in the table below and they all increase from 2006 to 2007.

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

"Working with laptops in class/at home involves..."	In Class	At Home
...taking notes SQ 43/50 (class/home)	Agree (3.24 /3.19)	Agree (2.86 /2.73)
...research skills on the internet (finding resources and applying them) SQ 38/45	Agree (3.17 /3.14)	Agree (2.99 /2.89)
...communicating (doing Power Points, adding pictures and sound to make a presentation better) SQ 40/47	Agree (3.14 /3.11)	Agree (3.04 /2.97)
...working independently and without much direction from adults SQ 41/48	Agree (2.98 /2.92)	Agree (3.04 /2.94)
...working with other students in a team SQ 42/49	Agree (2.92 /2.89)	Disagree (2.59 /2.48)
...evaluation skills (figuring out which facts or ideas are accurate and which are not) SQ 39/46	Agree (2.82 /2.74)	Agree (2.76 /2.64)
...problem-solving (getting a set of facts and having to	Agree (2.63 /2.51)	Disagree (2.64 /2.49)

The convention does not recognize letter frequencies or patterns in English and is to that extent inefficient.

figure out your own answer) SQ 37/44		
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3.2.4 Laptops and 21st 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. HCPS students agreed that they are “more likely to do well after I graduate because of the laptop” (SQ 52, **2.91**, 2.80), an improvement over 2006.

In last year’s baseline report, Interactive, Inc. noted the relative inattention to skills that were recommended by the *21st Century Skills Partnership*. Students now think their homework is related to what they will be doing after they graduate (SQ 35, **2.42**, disagree, 2.23)⁹ and that homework requires “...me to go to local business websites, collect data from businesses or other community groups or otherwise use technology outside the school” (SQ 34, **2.64**, disagree, 2.16)¹⁰. And students report more group work as a result of the laptops (SQ 59, **2.89**, disagree 2.49). 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. [One unchanged area from 2006 was web searches as part of homework. Students have not reported that as a practice in either year (SQ 33, **2.48**, 2.32).]

3.2.5 Students rate their teachers use of laptops

One of the remarkable phenomenon suggested by last year’s analysis is the extent to which instruction has changed, probably because of laptops in student hands. Students are even more certain this year than last, that when “we use laptops, my teachers lecture less and walk around the room more, helping students” (SQ 30, **2.64**, 252) and that they assign more group projects (SQ 29, **2.58**, 2.60).

Individualizing instruction or at least gearing instruction to the (differing) needs of small groups is as desirable as it is logistically difficult to achieve. Adding

⁹That change would not happen without a prior commitment by teachers. This year, teachers told us, “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” (TQ 17, **2.81**, 2.74) and “I assess students based on laptop projects that relate to the outside world” (TQ 24, **2.90**, 2.74).

¹⁰ For the most part, teachers disagreed with the statement, “I make assignments that require students to collect data from or study businesses and/or community institutions at least once a week” (TQ 16, Disagree, **2.20**, 1.88). Not all teachers have reason to do this. The student responses may reflect an increase in the number of teachers who are, nonetheless, doing this.

computers to instruction makes a major gain but last year, HCPS students reported that, regardless of the ubiquitous computing initiative, “everyone is taught the same way at the same time”. Students now disagree and see more differentiation (SQ 56, **2.22**, 2.71) although everyone still gets the same homework assignments (SQ 57 **2.89**, 3.12).

Students also register more teacher use of Power Point, interactive white boards and LCD projector presentations (SQ 24, **3.02**; SQ 25, **2.90**)

Students continue to believe that the laptops do not distract them from their teachers (SQ 76, **2.38**).

Last year, students thought they knew more about laptops than did their teachers and they reported showing their teachers how to do new things with the laptops. That has changed. They now acknowledge that the teachers know more “than I do about laptops” (SQ 60 **2.61**, 2.27) and they disagree that they have shown a teacher how to do things with the laptop (SQ 55 **2.40**, 2.54). The teachers are more modest and believe that “My students and I are equally competent with computers” (TQ 40, **2.54**).

Contrary to last year, this year, they believe that teachers are using their computers to communicate with parents (SQ 26, **2.46**) and, to get in touch with them outside of class (SQ 27, **2.28**). But, for themselves, they do not use their laptops to get in touch with either teachers or other students (SQ 61 and 62, **2.83/2.87** and **3.18/2.27**)

3.3 The Limits of Laptops

3.3.1 What laptops have not been able to accomplish

In a reversal of the previous year, at the end of 2007 students thought that laptops did not make a positive difference in their attitudes toward school (SQ 65, **2.47**, 2.81). For both 2006 and 2007, the students report that laptops have not made a difference in “how much I want to learn” (SQ 66, **2.60**, 2.50).

3.3.2 “No problems”

This year, as last, students reported no problems with: (1) acceptable use policies (SQ 80, **2.81**, 2.67); (2) troubleshooting batteries, software or application access (SQ 77, **2.48**, 2.29); (3) mute settings (SQ 78, **2.13**, 1.96); or (4) laptop sleep modes (SQ 79, **2.11**, 1.95). [Teachers and administrators disagree (see below).]

3.4 The Context of Infrastructure and Skill Levels

3.4.1 Students computer-related skill levels

Students thought they were most expert at using *Power Point* for presentations (SQ 5, **3.37**, 3.34); followed by creating multi-media presentations---sounds, pictures, full-motion video (SQ 2, **3.04**, 2.92); using spreadsheets to plot graphs (SQ 6, **2.97**, 2.96); sharing their own content on a blog---artwork, photos, videos, writing (SQ 8, **2.86**, 2.76); and using a database to produce a list of addresses (SQ 7, **2.75**, 2.73).

The list of things they did not think they were competent at has not changed---computer programming (SQ 3, **2.17**, 1.96); getting rid of viruses (SQ 1, **2.23**, 2.05); or constructing web pages (SQ 4, **2.45**, 2.37).

3.4.2 Computer use at home

Last year, 79% of students had access to an additional computer at home and 82% had at-home access to the Internet (SQ 81 and 82). This year, **81%** report another computer at home and **84%** say they have an Internet connection at home (SQ 81 and 82).

3.5 Student Random-interval Survey Results

The conventional way to study computer use has been to ask 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 a “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 selected the days and times to “ping” the laptops at random although the initial randomly-generated schedule was then modified to reflect school vacation days, testing periods and other school priorities and realities.

We sent 40 surveys and had 8,514 responses. The average responding student provided 16 surveys and a total of 524 students returned at least one survey. The average survey drew 213 responses.

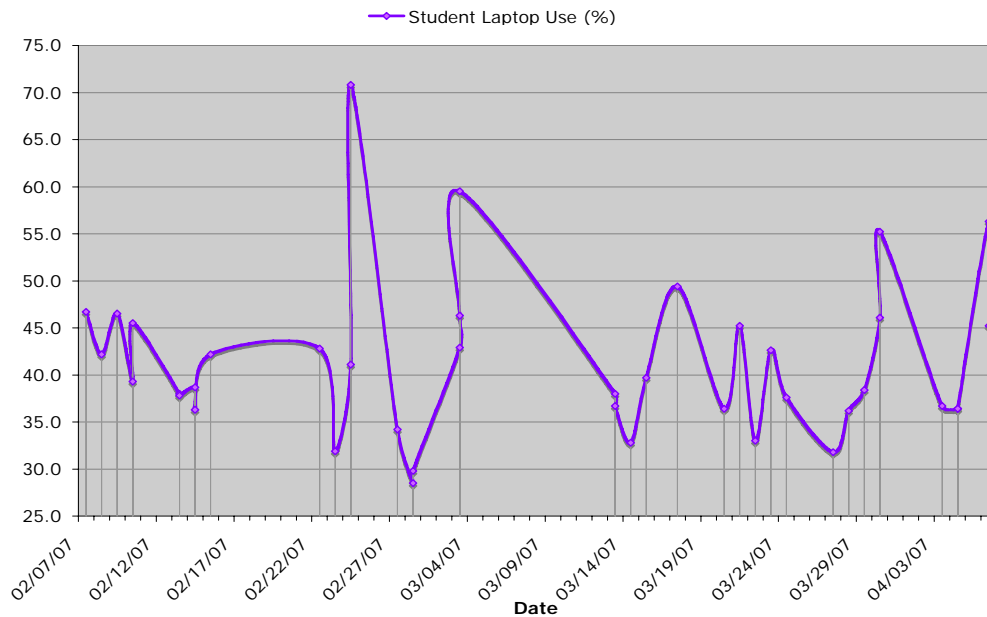
3.5.1 Student Laptop Use

On average, across all the school day and year, 40% of HCPS students report using their laptop at any moment. That is up from 2006’s 38%. By way of comparison, 35% of (elementary school) students in West Virginia schools supported by a special state project reported using technology at sampled moments in the school day (students in other schools averaged half that, about 18%).

Table 6: Amount of Laptop Use In School by Students (% responses to random interval surveys)	
	Percent (N)
Yes	40 (3172)
No	60 (4783)
<i>Total</i>	<i>100 (7955)</i>

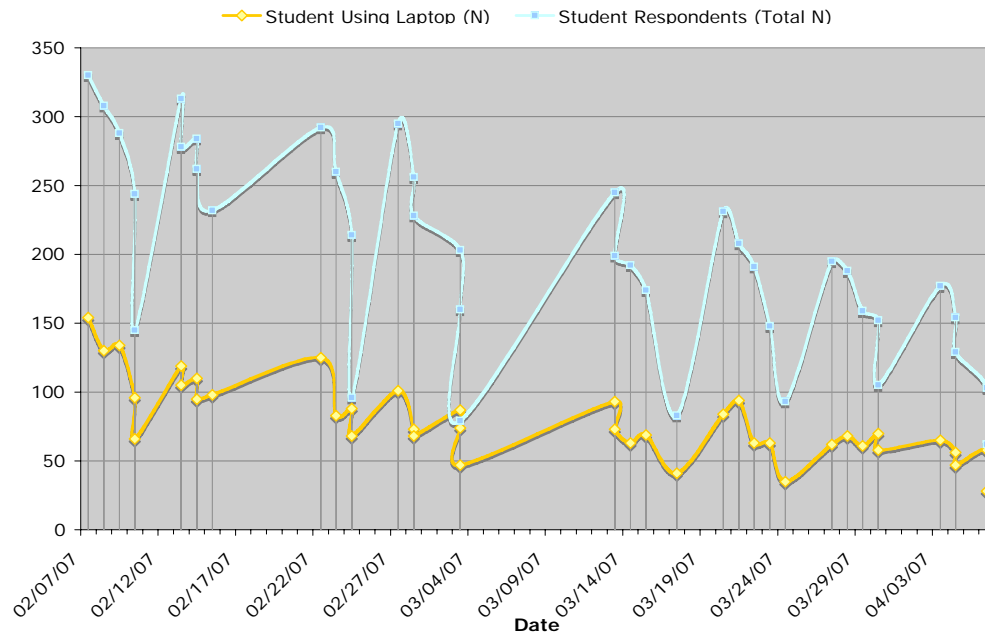
The student-indicated use of laptops fluctuated from 30% to 70% over the months of our random-interval data collection.

Figure 1: Student Laptop Use (Percent)



The response rate varied greatly over the survey period and declined over time. The proportion of students reporting laptop use was more stable (see below: the yellow, lower line shows the number of students reporting laptop use at any survey interval: the upper, blue line shows the total number of respondents).

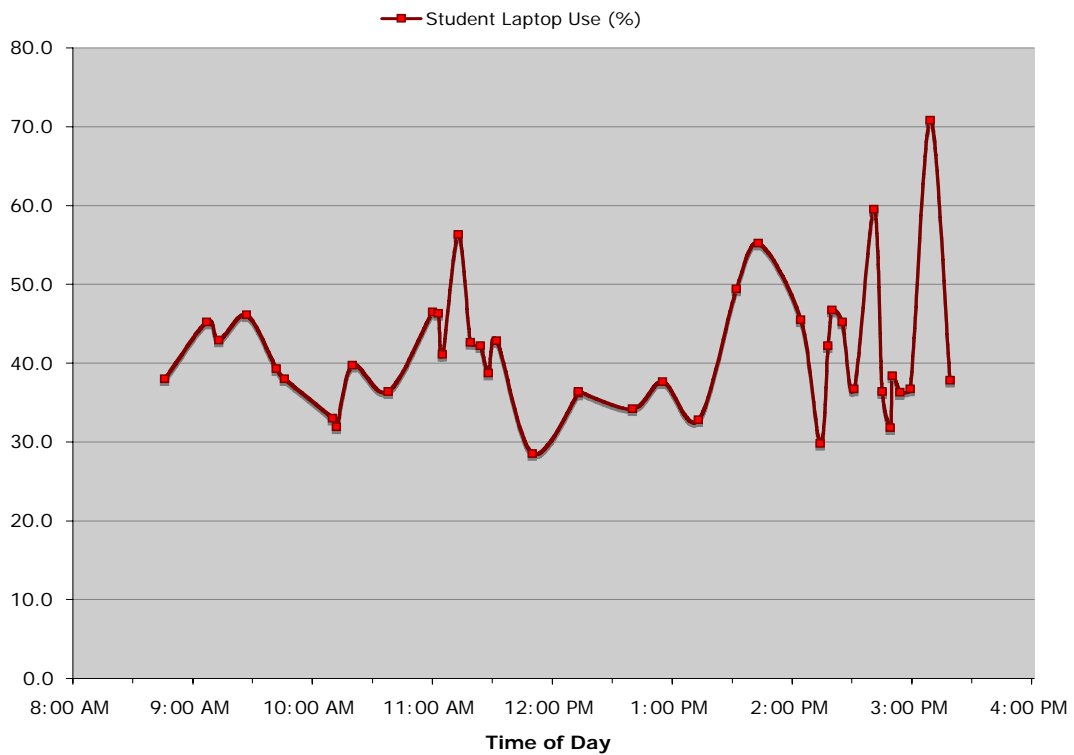
Figure 2: Student Laptop Use (Number)



3.5.2 Laptop Use by Time of Day

The table below shows the same spike in use at the end of the day as did the 2006 data.

Figure 3: Student Laptop Use by Time of Day (Percent)



3.5.3 Student Laptop Use by Class

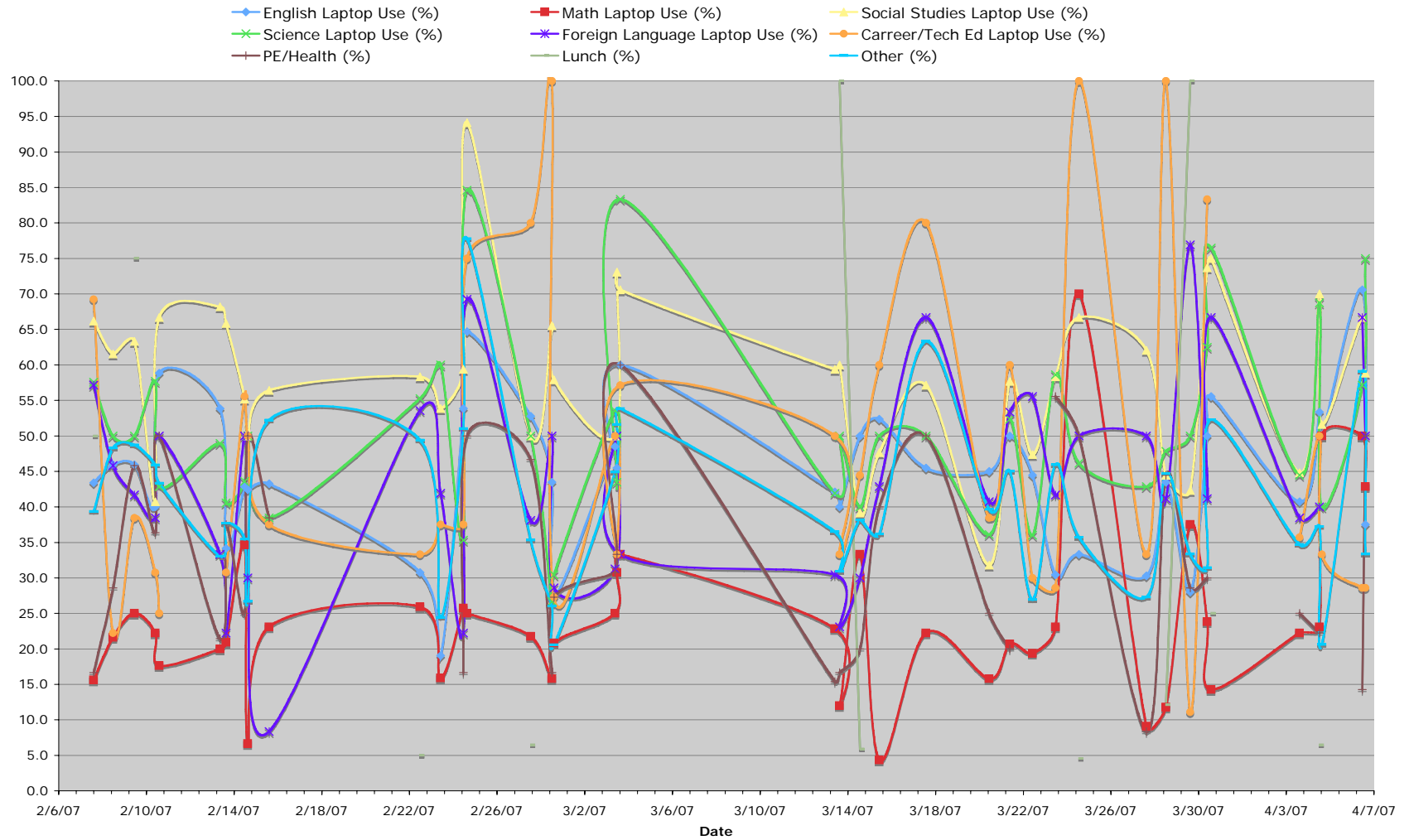
By looking at the overall number of students who indicated that they were using their laptops over the course of the survey, we can get an idea about which subjects require the most laptop use. The most laptop use continues to be in Social Studies (and there is substantially more in 2007 than 2006). There is also more use in P.E./Health. Math use declined.

Table 7: Student Laptop Use by Curriculum Topic (Random Interval Data)			
	Was the student using his/her laptop?		
Curriculum topic*	% Students using a laptop (2006-07)	Students using a laptop (N)	Students responding per class (Total N)
Social Studies	58 (49)	614	1060
Science	49 (47)	489	997
English	44 (43)	465	1061
Foreign Language	42 (45)	260	619
Career & Technical Education	41 (40)	138	333
Other	39 (43)	867	2244
P.E./Health	28 (20)	109	391
Math	22 (27)	208	930
Lunch	7 (8)	22	320
<i>Total</i>	<i>40</i>	<i>3172</i>	<i>7955</i>

*Not including absent students

There are large variations in use, per curriculum topic, over time.

Figure 4: Student Laptop Use by Subject (Percent)



Students told us what their teacher was doing at the moment of the survey: the pattern is stable from the previous year with a small decline in “lecturing” and a small increase in “class discussion”.

Table 8: Student eLearning Survey – Teacher Activity (Data are multiple response: % of responses = the proportion of the total responses indicating that activity. % of respondents indicates = the % of the respondents total choosing this activity)		
“My teacher was...	% of responses (2006-07) [N]	% of respondents
2d. working at his/her desk	29 (29) [2805]	35
2e. doing something else (“other”)	24 (28) [2326]	29
2a. lecturing/demonstrating	23 (20) [2259]	28
2c. leading a class discussion	15 (12) [1443]	18
2b. helping small groups or individuals	10 (10) [991]	13
<i>Totals</i>	<i>100</i> (9824)	

The third item on the survey asked, “What are/were you [the student] doing?”
The rank order of student activities is unchanged.

Table 9: Student eLearning Survey – Classroom Activity (Data are multiple response: % of responses = the proportion of the total responses indicating that activity. % of respondents indicates = the % of the respondents total choosing this activity)		
	% of responses (2006-07) [N]	% of respondents
3a. I was working on my own	37 (34) [3541]	44.5
3c. I was listening to the teacher	27 (24) [2561]	32.2
3d. I was doing something else (“other”)	26 (31) [2477]	31.1
3b. I was working in a small group	10 (10) [962]	12.1
<i>Totals</i>	<i>100</i>	

Finally, we captured uses of the laptops (“If yes, what are/were you working on?”). Internet research remains the most common use although “taking notes” has increased.

Table 10: Student eLearning Survey – Student Computer Use (Data are multiple response: % of responses = the proportion of the total responses indicating that activity. % of respondents indicates = the % of the respondents total choosing this activity)		
	% of responses (2006-07) [N]	% of respondents
5c. I was researching/using the internet	27 (30) [1190]	38
5f. I was doing something else ("other")	21 (23) [931]	29
5a. I was taking notes	20 (15) [883]	28
5d. I was reading onscreen text	17 (14) [775]	24
5b. I was working on a presentation	10 (11) [445]	14
5e. I was listening to music	6 (8) [270]	9
<i>Totals</i>	<i>100</i> [4494]	

4.0 TEACHER QUESTIONNAIRE RESULTS

4.1 Amounts and Applications

4.1.1 Increasing laptop use

HCPS high school teachers have had personal laptops for three years or more. More teachers in 2007 than 2006 agree that that has made a positive difference in their teaching (TQ 9, **3.33**, 3.22) and that they are using them even more than previously (TQ 8, **3.17**, 2.95). As well, the positive impact on faculty morale has grown (TQ 48, **2.73**, 2.57).

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 thought that the following functions had grown year-over-year.

4. Checking student attendance, information or grade administration (TQ 4, **3.72**, 3.65)
5. Communicating with other teachers (TQ 6, **3.71**, 3.64)
6. Communicating with administrators (TQ 7, **3.63**, 3.56)
7. Communicating with parents (TQ 5, **3.42**, 3.29)
8. Lesson planning (TQ 3, **3.41**, 3.22)
9. Looking at interim student assessments (TQ 2, **3.17**, 3.17)
10. Presenting instruction with content-specific software (TQ 1, **2.93**, 2.75)

The first three functions that continue to grow (attendance and in-school communication) are all in the “agree strongly” range. The order of the functions is unchanged although teacher consensus around six of the seven functions has grown.

Almost half of Henrico’s secondary school teachers (46%) 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.

Frequency	Percent (N)
Every day	46 (354)
3-4 days/week	15 (116)
1-2 days/week	24 (180)
Not at all	15 (115)
<i>Total</i>	<i>100 (765)</i>

The teachers believe that, compared to other faculty members, they are not unusual in their laptop utilization (SQ 46, **2.43**) and most say they have been part of a group working on new ways to use the laptops (SQ 47, **2.65**).

4.1.2 Teacher applications of laptops

Teachers told us that they use their laptops to:

Often

- print handouts (TQ 51, **2.82**, 2.81)
- find teaching resources online (TQ 52, **2.78**, 2.69)
- develop lesson plans (TQ 49, **2.64**, 2.53)
- post homework assignments (TQ 54, **2.52**, 2.38)

Sometimes

- assess individual students (TQ 50, **2.28**, 2.21)
- get professional help (TQ 56, **2.20**, 2.09)
- exchange lesson plans with other teachers (TQ 55, **2.12**, 2.03)
- keep my plan book (TQ 53, **2.11**, 2.01)

Forty-three percent of HCPS secondary teachers say they post their class syllabus online (TQ 121). One teacher in five has a class website (TQ 120, **22% yes**) and they report that they “often” update it (TQ 124), post homework assignments on it (TQ 122) and post due dates on it (TQ 123).

The table below displays the importance teachers assigned to laptops by different functions. “My laptop computer is useful for...”

1. Math (TQ 64, Agree strongly, **3.58**, 2.98)
2. Reading (TQ 62, Agree, **3.35**, 3.09)
3. Developing a computer-related lesson (TQ 61, **3.41**, 3.33)
4. Instructional technology (TQ 60, **3.33**, 3.27)
5. Writing (TQ 63, **3.33**, 3.02)

Teachers are strongly agreed that computers are helpful in Math but they do not use them very much for that subject.

Given the consistent and positive trajectory that describes the increasing utilization of technology by HCPS teachers, it is not a surprise that they think that online resources are better than paper-and-pencil systems for the following:

- teaching hints (TQ 77, **3.15**, 3.11)
- assessment of students (TQ 76, **3.02**, 2.89)
- carrying paper files to/from school and home (TQ 78, **3.00**, 2.99)
- individualizing instruction (TQ 75, **2.92**, 2.87)

4.1.3 Laptops, instruction, assessment and grouping

“Direct instruction” can be unfairly reduced to the “teacher talk” model. In fact, lecturing to whole groups has its place and will remain one valuable instructional technique. It is also the case that aphorisms about ‘learning by doing’ are valid observations about pedagogy. Last year, the students told us that teachers were doing less direct instruction because of the laptops but the teachers disagreed

and saw no change. This year, both the students and the teachers agree that there is less direct instruction (lecturing the whole class) (TQ 10, **2.61**, 2.45) and teachers report that the amount of coaching they are doing (the question defined it as “being with students while they work”) continues to increase (TQ 11, **2.92**, 2.76). Those positive trends are confirmed by the random interval survey data.

Teachers still are not assigning web searches as homework (TQ 15, **2.34**, 2.07) and probably for the same equity-related reason---they cannot be certain that all students have Internet access at home. But, teachers do not discount homework just because it is done on a computer (TQ 18, **2.06**)

The addition of in-process, frequent assessment of students is an important and recent development in school improvement and one tied directly to the digital revolution. If ‘flying blind’ is a bad idea, so is ‘teaching blind’, a practice that described schooling for decades. When the only serious tests were given at the end of the school year, the teacher had no information about mid-course adjustments and no way to do much more than “teach to the middle” with everyone getting the same superficially equitable opportunity to learn. While parents might wish for instruction more precisely geared to their child, that has been logistically unfeasible without radically reducing class sizes (and thus driving up the cost of schooling).

The solution is to harness the data harvesting, data management and data analysis benefits of computers for schooling in exactly the same manner that they have been applied to business purposes.

First, the use of quizzes seems not to have changed. Teachers say they are not “giving more quizzes this year” (TQ 25, **2.48**) and that they are not assessing students based on weekly quizzes (TQ 22, **2.32**). Further, they believe that they know their “...students without adding a lot of quizzes and assessments” (TQ 20, **2.76**, 2.58).

At the same time, they are using their laptops much more (1) “to analyze more quiz data, assessment data this year” (TQ 26, **2.63**, 2.37); and (2) “to assess students based on SOL state tests” (TQ 23, **2.95**, 2.57)¹¹.

And, teacher familiarity with those finely grained data and their implications---plus the availability of ubiquitous computers---is supporting changes in instruction. Consider the following statements.

- “Individual computers have made small group assignments more possible”: Agreed (TQ 19, **2.88**, 2.81)
- “Laptops have made small group instruction more feasible”: Agreed (TQ

¹¹ But, teachers also report that, “The laptop has made no difference in my ability to align my teaching to Virginia Standards” (TQ 12, **2.55**, disagree 2.40).

- 37, **2.82**, 2.08)
- “I use my laptop to change instructional groupings more frequently than last year”: Agreed (TQ 28, **2.55**, 2.22)
 - “I have changed the way I group students for instruction”: Agreed (TQ 27, **2.53**, 2.31)
 - “Individualized instruction is not practical for me”: Disagreed (TQ 36, **2.18**)

Those are big advances among the faculty from last year when they rejected several of those practices as being unfeasible (e.g., weekly assessments, more quizzes, more analysis of data, changed instructional grouping and more frequent grouping changes, c.f., “1-to-1 Laptops: 2005-06 Results”, 103106, p 21).

In the literature on school change, there is evidence about “critical mass”, that is, the minimum number of teachers who need to embrace an innovation in order for that departure from practice to survive the criticism of the balance of the faculty. In general, the critical mass is about a fifth in order for a new practice to survive. In the table below, teachers are reporting where their own practice is relative to their colleagues. It is apparent that sufficiently large fractions of the faculty have made the shift to instruction supported by ubiquitous teacher and student computing for that innovation to be sustained and, on this evidence, to flourish.

Table 12: Teacher Self-Reported Comparison to Other Teachers by Remedial, Assessment and Presentation Applications (%s)
<p>For <u>remedial applications</u>:</p> <ul style="list-style-type: none"> • 35% believe themselves to be more advanced in laptop use than other teachers (TQ 29a) • 35% have shown other teachers how to do things with their laptops (TQ 30a)
<p>For <u>assessment applications</u>:</p> <ul style="list-style-type: none"> • 39% believe themselves to be more advanced in laptop use than other teachers (TQ 29b) • 45% have shown other teachers how to do things with their laptops (TQ 30b)
<p>For <u>presentation applications</u>:</p> <ul style="list-style-type: none"> • 57% believe themselves to be more advanced in laptop use than other teachers (TQ 29c) • 57% have shown other teachers how to do things with their laptops (TQ 30c)

4.1.4 Teachers and time savings

Teachers remain convinced that online grade reporting saves time (TQ 42, **3.38**, 3.27) and that online student assessment saves time (TQ 41, **3.24**, 2.98).

4.2 Laptop Affects on Students

Teachers agree that computers are useful to students for the following functions (ordered most-to-least):

- present information (TQ 72, **3.38**, 3.33)
- find out about ideas/information (TQ 70, **3.37**, 3.34)
- communicate electronically with others (TQ 69, **3.20**, 3.15)
- learn to work independently (TQ 74, **3.16**, 3.13)
- express ideas in writing (TQ 67, **3.06**, 2.93)
- students analyze information (TQ 71, **3.04**, 2.93)
- learn to work collaboratively (TQ 73, **3.00**, 3.01)¹²
- measure what they have learned (TQ 68, **2.97**, 2.80) and
- catch up with what they have not learned (TQ 66, **2.93**, 2.81).

4.2.1 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, **3.20**, 3.18). And, to some extent, they believe that is happening. For example, they agree that laptops are helping students who are:

- bi-lingual students (TQ 35, **3.26**, 3.06)¹³
- visual learners (TQ 32, **3.26**, 3.23)
- kinesthetic learners (TQ 34, **2.89**, 2.88) and
- auditory learners (TQ 33, **2.79**, 2.78).

In a sharp reversal from last year, teachers now conclude that students with more computer knowledge are not moving faster than those with less (TQ 107, Disagree, **1.48**, 2.83)

4.3 The Limits of Laptops

4.3.1 What laptops have not been able to accomplish

Laptops are not an omnibus problem solver, equally able to fix every needy area of schooling. The next table shows areas of student performance where laptops have not made a difference.

Table 13: Teacher Identification of Areas of Student Performance Beyond the Reach of the Ubiquitous Computing, 1-to-1 Initiative (lower number indicates more consensus among HCPS respondents)
“Laptops have not made a difference in students...”
<ul style="list-style-type: none"> • behavior (TQ 98, 1.53, 2.04) • responsibility they feel for their work (TQ 96, 1.55, 2.26)

¹² And, teachers agree that, “Student -to-student collaboration has increased with laptops” (TQ 39, **2.78**).

¹³ And, “Individual laptops for students have made a positive difference in students' achievement of bilingual students (TQ 92, **2.66**).

¹⁴ Note: Items TQ 39 and 73 are similar (one asks about “collaboration” instead of “cooperation”) and for those, the teachers thought laptops had made a positive difference.

- grades (TQ 99, **1.66**, 2.31)
- desire to learn (TQ 87, **1.71**, 2.49)
- attendance (TQ 100, **1.71**, 2.05)
- interest in my class (TQ 97, **1.75**, 2.48)
- quality of assignments they turn in (TQ 88, **1.76**, 2.53 agree)
- cooperation with each other (TQ 95, **1.76**, 2.50 agree)¹⁴.
- ability to express themselves in writing (TQ 90, **1.92**, 2.51 agree) and
- depth and breadth of their research (TQ 89, **2.01**, 2.70 agree).

Teachers have changed their previously positive assessment of four of the items that are now thought to be not accessible to the affects of individual laptops---(1) “Quality of assignments they turn in”, (2) “Cooperation”, (3) “Ability to express themselves in writing”, and (4) “Depth and breadth” of their research.

For both years, teachers thought that laptops were not making a “positive difference in the achievement of failing students” (TQ 91, **1.66**, 2.27). Last year, they thought that laptops had helped “bridge the achievement gap between lower and higher achieving students” but they no longer believe that (TQ 94, **1.81**, 2.50). And they have similarly changed from a positive to a negative assessment of the ability of laptops to make a difference with special education/IEP students (TQ 93, **2.24**, 2.67).

4.3.2 Negative aspects of laptops

Last year, the most notable of the teacher-identified negative aspects was the distraction issue---teachers thought that, because of the laptops---students paid less attention to them, the teachers. They no longer feel that way (TQ 101, Disagree **2.05**, 3.01).

But, there are two new items on the “negative” list: “Laptops have given students unrealistic ideas about what learning is about” (TQ 103, **2.59**, 2.43) and student compliance with acceptable use policies (TQ 106, **2.03**, 1.98).

4.3.3 “No problems”

The questionnaire suggested that the items shown below might be problems but the teachers disagreed. None are a problem.

- “The education contribution of computer is not worth the time I have to spend troubleshooting batteries, software, application access” (TQ 102, **1.51**, 2.16)
- “Getting students to bring laptops to class is a problem” (TQ 104, **1.65**, 2.33)
- “The length of time the laptop batteries hold a charge is a problem” (TQ 103, **1.79**)
- “There is not enough good software” (TQ 108, **1.85**, 2.39)
- “Laptops encourage unrealistic expectations for what I have time to do as a teacher” (TQ 109, **1.72**, 2.46)

4.4 The Context of Infrastructure, Professional Development and Skill Levels

4.4.1 Teachers and the technology infrastructure of their classrooms

Last year, 95% of the teachers thought the Internet connection in their classroom was reliable. This year, it is 96% (TQ 128).

Twenty-seven percent of the teachers report an LCD projector in their classroom; 18% have a digital camera; 7% 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. Eighty percent have used televisions (TQ 138); 67% have used LCD projectors (TQ 136); and only 7% have used interactive white boards (TQ 137, the same per cent as report their availability in their classrooms).

Teachers continue to believe that their Dell laptops are reliable (TQ 57, **3.22**, 3.30); that their Internet connection is reliable (TQ 58, **3.23**, 3.32); and that they can get help with the technology when they need it (TQ 59, **3.26**, 3.27). HCPS teachers do not believe that “All textbooks and resources should be available on student laptops” and that is a change from last year (TQ 110, **1.72**, 2.96).

4.4.2 Teachers, school support professional development and other help

Teachers agreed both years that their school’s administration is supportive of their work with laptops (TQ 14, **3.47**, 3.42) but they now disagree that they have the “classroom support to implement the skills I learned from professional development” (TQ 113, **2.05**, 2.88). The latter conclusion is a contrast from the continuing increases in the teachers’ implementation of computer-related technology in their classrooms.

Table 14: Teachers’ Preferred Sources of Help with Technology (most-to-least)

Table 14: Teachers’ Preferred Sources of Help with Technology (most-to-least)
“When I need help, I go to...
1. other teachers” (TQ 116, 2.33 , 2.32)
2. an Instructional Technology Resource Trainer, Technology Trainer” (TQ 118, 2.33 , 2.35)
3. a TST” (TQ 119, 2.07 , 2.05)
4. a student” (TQ 120, 1.67 , 1.67)
5. no one” (TQ 121, 1.40 , 1.41)
6. the HCPS/Dell help line” (TQ 117, 1.13 , 1.16)

Last year, teachers reported that they were expected to participate in technology related professional development but this year, they said that was not an expectation at their building (TQ 114, **2.29**, 3.16). Still, they say they would like

more laptop-related professional development (TQ 112, disagreed with negative statement, **1.56**, 2.36).

Teachers expressed their preferences for the type of professional development they preferred (TQ 115).

Type	Percent (N)
Individual Help	33 (254)
Group Session	30 (228)
Online Training	23 (176)
Planning Period Training	14 (107)
Total	100 (765)

4.4.3 Teacher self-identified computer-related skill levels

Teachers judged their own expertise about several computer-related skills. For many previous studies of technology use in schools, presentation technology (e.g., *Power Point*) was never high but that has changed for Henrico.

They agree strongly that they can <ul style="list-style-type: none"> use an internet search engine (TQ 83, Agree strongly, 3.58, 3.56)
They agree that they are skillful with <ul style="list-style-type: none"> copying/moving files (TQ 82, Agree, 3.45, 3.43) presentation software (TQ 80, Agree 3.18, 3.09) spreadsheets (TQ 79, Agree 2.93, 2.90) creating and maintaining a website (TQ 84, Agree 2.92, 2.93) desktop publishing (TQ 81, Agree 2.87, 2.82)
They disagree that they are good at <ul style="list-style-type: none"> using content specific applications/software (TQ 85, 2.30, 3.21) using teaching aids such as QUIA, Beyond Books, etc. (TQ 86, 2.17, 2.99)

It is worth noting that the two areas where this year teachers doubted their skills were sources of strength last year. Both deal with “specific software” and “teaching aids”.

4.5 Teacher Random-interval Survey Results

We used the same procedure with the teachers as we did with the students in supplementing the self-report end-of-year questionnaire data and the results of our interviews and observations. From teachers, we had a total of 10,792 individual responses with an average of 270 responses to each survey. The average teacher gave us data at 28 points over the survey interval (390 teachers completed at least one survey).

Teacher use of their laptops is higher than student use. At any point in the instructional day, between 40% and 50% of HCPS teachers are using their laptops. That is more than 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 the state’s untrained teachers. That is less than half the use in HCPS.

Figure 5: Teacher Laptop Use (Percent)

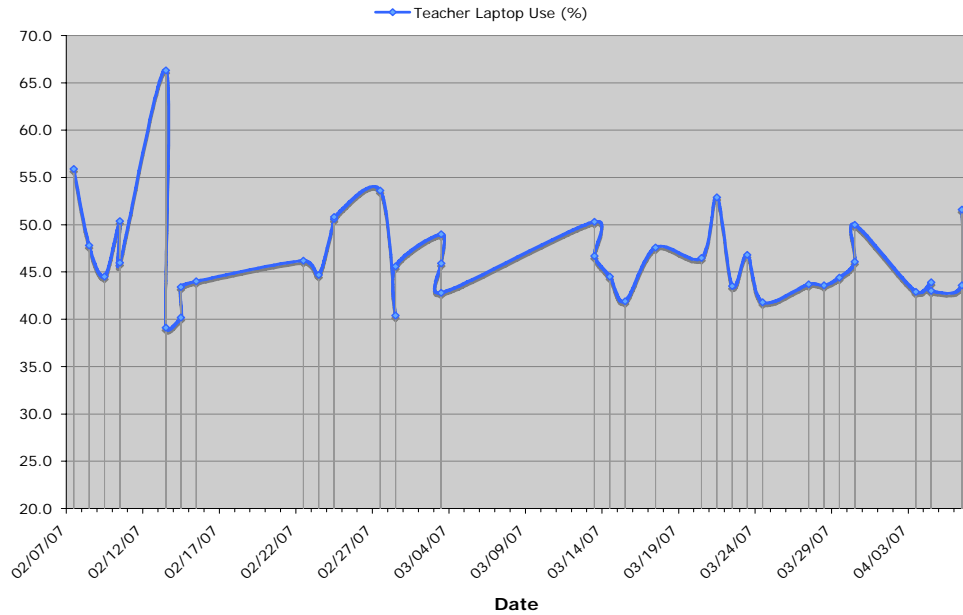
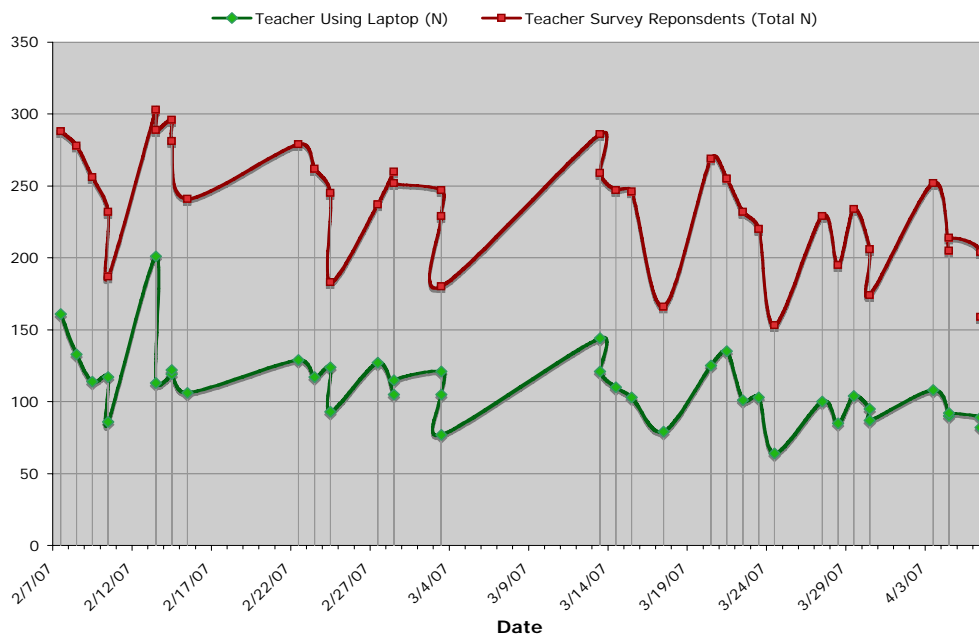
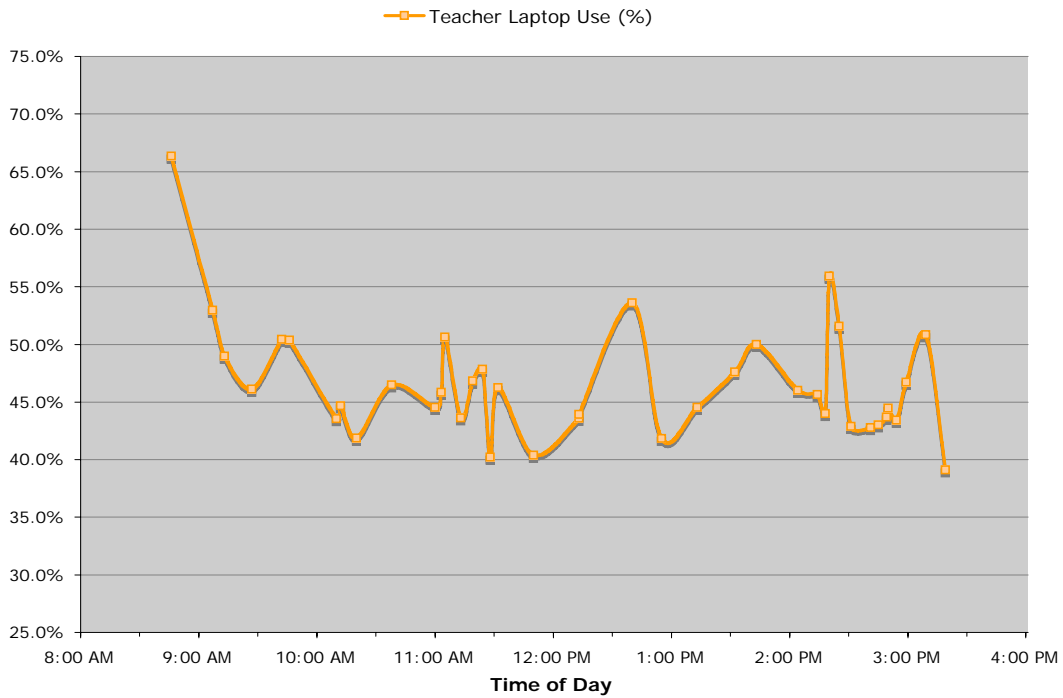


Figure 6: Teacher Laptop Use (Number)



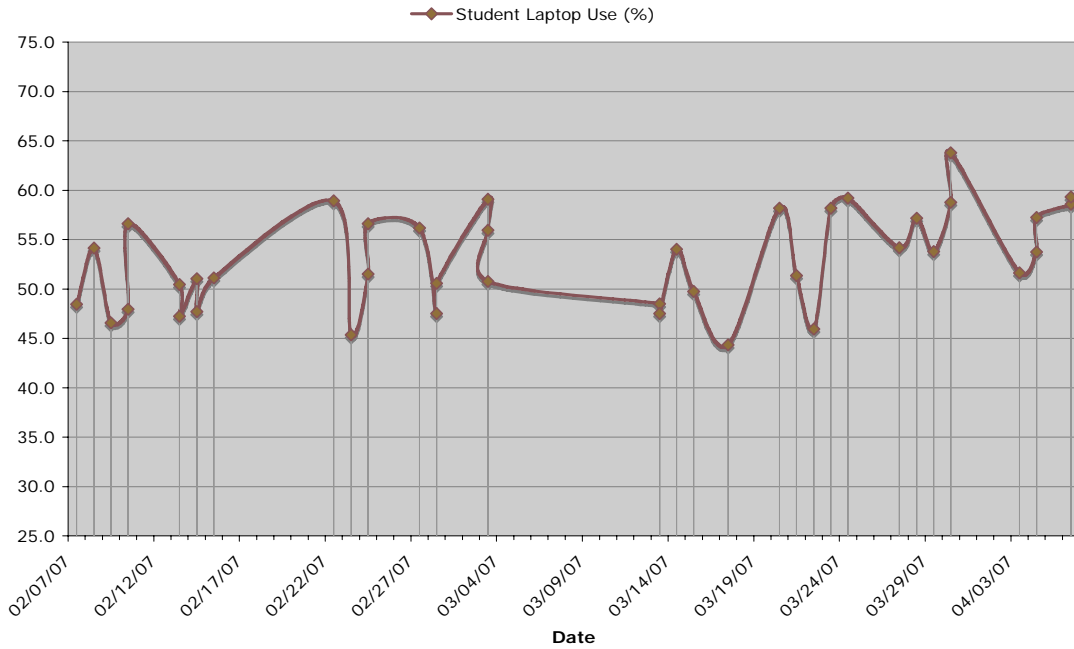
Teacher laptop use over the course of the day spikes in the early morning (student use went up at the end of the day) and then remains fairly constant.

Figure 7: Teacher Laptop Use By Time of Day (Percent)



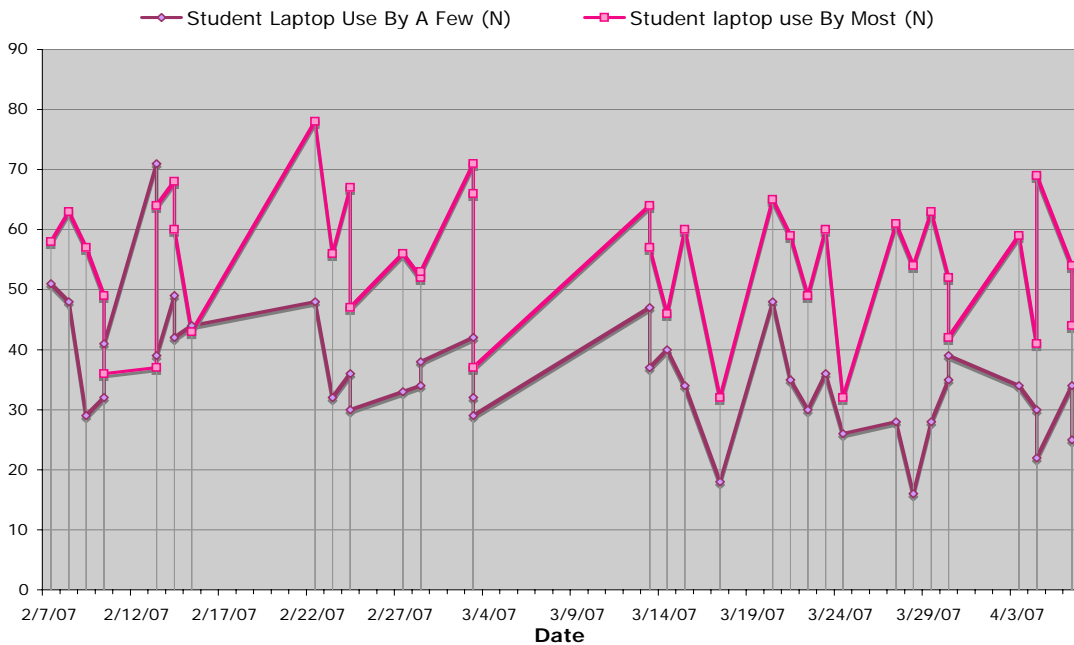
When asked if their students' were using their laptops, the teachers tended to report more use than did the students (student use was reported 40% of the time).

Figure 8: Teacher-indicated Student Laptop Use (Percent)



The next table shows the same pattern with teachers reporting generally more use by “most” students rather than by “a few”.

Figure 9: Teacher-Indicated Student Laptop Use (Comparing “A Few” to “Most”)



Teachers told us what they were doing at the moment of each query. Compared to last year, there are big drops in non-instructional activities (1d, “Planning...” and 1f “Non-instructional”). And, there is twice as much work with small groups or individuals.

Table 17: Teacher eLearning Survey – Teacher Activity (Data are multiple response: % of responses = the proportion of the total responses indicating that activity. % of respondents indicates = the % of the respondents total choosing this activity)		
What are/were you doing? (check all that apply)	% of responses (2007) [N]	% of respondents
1d. I was planning, doing clerical or research	17 (25) [2117]	19.6%
1e. I was doing something else/other instructional*	17 [2047]	19.0%
1f. I was doing something else/non-instructional	16 (24) [1962]	18.2%
1a. I was lecturing to the whole group/demonstration	15 (6) [1876]	17.4%
1b. I was helping small groups/individuals	14 (7) [1748]	16.2%
1g. I was absent/not in class	11 (10) [1362]	12.6%
1c. I was leading class discussion	9 (9) [1081]	10.0%
<i>Totals</i>	<i>100 [12193]</i>	<i>113.0%</i>

*New item for 2007.

Compared to last year, teachers are using their laptops more to present material and to assess or diagnose students.

Table 18: Teacher eLearning Survey – Teacher Computer Use (Data are multiple response: % of responses = the proportion of the total responses indicating that activity. % of respondents indicates = the % of the respondents total choosing this activity)		
If you are/were using a laptop, what are/were you working on? (check all that apply)	% of responses (2007) [N]	% of respondents
4c. I was reporting, doing clerical tasks or administrative tasks on my laptop	37 (42) [1948]	44.3%
4d. I was planning or researching instruction on my laptop	21 (23) [1089]	24.7%
4a. I was working on/making a presentation on my laptop	18 (13) [931]	21.1%
4b. I was diagnosing/assessing/testing students on my laptop	13 (9) [668]	15.2%
4e. I was doing something else on my laptop	11 (13) [572]	13.0%
<i>Totals</i>	<i>100 [5208]</i>	<i>118.3%</i>

4.6 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.

Table 19: Teachers by Amount of Post-Secondary Education (%)	
	% (N)
31+ Graduate Credits	40 (293)
0-30 Graduate Credits	35 (255)
Bachelors	26 (191)
<i>Total</i>	<i>100 (739)</i>

5.0 ADMINISTRATOR QUESTIONNAIRE RESULTS

5.1 Amounts and Applications

5.1.1 Increasing laptop use

Administrators report that in 2006-07 they used their laptops more than in previous years including for functions critical to school improvement like looking at interim assessments and communicating with teachers.

We asked administrators to respond to the statement: "I now use my laptop much more for..."

1. "communicating with teachers" (Agree Strongly, AQ 1), **3.77**, 3.65
2. "communicating with other administrators" (Agree Strongly, AQ 3), **3.75**, 3.70
3. "administering the business of the school---scheduling, budgets, personnel, etc." (Agree strongly, AQ 5) **3.65**, 3.58
4. "looking at interim assessments, student attendance" (Agree strongly AQ 4), **3.62**, 3.65 and
5. "communicating with parents" (Agree, AQ 2), **3.31**, 2.97.

Both administrators and teachers report e-communications with each other. Predictably, administrators use more school business applications. The big difference is in the administrators more frequent e-communication with parents.

About half of the administrators interviewed take their laptops home at least three days per week (AQ 64).

5.1.2 Principals' estimates of teachers' attitudes about laptops

Administrators describe the teachers as enthusiastic about laptops for themselves and for their students (AQ 6, **3.30**, 3.32). They continue to believe as they did in 2005-06 that the laptop program had helped with faculty morale (AQ 25, **2.95**, 2.83). The building administrators think that some teachers have learned or invented new ways to use the laptops during 2006-07 (AQ 9, **3.24**, 3.14).

The site administrators have concluded that it is time to get on with laptop-augmented instruction and these data support the conclusion that teachers are doing exactly that. The administrators believe that the teachers have had enough professional development (AQ 60, **2.38**), enough support in the classroom (AQ 61, **2.99**) and enough quality software to support instruction augmented with ubiquitous computing (AQ 57, disagreed **2.21**). They do not, however, believe that it is yet time to 'go paperless' and do away with print resources (AQ 59, disagreed **2.17**).

5.1.3 Principals on teachers' applications of laptops

We asked the building administrators how teachers were using their laptops. They agreed that most of their teachers maintain class websites (AQ 11, **2.86**), post their syllabi online (AQ 12, **3.26**) and post and update student assignments online (AQ 13, **3.21**). They thought that there was frequent use for lesson presentation (AQ 17, **3.20**, 3.24) and for remediation (AQ 15, **2.63**, 2.62).

5.1.4 Principals on 21st Century skill applications for students

We asked again about some of the 21st Century skills development. In a substantial improvement over the previous year, they agreed 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 11, **3.28**, 2.64) 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 10, **2.68**, 2.29). They do believe that laptops have increased collaboration (AQ 20, **3.07**, 2.94) and "cooperation with each other" (AQ 44, **2.67**, 2.67) among students.

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. For example, laptops have made small group instruction more feasible (AQ 19, **3.05**, 3.00). They recognized the link between computers and teachers SOL-related assessment (AQ 13, **3.04**, 2.94). And, most of the principals agreed that teachers were changing their instructional grouping because of assessment information (AQ 14, **2.69**, 2.61).

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 22, **3.46**, 3.51) and online student assessment (AQ 21, **3.34**, 3.17).

5.2 Laptop Effects on Students

5.2.1 Principals estimates of how laptops help students

The building administrators agreed among themselves about the 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 unanimity among the respondents):

12. special education/IEP student achievement (AQ 42, **2.99**, 2.92)
13. depth and breadth of research (AQ 38, **2.95**, 2.97)
14. quality of assignments completed (AQ 37, **2.93**, 3.08)

15. bi-lingual student achievement (AQ 41, **2.90**, 2.97)
16. desire to learn (AQ 36, **2.86**¹⁵, 2.92)
17. bridging the achievement gap between lower and higher achieving students (AQ 43, **2.82**, 2.97)¹⁶
18. ability to express themselves in writing (AQ 39, **2.82**, 2.81)
19. grades (AQ 48, **2.70**, 2.72)
20. cooperation with each other (AQ 44, **2.67**, 2.67)
21. achievement for failing students (AQ 40, **2.65**, 2.71)
22. sense of responsibility for their work (AQ 45, **2.59**, 2.56)

5.2.2 Laptops and different types of students

One other, near consensus item described 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 18, **3.37**, 3.38).

5.3 The Limits of Laptops

On the negative side, the administrators also concluded that getting students to (a) bring laptops to class (AQ 53, **2.90**, 2.72) and to (b) comply with the acceptable use policy (AQ 55, disagreed, **2.11**, 2.03) are both problems.

They did not think that laptops have helped with attendance (AQ 49, disagree **2.49**, 2.06) or made a positive difference in behavior generally (AQ 47, **2.29**, 2.23). And they thought that laptops distract students from direct instruction (AQ 50, **2.64**, 2.73), a view that is not shared by either teachers or students this year. [But neither do these respondents believe that the laptops have given students unrealistic ideas about learning (AQ 52, **2.24**, 2.22).]

5.4 The Context of infrastructure, Professional Development and Skill Levels

The administrators agreed that their laptops were reliable (AQ 26, **3.34**, 3.32) so was the Internet connectivity (AQ 27, **3.32**, 3.30) and, if they did have a problem, they could get help in a “reasonable amount of time” (AQ 28, **3.42**, 3.32).

5.4.1 Principals computer-related skills

Building administrators rated their own skills from highest to lowest as follows:

1. Using a search engine (AQ 33, **3.69**, 3.59)
2. Copying/moving files (AQ 32, **3.56**, 3.41)
3. Using specific content or applications (AQ 35, **3.40**, 3.24)
4. Using presentation software (AQ 30, **3.31**, 3.43)
5. Using spreadsheets (AQ 29, **3.14**, 3.17)

¹⁵ Neither students nor teachers agree.

¹⁶ Similarly they concluded students who have more and less computer knowledge are progressing at about the same rates.

6. Doing desktop publishing (AQ 31, **2.96**, 2.78)
7. Maintaining a website (AQ 34, **2.71**, 2.39)

5.4.2 Demographics of responding administrators

We had responses from 137 administrators. Most administrators have had five and a half years teaching experience. Most of their school experience is in HCPS. Almost three-fourths of the group has a master's degree or higher advanced degree.

6.0 HCPS PARENT WEB SURVEY RESULTS

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.

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 HCPS CLASS OF 2006 GRADUATE WEB SURVEY RESULTS

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

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 graduate 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.

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.

Missing component	% reporting
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 SCHOOL AND STUDENT PERFORMANCE IMPROVEMENT AND RECOMMENDATIONS

8.1 School and student performance improvement

Henrico's 2005 vision had been to make laptops ubiquitously available and that is being achieved. The district also sought to integrate technology into classroom instruction and, through that integration, to promote the differentiation and even individualization of instruction. Over this study's two years, those are gains that are in place and growing.

The analysis also documents that for several topics, the more students use laptops, the more likely they are to perform well on the SOL state tests. The production of learning is the sum of many influences including computers. Or, said differently, laptop computers are one teaching/learning tool among several. The district's multiple school improvement initiatives, taken together with the 1-to-1 initiative have the prospect of substantial additional transformation.

8.2 Recommendations

Last year we made several recommendations. The willingness of HCPS to follow through with evidence-based planning is reflected in the improvements detailed in this year's report. However, school improvement is a continuous business. We believe that the following areas should continue to have priority attention:

- Professional development about laptop integration into classroom instruction especially among the lower use topics
- Interim assessment of student performance linked to changes in instruction during the school year
- Connecting teachers to each other through best practice sharing
- School-home-school communications and
- 21st Century skills for students.

9.0 METHODS

This report is based mainly on descriptive statistics. We report the average (mean) responses of students, teachers or administrators.

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 to discover trends. 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 closest value on a Likert (agree/disagree) scale. Response intervals for the Likert and other response formats have been coded as follows:

1.00-1.49	Strongly disagree	Not at all	Never	No
1.50-2.49	Disagree	1-2 days/week	Sometimes	Yes
2.50-3.49	Agree	3-4 days/week	Often	
3.50-4.00	Strongly agree	Every day		

EOY questionnaire response rates by group are:

- Teachers 82% (808/988)
- Administrators 73% (37/51)
- Students 48% (7224/15029)

The number "missing" includes those who responded with "Not applicable (N/A)"

APPENDIX A: STUDENT SURVEY RESULTS

The number “missing” includes those who responded with “Not applicable (N/A)”

For reporting, the means are rounded to the closest value from the scale students responded with:

1.00-1.49 = No, 1.50-2.00 = Yes

1.00-1.49 = Strongly Disagree, 1.50-2.49 = Disagree, 2.50-3.49 = Agree, 3.50-4.00= Strongly Agree

1.00-1.49 = Not at all, 1.50-2.49 = 1-2 days/week, 2.50-3.49 = 3-4 days/week, 3.50-4.00= Every day

1.00-1.49 = Never, 1.50-2.49 = Sometimes, 2.50-3.00 = Often

Statistics

	N		Mean	Std. Deviation
	Valid	Missing		
1. I am an expert at using software to find and get rid of viruses	8270	168	2.23	1.057
2. I am an expert at creating a multi-media presentation (w/ sound, pictures, video)	8270	168	3.04	.846
3. I am an expert at creating computer programs (e.g. in Logo, Pascal, Basic)	8270	168	2.17	1.033
4. I am an expert at constructing a web page	8270	168	2.45	1.020
5. I am an expert at creating a presentation (e.g. using MS PowerPoint)	8270	168	3.37	.750
6. I am an expert at using spreadsheets to plot a graph	8270	168	2.97	.880
7. I am an expert at using a database to produce a list of addresses	8270	168	2.75	.958
8. I am an expert at sharing my own content (writing, artwork, photos, videos) on a blog	8270	168	2.86	1.006
9 At school last year (2005-06), I used a laptop computer	8270	168	3.37	.917
10 At school this year (2006-07), I used my laptop during free periods	8270	168	3.43	.865
11. At school this year (2006-07), I used a laptop computer	8270	168	3.58	.745
12. I take my laptop home	8270	168	3.87	.537
13. At home, this year, I used my laptop	8270	168	2.97	1.058
14. I use my laptop in English	8270	168	2.53	.971
15. I use my laptop in Math	8270	168	1.90	1.047
16. I use my laptop in Science	8270	168	2.80	.962
17. I use my laptop in History	8270	168	3.05	1.007
18. I use my laptop in Another Elective Course	8270	168	2.84	1.080
24. Compared to last year, my teachers use computers more for PowerPoint presentations, etc.	8270	168	3.02	.829
25. Compared to last year, my teachers use computers more for white board and LCD projector presentations	8270	168	2.90	.892
26. Compared to last year, my teachers use computers more for communicating with my parents	8270	168	2.46	1.024
27. Compared to last year, my teachers use computers more for communicating with me outside of class	8270	168	2.28	1.066

28. I think I should be allowed to determine when to use my laptop at school for school work	8270	168	3.23	.780
29. When we use laptops, my teachers assign more groups projects	8270	168	2.58	.864
30. When we use laptops, my teachers lecture less and walk around the room helping students more	8270	168	2.64	.933
31. When we use laptops, I am more interested in school	8270	168	2.93	.960
32. Being at schools is more fun with the laptops.	8270	168	3.16	.912
33. My teachers assign internet searches as part of homework at least once a week	8270	168	2.48	.918
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	8270	168	2.64	.939
35. The homework I have seems related to what I will be doing after I graduate	8270	168	2.42	.973
36. Homework done on computers seems less important than paper and pencil homework	8270	168	2.23	.986
37. Working with laptops in class involves problem-solving (getting a set of facts and having to figure out your own answer)	8270	168	2.63	.885
38. Working with laptops in class involves research skills on the internet (finding resources and applying them)	8270	168	3.17	.729
39. Working with laptops in class involves evaluation skills (figuring out which facts or ideas are accurate and which are not)	8270	168	2.83	.826
40. Working with laptops in class involves communication (doing PowerPoints, adding pictures and sound to make a presentation better)	8270	168	3.14	.762
41. Working with laptops in class involves working independently and without much direction from adults	8270	168	2.98	.783
42. Working with laptops in class involves working with other students in a team	8270	168	2.92	.794
43. Working with laptops in class involves taking notes	8270	168	3.24	.772
44. Working with laptops at home/for homework involves problem-solving (getting a set of facts and having to figure out your own answer)	8270	168	2.64	.933
45. Working with laptops at home/for homework involves research skills on the internet (finding resources and applying them)	8270	168	2.99	.843
46. Working with laptops at home/for homework involves evaluation skills (figuring out which facts or ideas are accurate and which are not)	8270	168	2.76	.891
47. Working with laptops at home/for homework involves communication (doing PowerPoints, adding pictures and sound to make a presentation better)	8270	168	3.04	.826
48. Working with laptops at home/for homework involves working independently and without much direction from adults	8270	168	3.04	.834
49. Working with laptops at home/for homework involves working with other students in a team	8270	168	2.59	.954
50. Working with laptops at home/for homework involves taking notes	8270	168	2.86	.954
51. I am learning more because of the laptop	8270	168	2.87	.913
52. I'm more likely to do well after I graduate because of the laptop	8270	168	2.91	.910
53. I am using my laptop in ways that other students don't.	8270	168	2.89	.909
54. I have shown other students how to do things with their laptops	8270	168	2.80	.936
55. I have shown a teacher how to do things with their laptops	8270	168	2.40	.945
56. In my classes, everyone is taught the same way at the same time	8270	168	2.22	.992
57. In my classes, everyone gets the same homework assignments	8270	168	2.89	.932
58. I still carry the same amount of paper books to my class	8270	168	2.60	.947
59. I do more school work with other students because of the laptop	8270	168	2.89	.842
60. My teacher knows more than I do about laptops	8270	168	2.61	.922
61. I do not use my laptop to communicate with my teachers	8270	168	2.83	.817
62. I do not use a laptop to communicate with other students	8270	168	3.18	.669

63. I use my laptop much more than other students in this school	8270	168	2.85	.970
64. I have been part of a group that worked on new ways to use laptops	8270	168	2.57	.894
65. Laptops have had a positive effect on my attitudes toward school	8270	168	2.47	.970
66. Having a laptop has not made a difference in how much I want to learn	8270	168	2.60	.976
67. Having a laptop has not made a difference in the quality of the homework I turn in	8270	168	2.57	.971
68. Having a laptop has not made a difference in the amount of research I do	8270	168	2.33	1.009
69. Having a laptop has not made a difference in how well I do in writing assignments	8270	168	2.51	1.005
70. Having a laptop has made a positive difference in how much I cooperate with other students	8270	168	2.67	.916
71. Having a laptop has made a positive difference in the responsibility I feel for my work	8270	168	2.77	.888
72. Having a laptop has made a positive difference in my interest in my classes	8270	168	2.82	.899
73. Having a laptop has made a positive difference in my behavior	8270	168	2.69	.944
74. Having a laptop has made a positive difference in my grades	8270	168	2.81	.923
75. Having a laptop has made a positive difference in the number of assignments I turn in on-time	8270	168	2.83	.924
76. Laptops distract me from the teacher, I pay less attention	8270	168	2.38	.968
77. I have to spend a lot of time troubleshooting batteries, software, application access	8270	168	2.48	.960
78. Getting laptops set to mute is a problem	8270	168	2.13	.963
79. Bringing laptops to class in the sleep mode is a problem	8270	168	2.11	.941
80. Complying with acceptable use policies is not a problem for me	8270	168	2.81	.922
81. I have a computer at home other than the laptop I get from the school	8270	168	3.14	.910
82. I have an Internet connection at home	8270	168	3.18	.878
83. Comments	8438	0		
19A. The Laptop has helped me study in English	8151	287	1.69	.461
20A. The Laptop has helped me study in Math	8151	287	1.42	.493
21A. The Laptop has helped me study in Science	8151	287	1.80	.398
22A. The Laptop has helped me study in History	8151	287	1.83	.379
23A. The Laptop has helped me study in another elective course	8151	287	1.70	.457
19B. The Laptop has helped me take notes in English	8151	287	1.73	.444
20B. The Laptop has helped me take notes in Math	8151	287	1.38	.485
21B. The Laptop has helped me take notes in Science	8151	287	1.77	.421
22B. The Laptop has helped me take notes in History	8151	287	1.83	.379
23B. The Laptop has helped me take notes in another elective course	8151	287	1.70	.457
19C. The Laptop has helped me prepare presentations in English	8151	287	1.78	.416
20C. The Laptop has helped me prepare presentations in Math	8151	287	1.38	.485
21C. The Laptop has helped me prepare presentations in Science	8151	287	1.75	.434
22C. The Laptop has helped me prepare presentations in History	8151	287	1.80	.400
23C. The Laptop has helped me prepare presentations in another elective course	8151	287	1.75	.430
19D. The Laptop has helped me organize information in English	8151	287	1.77	.419
20D. The Laptop has helped me organize information in Math	8151	287	1.45	.498
21D. The Laptop has helped me organize information in Science	8151	287	1.79	.408
22D. The Laptop has helped me organize information in History	8151	287	1.82	.386
23D. The Laptop has helped me study in another elective course	8151	287	1.74	.441
1. I am an expert at using software to find and get rid of viruses	8270	168	.37	.483
2. I am an expert at creating a multi-media presentation (w/ sound, pictures, video)	8270	168	.78	.417
3. I am an expert at creating computer programs (e.g. in Logo, Pascal, Basic)	8270	168	.34	.475
4. I am an expert at constructing a web page	8270	168	.48	.500

5. I am an expert at creating a presentation (e.g. using MS PowerPoint)	8270	168	.90	.294
6. I am an expert at using spreadsheets to plot a graph	8270	168	.75	.435
7. I am an expert at using a database to produce a list of addresses	8270	168	.62	.486
8. I am an expert at sharing my own content (writing, artwork, photos, videos) on a blog	8270	168	.66	.473
24. Compared to last year, my teachers use computers more for PowerPoint presentations, etc.	8270	168	.80	.401
25. Compared to last year, my teachers use computers more for white board and LCD projector presentations	8270	168	.72	.447
26. Compared to last year, my teachers use computers more for communicating with my parents	8270	168	.48	.500
27. Compared to last year, my teachers use computers more for communicating with me outside of class	8270	168	.41	.491
28. I think I should be allowed to determine when to use my laptop at school for school work	8270	168	.87	.341
29. When we use laptops, my teachers assign more groups projects	8270	168	.51	.500
30. When we use laptops, my teachers lecture less and walk around the room helping students more	8270	168	.57	.495
31. When we use laptops, I am more interested in school	8270	168	.71	.453
32. Being at schools is more fun with the laptops.	8270	168	.81	.389
33. My teachers assign internet searches as part of homework at least once a week	8270	168	.51	.500
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	8270	168	.61	.488
35. The homework er have seems related to what I will be doing after I graduate	8270	168	.48	.500
36. Homework done on computers seems less important than paper and pencil homework	8270	168	.34	.474
37. Working with laptops in class involves problem-solving (getting a set of facts and having to figure out your own answer)	8270	168	.60	.489
38. Working with laptops in class involves research skills on the internet (finding resources and applying them)	8270	168	.88	.323
39. Working with laptops in class involves evaluation skills (figuring out which facts or ideas are accurate and which are not)	8270	168	.70	.457
40. Working with laptops in class involves communication (doing PowerPoints, adding pictures and sound to make a presentation better)	8270	168	.86	.346
41. Working with laptops in class involves working independently and without much direction from adults	8270	168	.79	.411
42. Working with laptops in class involves working with other students in a team	8270	168	.76	.427
43. Working with laptops in class involves taking notes	8270	168	.88	.322
44. Working with laptops at home/for homework involves problem-solving (getting a set of facts and having to figure out your own answer)	8270	168	.60	.491
45. Working with laptops at home/for homework involves research skills on the internet (finding resources and applying them)	8270	168	.79	.409
46. Working with laptops at home/for homework involves evaluation skills (figuring out which facts or ideas are accurate and which are not)	8270	168	.65	.476
47. Working with laptops at home/for homework involves communication (doing PowerPoints, adding pictures and sound to make a presentation better)	8270	168	.81	.389
48. Working with laptops at home/for homework involves working independently and without much direction from adults	8270	168	.81	.394
49. Working with laptops at home/for homework involves working with other students in a team	8270	168	.55	.498
50. Working with laptops at home/for homework involves taking notes	8270	168	.69	.463

51. I am learning more because of the laptop	8270	168	.71	.452
52. I'm more likely to do well after I graduate because of the laptop	8270	168	.71	.452
53. I am using my laptop in ways that other students don't.	8270	168	.70	.456
54. I have shown other students how to do things with their laptops	8270	168	.66	.473
55. I have shown a teacher how to do things with their laptops	8270	168	.39	.487
56. In my classes, everyone is taught the same way at the same time	8270	168	.34	.472
57. In my classes, everyone gets the same homework assignments	8270	168	.72	.447
58. I still carry the same amount of paper books to my class	8270	168	.50	.500
59. I do more school work with other students because of the laptop	8270	168	.74	.438
60. My teacher knows more than I do about laptops	8270	168	.55	.498
61. I do not use my laptop to communicate with my teachers	8270	168	.71	.453
62. I do not use a laptop to communicate with other students	8270	168	.92	.275
63. I use my laptop much more than other students in this school	8270	168	.65	.476
64. I have been part of a group that worked on new ways to use laptops	8270	168	.53	.499
65. Laptops have had a positive effect on my attitudes toward school	8270	168	.48	.500
66. Having a laptop has not made a difference in how much I want to learn	8270	168	.57	.496
67. Having a laptop has not made a difference in the quality of the homework I turn in	8270	168	.54	.498
68. Having a laptop has not made a difference in the amount of research I do	8270	168	.41	.493
69. Having a laptop has not made a difference in how well I do in writing assignments	8270	168	.51	.500
70. Having a laptop has made a positive difference in how much I cooperate with other students	8270	168	.60	.490
71. Having a laptop has made a positive difference in the responsibility I feel for my work	8270	168	.66	.473
72. Having a laptop has made a positive difference in my interest in my classes	8270	168	.70	.460
73. Having a laptop has made a positive difference in my behavior	8270	168	.60	.490
74. Having a laptop has made a positive difference in my grades	8270	168	.69	.465
75. Having a laptop has made a positive difference in the number of assignments I turn in on-time	8270	168	.69	.464
76. Laptops distract me from the teacher, I pay less attention	8270	168	.43	.495
77. I have to spend a lot of time troubleshooting batteries, software, application access	8270	168	.46	.499
78. Getting laptops set to mute is a problem	8270	168	.29	.456
79. Bringing laptops to class in the sleep mode is a problem	8270	168	.27	.442
80. Complying with acceptable use policies is not a problem for me	8270	168	.68	.466
81. I have a computer at home other than the laptop I get from the school	8270	168	.81	.391
82. I have an Internet connection at home	8270	168	.84	.370

APPENDIX B: TEACHER SURVEY RESULTS

The number “missing” includes those who responded with “Not applicable (N/A)”

For reporting purposes, the means will be rounded to the closes value from the scale students responded with:

1.00-1.49 = No, 1.50-2.00 = Yes

1.00-1.49 = Strongly Disagree, 1.50-2.49 = Disagree, 2.50-3.49 = Agree, 3.50-4.00= Strongly Agree

1.00-1.49 = Not at all, 1.50-2.49 = 1-2 days/week, 2.50-3.49 = 3-4 days/week, 3.50-4.00= Every day

1.00-1.49 = Never, 1.50-2.49 = Sometimes, 2.50-3.00 = Often

1.00-1.49 = No access, 1.50-2.49 = Occasional access, 2.50-3.00 = Access anytime

Statistics

	N		Mean	Std. Deviation
	Valid	Missing		
1. I now use my laptop much more for presenting instruction with content-specific software	765	0	2.93	.938
2. I now use my laptop much more for looking at interim student assessments	765	0	3.17	.797
3. I now use my laptop much more for lesson planning	765	0	3.41	.762
4. I now use my laptop much more for checking student attendance, information or grade administration	765	0	3.72	.533
5. I now use my laptop much more for communicating with parents	765	0	3.42	.638
6. I now use my laptop much more for communicating with other teachers	765	0	3.71	.515
7. I now use my laptop much more for communicating with administrators	765	0	3.63	.552
8. I am using my laptop more this year than last	739	26	3.17	.806
9. My Laptop has made a positive difference in my teaching	739	26	3.33	.723
10. I am doing less direct instruction (lecturing to the whole class) this year	739	26	2.61	.863
11. I am coaching more this year (being with students while they work)	739	26	2.92	.769
12. The laptop has made no difference in my ability to align my teaching to Virginia Standards	739	26	2.55	.949
13. I determine when student laptops are open and used	739	26	3.51	.625
14. This school's administration supports my work with laptops	739	26	3.47	.607
15. I assign web searches with laptops for homework at least once a week	739	26	2.34	.955
16. I make assignments require students to collect data from or study businesses and/or community institutions at least once a week	739	26	2.20	.979
17. 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	739	26	2.81	.860
18. Homework done on a computer is less important than paper and pencil homework	739	26	2.06	.881
19. Individual Computers have made small group assignments more possible	739	26	2.88	.832
20. I know my students without adding a lot of quizzes and assessments	739	26	2.76	.818
21. Laptops do not help me test or assess students	739	26	2.31	.866
22. I use laptops to assess students based on quizzes at least once a week	739	26	2.32	.881

23. I use my laptop to assess students based on SOL state tests	739	26	2.95	.940
24. I assess students based on laptop projects that relate to the outside world	739	26	2.90	.836
25. I use the laptops to give more quizzes this year	739	26	2.48	.939
26. I use my laptop to analyze more quiz data, assessment data this year	739	26	2.63	.917
27. I have changed the way I group students for instruction	739	26	2.53	.851
28. I use my laptop to change instructional groupings more frequently than last year	739	26	2.55	.932
29a. I am more advanced in laptops than other teachers for remediation	765	0	1.35	.478
30a. I show other teachers how to do things with their laptops for remediation	765	0	1.35	.476
29b. I am more advanced in laptop use than other teachers for assessment	765	0	1.39	.489
30b. I show other teachers how to do things with their laptops for assessment	765	0	1.45	.498
29c. I am more advanced in laptop use than other teachers for presentation	765	0	1.57	.496
30c. I show other teachers how to do things with their laptops for presentation	765	0	1.57	.495
31. I would like to see a practical way for laptops to work with the different learning styles in my classes	739	26	3.20	.574
32. Laptops help students who are visual learners	739	26	3.26	.613
33. Laptops help students who are auditory learners	739	26	2.79	.766
34. Laptops help students who are kinesthetic learners	739	26	2.89	.741
35. Laptops help bi-lingual students	739	26	3.26	.701
36. Individualizes instruction is not practical for me	739	26	2.18	.818
37. Laptops have made small group instruction more feasible	739	26	2.82	.755
38. Students still bring the same amount of paper books to my class	739	26	2.61	.931
39. Student -to-student collaboration has increased with laptops	739	26	2.78	.815
40. My students and I are equally competent with computers	739	26	2.54	.761
41. When Students take assessments online, that saves me time	739	26	3.24	.812
42. Online grade reporting saves me time	739	26	3.38	.679
45. I do not use my laptop to communicate with other teachers	739	26	1.46	.684
46. I use computers much more than my colleagues in the school.	739	26	2.43	.804
47. I have been part of a group that worked on new ways to use laptops	739	26	2.65	.971
48. Laptops have had a positive effect on faculty morale.	739	26	2.73	.867
49. I have used my laptop to develop lesson plans	765	0	2.64	.576
50. I have used my laptop to assess individual students	765	0	2.28	.708
51. I have used my laptop to print handouts	765	0	2.82	.421
52. I have used my laptop to find teaching resources online	765	0	2.78	.450
53. I have used my laptop to keep my plan book	765	0	2.11	.869
54. I have used my laptop to post homework assignments	765	0	2.52	.682
55. I have used my laptop to exchange lesson plans with other teachers	765	0	2.12	.724
56. I have used my laptop to get professional help	765	0	2.20	.665
57. My computer is reliable	765	0	3.22	.665
58. My Internet connection is reliable	765	0	3.23	.632
59. I can get help with technology when I need it/within a reasonable amount of time	765	0	3.26	.700
60. My laptop computer is useful for instructional technology	765	0	3.33	.568
61. My laptop computer is useful for developing a computer-related lesson	765	0	3.41	.563
62. My laptop computer is useful for instructional technology for reading	765	0	3.35	.714
63. My laptop computer is useful for instructional technology for writing	765	0	3.33	.712
64. My laptop computer is useful for instructional technology for math	765	0	3.58	.645
65. My laptop computer is useful for instructional technology for other subjects	765	0	3.45	.615

66. Computers are useful for helping my students catch up with what they have not learned	765	0	2.93	.785
67. Computers are useful for helping my students express ideas in writing	765	0	3.06	.721
68. Computers are useful for helping my students measure what they have learned	765	0	2.97	.721
69. Computers are useful for helping my students communicate electronically with others	765	0	3.20	.741
70. Computers are useful for helping my students find out about ideas/information	765	0	3.37	.583
71. Computers are useful for helping my students analyze information	765	0	3.04	.717
72. Computers are useful for helping my students present information	765	0	3.38	.575
73. Computers are useful for helping my students learn to work collaboratively	765	0	3.00	.757
74. Computers are useful for helping my students learn to work independently	765	0	3.16	.679
75. Compared to paper-and-pencil systems, I think online resources might make it easier to individualize instruction	765	0	2.92	.746
76. Compared to paper-and-pencil systems, I think online resources might make it easier to assess students	765	0	3.07	.740
77. Compared to paper-and-pencil systems, I think online resources might give me more teaching hints	765	0	3.15	.682
78. Compared to paper-and-pencil systems, I think online resources might save time carrying paper files to/from school and home	765	0	3.00	.848
79. I am good at spreadsheets	765	0	2.93	.823
80. I am good at presentation software	765	0	3.18	.741
81. I am good at desktop publishing	765	0	2.87	.837
82. I am good at copying/moving files	765	0	3.45	.605
83. I am good at using an internet search engine	765	0	3.58	.544
84. I am good at creating and maintaining a website	765	0	2.92	.854
85. I am good at using content specific applications/software	755	10	2.30	.726
86. I am good at using teaching aides such as QUIA, Beyond Books, etc.	745	20	2.17	.841
87. Individual laptops for students have made a positive difference in students' desire to learn	678	87	1.71	.708
88. Individual laptops for students have made a positive difference in students' quality of assignments they turn in	694	71	1.76	.766
89. Individual laptops for students have made a positive difference in students' depth and breadth of the research they do	697	68	2.01	.809
90. Individual laptops for students have made a positive difference in students' ability to express themselves in writing	701	64	1.92	.913
91. Individual laptops for students have made a positive difference in students' achievement of failing students	677	88	1.66	.852
92. Individual laptops for students have made a positive difference in students' achievement of bilingual students	732	33	2.66	1.135
93. Individual laptops for students have made a positive difference in students' achievement special education/IEP students	718	47	2.24	1.041
94. Individual laptops for students have made a positive difference in students' bridging the achievement gap between lower and higher achieving students	693	72	1.82	.856
95. Individual laptops have made a positive difference in how well students cooperate with each other	700	65	1.76	.761
96. Individual laptops have made a positive difference in the responsibility they feel for their work	671	94	1.55	.725
97. Individual laptops have made a positive difference in their interest in in my class	690	75	1.75	.786
98. Individual laptops have made a positive difference in their behavior	587	178	1.53	.748

99. Individual laptops have made a positive difference in their grades	673	92	1.66	.793
100. Individual laptops have made a positive difference in their attendance	647	118	1.71	1.051
101. Laptops distract students from my direct instruction, they pay less attention	734	31	2.05	.819
102. The education contribution of computer is not worth the time I have to spend troubleshooting batteries, software, application access	627	138	1.51	.804
103. Laptops have given students unrealistic ideas about what learning is about	758	7	2.59	.635
104. Getting students to bring laptops to class is a problem	694	71	1.65	.782
103. The length of time the laptop batteries hold a charge is a problem	662	103	1.79	.853
106. Student compliance with acceptable use policies is not a problem	732	33	2.03	.784
107. Students with more computer knowledge are moving faster than those with less	517	248	1.48	.725
108. There is not enough good software	745	20	1.85	.732
109. Laptops encourage unrealistic expectations for what I have time to do as a teacher	721	44	1.72	.960
110. All textbooks and resources should be available on student laptops	722	43	1.72	.873
111. Permanent LCD projectors in each classroom would encourage more use of laptops for presentation and instruction	730	35	2.25	.767
112. I have had all the professional development I need to use the laptops	677	88	1.56	.712
113. I have had classroom support to implement the skill I learned from professional development	748	17	2.05	.683
114. There is an expectation at my school that I will participate in technology professional development activities	761	4	2.29	.540
115. What kind of professional development suits you best?	765	0	2.30	1.126
116. When I need help, I go to other teachers	765	0	2.33	.557
117. When I need help, I go to the HCPS/Dell helpline	765	0	1.13	.363
118. When I need help, I go to a Instructional Technology Resource Trainer, Technology Trainer	765	0	2.33	.590
119. When I need help, I go to a TST	765	0	2.07	.627
120. When I need help, I go to a student	765	0	1.67	.561
121. When I need help, I go to no one	765	0	1.40	.607
120. I have a website(s) for my class(es)	765	0	1.22	.414
121. I post my class(es)' syllabus online	765	0	1.43	.495
122. How frequently do you post homework assignments on a school or class website?	739	26	2.86	.349
123. How frequently do you post due dates and project dates through a school or class website?	739	26	2.86	.342
124. How frequently do you update your class(es)' website?	739	26	2.87	.341
128. In my classroom I have a reliable internet connection	765	0	1.96	.194
129. In my classroom I have a Smartboard or an interactive white board	765	0	1.07	.252
130. In my classroom I have a digital camera	765	0	1.18	.384
131. In my classroom I have a LCD projector	765	0	1.27	.445
132. How accessible is a reliable internet connection?	765	0	2.92	.314
133. How accessible is a Smartboard or interactive white board?	765	0	1.27	.590
134. How accessible is a digital camera?	765	0	1.93	.738
135 How accessible is a LCD projector?	765	0	2.12	.692
136. In order to display content to the class from a laptop, I have used an LCD projector	765	0	1.67	.472
137. In order to display content to the class from a laptop, I have used an interactive whiteboard	765	0	1.07	.252

138. In order to display content to the class from a laptop, I have used a television	765	0	1.80	.401
Q136_topic	765	0		
Q136_practice	765	0		
Q136_materials	765	0		
Q136_results	765	0		
Q136_grade	765	0	2.15	5.246
Q136_contact	765	0	1.00	.000
Q137_name	765	0		
Q137_description	765	0		
141. I take my laptop home	765	0	2.93	1.138
145. What is your highest degree?	739	26	2.14	.798
146. How many years have you been a teacher?	728	37	12.35	10.263
147. How many years have you been a teacher at HCPS	728	37	8.94	9.170

APPENDIX C: ADMINISTRATOR SURVEY RESULTS

The number “missing” includes those who responded with “Not applicable (N/A)”

For reporting purposes, the means will be rounded to the closes value from the scale students responded with:

1.00-1.49 = No, 1.50-2.00 = Yes

1.00-1.49 = Strongly Disagree, 1.50-2.49 = Disagree, 2.50-3.49 = Agree, 3.50-4.00= Strongly Agree

1.00-1.49 = Never, 1.50-2.49 = Sometimes, 2.50-3.00 = Often

	N		Mean	Std. Deviation
	Valid	Missing		
1. I now use my laptop much more for communicating with teachers	136	3	3.77	.530
2. I now use my laptop much more for communicating with parents	119	20	3.31	.789
3. I now use my laptop much more for communicating with other administrators	134	5	3.75	.541
4. I now use my laptop much more for looking at interim assessments, student attendance, etc.	117	22	3.62	.704
5. I now use my laptop much more for administering the business of the school (scheduling, budgets, personnel, etc.)	123	16	3.65	.614
6. Most teachers in this school are enthusiastic about their laptops	133	6	3.30	.577
7. Most teachers in this school are enthusiastic about the students having laptops	133	6	2.97	.674
8. Most teachers in this school have learned new ways to use laptops during this year	126	13	3.17	.616
9. Some teachers have invented new ways to use laptops during this year	126	13	3.24	.543
10. Many teachers make research assignments that require students to collect data from or study businesses and/or community institutions at least once a week	111	28	2.68	.774
11. Most of my teachers have class websites	108	31	2.86	.690
12. Most of my teachers post class syllabi online	124	15	3.26	.708
13. Most of my teachers post and update assignments for their students online	117	22	3.21	.717
11. 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	125	14	3.28	.691
12. Laptops do not help teachers assess or test students	128	11	1.72	.731
13. Most teachers are using laptops to assess students based on SOL state tests	118	21	3.04	.632
14. Because of assessment data, most teachers have changed the way they group students for instruction	101	38	2.69	.689
15. Most teachers make the most use of their laptops for remediation	112	27	2.63	.686
16. Most teachers make the most use of their laptops for assessment	113	26	2.73	.707
17. Most teachers make the most use of their laptops to present teaching material	124	15	3.20	.611
18. I would like to see a practical way for laptops to work in with the different learning styles in the classes in this school	123	16	3.37	.564
19. Laptops have made small group instruction more feasible	114	25	3.05	.702
20. Student-to-student collaboration has increased with laptops	115	24	3.07	.746
21. When students take assessments online, that saves time	125	14	3.34	.647

22. Online grade reporting saves time	125	14	3.46	.603
25. Laptops have made a positive effect on faculty morale	128	11	2.95	.782
26. My computer is reliable	137	2	3.34	.622
27. My Internet connection is reliable	137	2	3.32	.593
28. I can get help with technology when I need it/within a reasonable amount of time	137	2	3.42	.626
29. I am good at spreadsheets	132	7	3.14	.707
30. I am good at presentation software	131	8	3.31	.689
31. I am good at desktop publishing	130	9	2.96	.791
32. I am good at copying/moving files	135	4	3.56	.527
33. I am good at using an internet search engine	135	4	3.69	.480
34. I am good at creating and maintaining a website	126	13	2.71	.884
35. I am good at using content specific applications/software	121	18	3.40	.640
36. Individual laptops for students have made a positive difference in students' desire to learn	129	10	2.86	.747
37. Individual laptops for students have made a positive difference in students' quality of assignments they turn in	122	17	2.93	.769
38. Individual laptops for students have made a positive difference in students' depth and breadth of the research they do	126	13	2.95	.778
39. Individual laptops for students have made a positive difference in students' ability to express themselves in writing	124	15	2.82	.787
40. Individual laptops for students have made a positive difference in students' achievement of failing students	120	19	2.65	.729
41. Individual laptops for students have made a positive difference in students' achievement of bilingual students	104	35	2.90	.757
42. Individual laptops for students have made a positive difference in students' achievement special education/IEP students	119	20	2.99	.707
43. Individual laptops for students have made a positive difference in students' bridging the achievement gap between lower and higher achieving students	122	17	2.82	.693
44. Individual laptops have made a positive difference in how well students cooperate with each other	122	17	2.67	.797
45. Individual laptops have made a positive difference in the responsibility they feel for their work	123	16	2.59	.818
46. Individual laptops have made a positive difference in their interest in my class	126	13	2.82	.763
47. Individual laptops have made a positive difference in their behavior	126	13	2.29	.760
48. Individual laptops have made a positive difference in their grades	122	17	2.70	.679
49. Individual laptops have made a positive difference in their attendance	110	29	2.25	.696
50. Laptops distract students from my direct instruction, they pay less attention	126	13	2.64	.805
51. The education contribution of computer is not worth the time I have to spend troubleshooting batteries, software, application access	126	13	1.98	.795
52. Laptops have given students unrealistic ideas about what learning is about	130	9	2.24	.766
53. Getting students to bring laptops to class is a problem	120	19	2.90	.653
55. Student compliance with acceptable use policies is not a problem	128	11	2.11	.766
56. Students with more computer knowledge are moving faster than those with less	118	21	2.42	.789
57. There are not enough quality educational software titles available for teachers	129	10	2.21	.767
58. Laptops encourage unrealistic expectations for what I have time to do as a teacher	120	19	2.90	.653
59. All textbooks and resources should be available on student laptops	103	36	2.17	.687
60. Teachers have had all the professional development they need to use the laptops	120	19	2.38	.791

61. Teachers have had classroom support to implement the skills they learned from professional development	129	10	2.99	.870
Q62_topic	139	0		
Q62_grade	139	0		
Q62_practice	139	0		
Q62_materials	139	0		
Q62_results	139	0		
Q62_contact	139	0		
Q63_name	139	0		
Q63_description	139	0		
64. I take my laptop home	137	2	2.57	1.123
65. What is your highest degree?	137	2	2.67	.595
66. How many years have you been a teacher?	136	3	5.51	6.901
67. How many years have you been a teacher at HCPS	136	3	4.68	5.583