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The Elementary Classroom Computer Initiative: Teacher Perceptions of Three Years of Implementation

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THE ELEMENTARY CLASSROOM COMPUTER INITIATIVE: TEACHER PERCEPTIONS OF THREE YEARS OF IMPLEMENTATION

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The Henrico County Computer Initiative and Student Achievement
<u>Executive Summary</u>

Henrico County Public Schools received funding in 1995 to place five computers and an ink jet color printer in each of its regular elementary classrooms first through fifth grade. The goals of the initiative were numerous but focused on: (1) increasing student performance, (2) addressing different learning styles, (3) providing students with daily access to computers, (4) increasing student proficiency with computers, and (5) preparing students for the future. To accomplish these goals, teachers were required to acquire the capacity to integrate computers into their daily classroom lessons and the school division needed to install, maintain the technical hardware and courseware required to support teacher efforts.

The implementation of the Initiative was evaluated in each of the three years since 1995 in order to provide information to the school division for use in planning, work tasks and staff development. Teacher attitudes, ability, and instructional behaviors were sampled as well as their perceptions of student motivation and performance due to the Initiative. Student achievement was not reviewed until the third year of the study. It was, and is, thought that the full impact of the Initiative on student achievement will not achieved until at least the fifth year of the Initiative. During the three years, data were collected through classroom observations, focus group interviews, teacher surveys, software surveys, and standardized test scores.

The evaluations found that the school division had been successful in the implementation of the Initiative and staff reactions were positive to their services. Those reports also indicated that teachers perceived that student learning, student proficiency with computers had been greatly enhanced by the Initiative and thus afforded better preparation for future work plans. Teachers also reported that their ability to use the computers and their instructional styles had been positively impacted by the Initiative. This executive summary provides specific information which describes the benefits students and teachers received from Initiatives.

Student Benefits
<u>Student Achievement</u> The impact of the initiative on student achievement was measured by examining scores on the Literacy Testing Program (LTP) reading, math, and writing of students who were enrolled in Henrico County elementary schools prior to the placement of five computers in their classrooms. The results on the LTP were examined in two ways.

First, the impact of the Initiative was investigated using the 34 elementary schools that received the computers. The LTP test scores of the Before Cohort students were compared with the test scores of the After Cohort following three years of the Initiative. The Before Cohort (4,122 students) was formed from students who had completed the sixth grade without the advantage of the Computer Initiative. The After Cohort (4,328 students) was formed from students who completed the sixth grade with the advantage of the Computer Initiative. Differences in potential ability were controlled by using the Cognitive Aptitude Test scores as a covariant. The results of this examination indicate that following 3 years of the Initiative:

❑ The Literacy Testing Program-reading scores of the student cohorts involved in the Initiative were significantly higher than the student cohorts not involved in the Initiative.

❏ The mean writing and math literacy scores of student cohorts involved in the Initiative were not significantly different than student cohorts not involved in the Initiative.

Second, eight schools were randomly drawn from the 34 elementary schools involved in the Computer Initiative for more in-depth study on the effects of the Initiative. An identical analysis design of Before and After cohorts was utilized. The results of this examination indicates that following 3 years of the Initiative:

❏ The Literacy Testing Program-reading scores of the student cohorts involved in the Initiative were significantly higher than the student cohorts not involved in the Initiative.

❏ The mean writing and math literacy scores of student cohorts involved in the Initiative were not significantly different than student cohorts not involved in the Initiative.

Third schools that experienced "improving," "stable," and "declining" test scores and ascertaining factors associated with that achievement growth were studied. The results of this examination indicate that after 3 years of the Initiative:

❏ School achievement was significantly correlated with the frequency of software used by teachers. In "improving" schools, students completed significantly more booklets using the accelerated reader software than "stable," or "declining" schools.

❏ In "Improving" schools, teachers who perceived that their students' motivation to learn improved also reported that their students used the accelerated reader software significantly more often than teachers who did not perceive improvements in student motivation to learn.

❏ In "Improving" schools, teachers exhibited instructional behaviors more closely related to the "ideal" teacher technology profile.

❏ Administrative support variables were indirectly related to student achievement. Support from the technology technicians was significantly associated with improvements in teacher attitude and teacher instructional behavior. Support from the technology assistant was significantly associated with changes in a teacher's instructional behavior. Support from training programs was significantly associated with teacher ability to integrate technology into their instruction.

These primary findings are supported by secondary information available to the school division. For example, the recent state testing program identified Henrico County students as among the highest performing on writing portions of the examination. It is apparent that improved achievement in writing resulted from a synergistic effect between the use of computers and teacher emphasis on the SOLs.

Furthermore, on surveys, teachers reported that the introduction of five computers into their

classrooms has motivated students to write and to a lesser degree to read, learn and to perform math.

- In year three of the Initiative, fifty-four percent (54%) of the teachers reported that there has been an increase in their students motivation to write. Only four percent (4%) of the teachers disagreed with this assessment.

- Teachers responded to this increased motivation by expecting more from students in terms of correcting and editing their work. Eighty-six percent (86%) reported that they strongly agreed or agreed that the expect more in this regard from their students.

- Seventy-six percent (76%) of the teachers strongly agreed or agreed that there has been an increase in student motivation to read.

Student Behavior. The strongest effect of the Computer Initiative on student behavior has been seen in their ability work cooperatively with other students since the Computer Initiative was introduced. For example, twenty-seven percent (27%) of the year three teachers strongly agreed that students ability to work cooperatively with other students had been improved. This finding compares to twelve percent (12%) of year two teacher perceptions. However, also reported that student discipline had not decreased since the introduction of computers into their classrooms.

Student Performance. Teachers were asked since they have been using computers if high-achieving, average-achieving and low-achieving students had profited. They reported that students in every category had profited from the Initiative. For example,

- Fifty-three percent (53%) of the teachers strongly agree that high-achieving students had profited.

- Forty-six percent (46%) of the teachers strongly agreed that the performance of their average achieving student improved since they have been using computers in their classrooms.

- Forty-one percent (41%) of the teachers strongly agreed that their low achieving student's performance improved

Ninety-one percent (91%) of the year three teachers perceive that their student's research skills have improved since they have used computers in their classrooms. This perception is similar to year two teachers (93%). However overall, they see little improvement in grades, class assignments, completion of homework assignments since the introduction of computers in their classrooms.

Teacher Benefits
Computer Ability. The Computer Initiative has had a dramatic impact on teacher ability to integrate computers into instruction. For example, non-technology using teachers were eliminated after the first year of the initiative. Furthermore,

❑ Fifty six percent (56%) of year 1 teachers reported that they were Beginners (i.e., they can perform basic computer tasks such as word processing quite well although they do not know or utilize the full potential of the program). This percentage declined to twenty-four percent (24%) by year three.

❑ Eleven percent (11%) of year 1 teachers reported that they were Advanced computer users (i.e., they can perform numerous tasks on the computer such as word-processing, graphics, and information management quite well and are familiar with the software's capabilities). This percentage increased to forty-eight percent (48%) in year three.

❑ One percent (1%) of year 1 teachers reported that they were Accomplished computer users (they know a great deal about computer software and hardware and can perform many tasks using a variety of software). This total increased to twenty-seven percent (27%) of the respondents in the third year of the initiative.

These findings lend support to the conclusion that computer ability can be influenced by factors such as training, instruction and administrative support.

Teacher Growth. Most teachers (95%) agree or strongly agree that the Computer Initiative has facilitated their professional growth. And, ninety-nine percent (99%) say that it has made them aware of the creative uses of computers in education.   Additionally, teachers report that they have more than sufficient knowledge to use computers to aid their instruction. For example, seventy-seven percent (77%) of all teachers report that computer knowledge is less than moderately difficult to the least difficult barrier that they face in implementing the Initiative.

However, teachers continue to be less sure of their knowledge of the technical side of the initiative than the instructional side. Forty percent (40%) of them reported that their technical knowledge is the most difficult barrier to implementing the initiative.

Teacher Beliefs and Attitudes. Teacher reaction to computers in their classrooms has been overwhelmingly supportive. They continue to see the computers a very important to their work as a classroom teacher. For example, ninety-seven percent (97%) of all teachers agree or strongly agree that the Initiative is very important to their work as a classroom teacher. Additionally, teachers continue to view the Computer Initiative as worth the cost and time. Ninety-three percent (93%) of all teachers agree or strongly agree that the computers are worth their cost and time. They continue to enjoy working with their students on the computers. Teachers continue to be satisfied with their progress they have made since the Computer Initiative was implemented.

Furthermore, teacher integration of the technology into their instructional strategies seem to be less complicated than in year three than in year two. For example, fewer teachers (20%) in year three perceive that the Computer Initiative requires too much of them than teachers (28%) who reported in year two.

Teacher Instructional Behavior.   The primary curricular objective of teachers is improvement of language arts rather than math, social studies or science. For example, fifty-eight percent (58%) of the teachers responded that improving language arts skills was the primary goal for using

computers in the classroom. In this area, seventy-four percent (74%) indicated that their primary objective was to use computers to improve writing skills and fifty-two (52%) reported using classroom computers to improve reading skills. On the other hand, teachers rank mathematics, social studies and science as moderate instructional objectives for computer use by teachers.

Instructional Goals. Teachers computers in their classrooms to: (1) introduce new concepts by preparing students for instruction on a topic by using an appropriate software package, (2) reinforce the core curriculum by providing students with extra practice on material already learned, (3) extend the core curriculum by providing additional information on a topic, and/or (4) remediate the core curriculum by providing appropriate software for students who need additional help on a topic

Instructional Strategies. Teachers believe they are (1) better able to present more complex material to their students, (2) use less lecture and whole class instruction, and (3) use more small group instructional strategies.

- There is a strong consensus among teachers that the computers have allowed them to create better products such as newsletters. For example, ninety-eight percent (98%) of the teachers strongly agreed or agreed with the statement.

- Teachers at all grade levels indicate that they discuss technology ideas with other teachers. However, teachers in the primary grades engage in more cooperative planning with their colleagues than the upper grades.

School Technology Teaching Culture. Schools were classified as having "strong," "stable," or "weak" cultures to support the implementation of the Computer Initiative. The results of this examination indicate that after 3 years of the Initiative:

- Teachers in schools with a "strong" school teaching culture reported greater changes in teacher instructional behaviors than teachers in "stable" and "weak" school cultures.

- Teachers in schools with a "strong" school teaching culture reported teacher attitude scores that were closer to the "Ideal" profile than teachers in schools with "stable" or "weak" cultures.

- Schools in which teachers attributed significantly greater changes in their instructional behavior to the Initiative also demonstrated greater student growth in student test scores.

THE COMPUTER INITIATIVE:
SUMMARY OF MAJOR FINDINGS FROM THREE YEARS OF IMPLEMENTATION

Students Benefits	Motivation to: (1) write, strongly increased, (2) learn and read, moderately increased, and (3) perform math, increased very little. Student work behavior improved by: (1) ability to work cooperatively, and (2) manage own learning. Work behaviors which remain less improved were: (1) student attention, (2) student teacher rapport, and (3) discipline. Performance (1) of high achieving students strongly increased, (2) of average and low achieving students moderately increased and (3) research skills increased. Performance was unchanged in (1) grades, (2) completed assignments, and (3) homework.
Teacher Benefits	Teacher computer ability dramatically improved since beginning of initiative. Teachers are satisfied with: (1) working with students on computers and (2) increased knowledge about technology, (3) Importance of initiative to teacher work, and (4) progress thus far. Beliefs remain that: (1) school is getting most out of initiative and (2) is worth the cost and time. Computers are primarily used to improve language arts, reading and writing skills. Instructional focus on: (1) challenging high ability students and (2) improving student directed learning rather than remediating deficiencies. Instructional delivery changed by: (1) better able to present more complex material, (2) use a more thematic approach, (3) less lecture and whole class instruction, and (4) more small group instruction. Instructional delivery improved in by: (1) teachers being able to present more complex material and (2) software availability. Teacher work behavior changed by: (1) planning how to integrate computer into subject matter delivery and (2) produce better teacher products.
District Support	Parental support remains assuredly high. Training by : (1) division was adequate, (2) school in-service was inadequate and (3) technology instructor on-site was adequate. Training on: (1) software content adequate and (2) development of materials and classroom management was less adequate. Training on: (1) own time and (2) on software content improved in year two. Instructional support from: (1) colleagues available, (2) computer contact and technology instructor more than adequate, and (3) elementary specialists less adequate. Instructional support from: (1) Technology Committee, (2) school computer contacts, and (3) technology instructors improved in year two. Teachers as a source of support decreased in year two. Administrative support from: (1) principal less adequate and (2) technical assistant adequate. Administrative barriers: Lack of planning time is most difficult barrier to overcome and this barrier increased in year two. Time in the school schedule is also seen as a moderately difficult barrier. Technical problems with (1) network and hardware less than moderately difficult and (2) printers more than moderately difficult.

Submitted by:
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THE ELEMENTARY CLASSROOM COMPUTER INITIATIVE:
TEACHER PERCEPTIONS OF THREE YEARS OF IMPLEMENTATION

Henrico County Public Schools received funding in 1995 to place five computers and an ink jet color printer in each of its regular elementary classrooms first through fifth grade. The goals of the initiative were numerous but focused on: (1) increasing student performance, (2) addressing different learning styles, (3) providing students with daily access to computers, (4) increasing student proficiency with computers, and (5) preparing students for the future.

The Henrico County Computer Initiative has been studied for three years. The results of the first two years were used by the school division to manage the implementation. This third year report of teacher perceptions provides both formative and summative information to the school division. Formatively, the information can be used to continue to improve the use of computers in the elementary schools. Summatively, the information can be used as a report card on how well teachers and students used the computers and how well the school division managed the Initiative.

Focus of the Third Year Report
This report contains (1) formative data for the third year and (2) summative data for teacher perceived changes over the three-years of the implementation of the Computer Initiative. The report is generally arranged around the following three areas of concern.

1. Teacher capacity, curriculum focus, classroom behavior, and work behavior,

2. Student motivation and performance, and

3. Organizational capacity to implement the initiative.

This third year report will be followed by reports on (1) software usage, and (2) student achievement as measure by standardized tests.

Methodology. Thirty-four elementary schools took part in the initiative. A random sample of eight of these thirty-four schools was selected in 1996 for in-depth analysis over three years. In this report, teacher responses from the sample schools are the bases of the results discussed. Sixty-one percent (61%) of the teachers (N=87) of the teachers from first through fifth grade in the schools completed a 113 item survey developed for the project by MERC in conjunction with division personnel. In addition, one hundred percent of the principals (N=8) and computer contacts (N=8) from these schools completed a brief survey assessing their perspective of the initiative.

Table 1 provides a description of the teachers who responded to the third year survey to determine the impact of the Computer Initiative (CI). The description of teachers who completed the survey in 1998 compares favorably with those who completed the survey in 1997 and 1996.

The average teacher responding to the 1998 survey is: (1) a female (93%) Caucasian (82%), (2) an undergraduate education major (77%), and has (3) taught for over fourteen years in a self-contained classroom (46%), (4) a computer at home (74%), (5) used computers in their teaching for three to five years (46%), (6) been self-taught on computer use by attending conferences and workshops on their own time (75%) but also reports to receiving training from other teachers and the districts technology Instructors.

[Table 1 about here]

The average teacher profile may be more useful to readers interpreting the study's findings when the following demographic information is considered.

- Minority teachers are found at all grade levels but are more highly concentrated (25%) at grade three.

- Teachers with liberal arts undergraduates are found at most grade levels but are in the greatest number (11%) at grade three.

- Teachers with psychology undergraduate majors are found at all grade levels but primarily at the grade two (18%) and grade five (14%).

- Experienced teachers, (i.e., those over 10 years experience), are found at all grade levels. The most novice teachers, (i.e., those less than 2 years experience), are found at grade two (23%).

Table 1
Characteristics of Teachers Responding to the Survey by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
1	Gender	M	6%	0%	0%	10%	11%	7%
	M=Male F=Female n=Number Responding	F	94%	100%	100%	90%	89%	93%
2	Ethnic Group	C	82%	82%	84%	75%	83%	93%
	C=Caucasian; AA=African American; O=Other	AA	15%	14%	8%	25%	17%	7%
		O	2%	4%	8%	0%	0%	0%
3	Undergraduate Major Degree	ED	80%	86%	73%	74%	83%	79%||
	ED=Education; LA=Liberal Arts; PY=Psychology; SC=Science O=Other	LA	6%	5%	0%	11%	6%	7%
		PY	8%	5%	18%	5%	6%	14%
		SC	1%	0%	9%	0%	0%	0%
		O	5%	4%	0%	10%	5%	0%
4	Number of Years Teaching	<2	12%	23%	0%	15%	12%	0%
		3-5	15%	4%	18%	15%	11%	36%
		6-9	15%	14%	37%	15%	11%	7%
		10-13	11%	9%	9%	20%	11%	0%
		>14	47%	50%	36%	35%	56%	57%
5	Computer at Home for Personal Use	Y	74%	73%	67%	90%	72%	64%
		N	24%	27%	25%	10%	28%	36%
6	Years Using Computers in Teaching	<2	18%	27%	8%	25%	22%	0%
		3-5	46%	41%	75%	40%	34%	61%
		6-9	22%	23%	0%	30%	22%	31%
		10-13	9%	9%	17%	5%	17%	0%
		14+	2%	0%	0%	0%	6%	8%
9	I am self-taught (e.g. practice on the computer at home	Y	58%	45%	67%	65%	67%	50%
		N	42%	55%	33%	35%	33%	50%
10	I received training from classes, conferences, and workshops on own time	Y	87%	86%	92%	80%	94%	86%
		N	12%	14%	8%	15%	6%	14%
	Total Number of Respondents to each question		87	22	12	20	18	14

* Percentages which do not equal 100% are the result of rounding or missing data

□ The highest number of teachers who have a computer at home are found in grade three (90%). The lowest number of teachers with computers at home are found at grade five (64%).

□ Teachers with the most experience in using computers in their instruction (i.e., over 6 years) are found at grade four (44%). The teachers with least experience in using computers in instruction are found at grade two (17%).

Data Analysis. The survey data were first analyzed through descriptive statistics and displayed in tables for each question at aggregate and grade levels. Then, the responses of teachers in 1998, were compared to 1996 and 1997 survey results to determine if significant changes had occurred from year-one to year-three data by a repeated measures design. Paired t-tests were employed for these analyses. The criteria for selection was $p < .05$.

Finally, a multiple regression was employed to determine predictors of teacher perceptions of their attitudes and instructional behavior, and student motivation and performance. The criteria for selection was $p < .05$. These predictor variables enable administrators and teachers to focus their efforts to continue to improve the implementation of the Initiative. The results of these analyses are found in this report.

FINDINGS

TEACHER CAPACITY TO IMPLEMENT THE COMPUTER INITIATIVE
Teacher capacity refers to the teacher's computer ability, knowledge, skills, dispositions necessary to integrate computers into instruction.

Computer Ability. Computer ability was measured by asking teachers to categorize themselves according to the tasks they were able to perform with computers in their classrooms. Table 2 displays teacher perceptions of their computer ability before the Initiative and after the first, second and third year of the Initiative. The results indicate that the Computer Initiative dramatically improved teachers' ability to integrate computers into their instruction.

[Table 2 about here]

Of those teachers reporting, non technology-using teachers were eliminated after the first year of the initiative. In the second year of the initiative, no teachers described themselves as Novices (i.e., those who can only perform simple tasks on the computer with some difficulty) and only one percent of the year three teachers reported being a novice.

In the first year of the initiative fifty six percent (56%) of the teachers reported that they are still Beginners (i.e., they can perform basic computer tasks such as word processing quite well although they do not know or utilize the full potential of the program). This percentage declined to thirty eight percent (38%) in year two, and twenty-four percent (24%) in year three.

Table 2
Teacher Perceptions of their Computer Ability Before and After the Computer Initiative by Grade Level

Ability Level	Total				Grade Level																			
					1				2				3				4				5			
	YO	Y1	Y2	Y3	YO	Y1	Y2	Y3	Y0	Y1	Y2	Y3	YO	Y1	Y2	Y3	YO	Y1	Y2	Y3	YO	Y1	Y2	Y3
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Non-User	87	6	0	0	88	6	0	0	80	13	0	0	76	5	0	0	95	0	0	0	00	10	0	0
Novice	11	23	0	1	13	16	0	5	13	13	0	0	19	19	0	0	6	32	0	0	0	50	0	0
Beginner	1	56	38	24	0	59	42	18	0	33	46	18	5	76	44	45	0	63	20	17	0	20	43	14
Advanced	0	11	44	48	0	9	42	55	0	40	23	18	0	0	44	45	0	5	65	50	0	10	36	64
Accomplished	1	4	18	27	0	9	15	23	7	0	31	64	0	0	11	10	0	0	15	33	0	10	21	21
Respondents #	98	98	83	85	32	32	26	22	15	15	13	11	21	21	9	20	19	19	29	18	11	10	14	14

Note: Not all item responses will equal 100% due to rounding and/or response errors.
Legend : **Novices** – can perform only simple tasks on the computer with some difficulty. **Beginners** - can perform basic computer tasks (e.g. word processing) quite well, although they might not know or utilize the full potential of the program. **Advanced** - can perform numerous tasks on the computer (e.g. word-processing, graphics, information management etc.) quite well and is familiar with the software's capabilities. **Accomplished** - know a great deal about computer software and hardware, and can perform many tasks using a variety of software.

In the first year of the initiative, eleven percent (11%) of the teachers reported that they were Advanced computer users (meaning that they can perform numerous tasks on the computer such as word-processing, graphics, and information management quite well and are familiar with the software's capabilities). This percentage increased to forty-four percent (44%) in year two and forty-eight percent (48%) in year three.

In the first year of the initiative, one percent (1%) of the teachers reported that they were Accomplished computer users (meaning they know a great deal about computer software and hardware and can perform many tasks using a variety of software). This total increased in the second year to eighteen percent (18%) and twenty-seven percent (27%) of the respondents in the third year of the Initiative. By the third year, teachers in all grades except grade three (where forty-five percent of the teachers still classify themselves as beginners) made impressive increases in their ability to perform many tasks on the computers and use a variety of software.

<u>Predicting Computer Ability</u>: Computer ability was predicted from the teacher background variables each year of the Initiative. However, the predictor variables have changed each year since the Initiative was implemented. For example,

- □ in year one, thirty-four percent (33.5%) of the variance of computer ability was accounted for by item 4 (number of years teaching), item 6 (number of years computer used in teaching), and item 5 (computer at home for professional use).

- □ In year two, item 4 (years teaching), item 1 (gender), and item 6 (number of years using computers in instruction) accounted for fourteen percent (14%) of the variance.

- □ In year three, twelve percent (11.6%) of the variance in teacher reported computer ability was accounted for by two items: item 2 (ethnicity) and item 5 (having a computer at home for professional use).

It appears that experience in using the computer initiative was equalized by school division efforts through staff development activities, and teacher efforts to pursue knowledge. When the effect of teacher experience in using computers in instruction was reduced, the remaining factors predicting computer ability are teacher ethnicity and whether or not they own a computer. It should be noted, however, that these remaining factors: ethnicity and computer at home have been traditionally considered outside the school division's control.

Interestingly though, is the notion that by participating in the Initiative, over a relatively short time, previous computer and teaching experience is leveled and no longer a determining factor in predicting ability to use the computer in the classroom. This finding lends support to a second year conclusion that teacher computer ability can be influenced by factors such as training, instruction and administrative support.

Teacher Growth.
As portrayed in Table 3, most teachers agree or strongly agree that the Computer Initiative has facilitated their professional growth. For example,

- ● Ninety-five (95%) say it has motivated them to grow professionally. And, ninety-nine percent (99%) say that it has made them aware of the creative uses of computers in education. These percentages demonstrate continuous improvements over the life of the initiative.

Teachers continue to report in the Initiative's third year that they have more than sufficient knowledge to implement the Computer Initiative. For example, seventy-seven percent (77%) of all teachers report that computer knowledge was a less than

moderately difficult to the least difficult barrier that they face in implementing the Initiative. Additionally, between thirty-two (32%) and sixty-four percent (64%) of the teachers at each grade level find computer knowledge was the least difficult barrier to implementing the Computer Initiative.

- Ninety-nine percent (90%) of all teachers sampled agree or strongly agree that they have an awareness of the creative uses of computers in education.

- Improvements were recorded at grade three where seventy-four percent (74%) of the third grade teachers reported that their computer knowledge was less than moderately difficult in the third year as compared to 55% in the second year.

- Decreases were recorded at grades four where seventy-eight percent (78%) of the fourth grade teachers reported that their computer knowledge was less than moderately difficult in the third year as compared to 95% in the second year. Division staff should be further investigate these findings to determine their causes (i.e., migration of teachers, new teachers).

[Table 3 about here]

Teachers continue to be less sure of their knowledge of the technical side of the initiative than the instructional side. The total teacher responses are evenly distributed over all response modes, from most difficult to least difficult. However, forty percent (40%) of them reported that their technical knowledge is the most difficult barrier to implementing the initiative. And, approximately fifty percent (50%) of the teachers at each grade level report their lack of technical knowledge makes implementing the Initiative more than moderately difficult.

- First grade teachers are strongest in their understanding of the technical side of the Initiative as seventy-five percent (75%) of them report that the technical aspects of the Initiative is a less than moderately difficult or the least difficult barrier to implementing the Initiative. Sixty-three percent (63%) of teachers in grade three report more difficulty in understanding the technical side of the initiative. They view it as a moderate barrier to effectively implementing the initiative.

Table 3
Teacher Perceptions of their Knowledge, Ability and Skill by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
18	The computer initiative has motivated me to grow professionally as a teacher.	SA	49%	68%	64%	40%	39%	36%
		A	47%	27%	27%	55%	61%	64%
		D	4%	5%	9%	5%	0%	0%
		SD	0%	0%	0%	0%	0%	0%
50	I have an awareness of the creative uses of computers in education.	SA	39%	50%	46%	35%	33%	29%
		A	60%	50%	55%	60%	67%	71%
		D	1%	0%	0%	5%	0%	0%
		SD	0%	0%	0%	0%	0%	0%
102	My knowledge of computers is still too weak to use them effectively.	MD	1%	0%	0%	0%	6%	0%
		MTD	4%	5%	0%	5%	0%	7%
		MoD	18%	15%	9%	21%	17%	29%
		LMD	29%	25%	55%	42%	28%	0%
		LD	48%	55%	36%	32%	50%	64%
107	I don't understand the technical side of the initiative.	MD	26%	20%	36%	30%	19%	31%
		MTD	14%	0%	27%	20%	25%	0%
		MoD	11%	5%	0%	10%	25%	15%
		LMD	20%	30%	18%	20%	19%	8%
		LD	29%	45%	18%	20%	13%	46%
Total Respondents to each Question		n	85	22	11	20	18	14

Note: Not all item responses will equal 100% due to rounding and/or response errors.
RM = Response Mode

Teacher Beliefs and Attitudes. Teacher beliefs and attitudes about using computers in the classroom were assumed to affect the implementation of the Computer Initiative. As the data found in Table 4 displays, teacher reactions to computers in their classrooms has been overwhelmingly supportive. They continue to see the computers a very important to their work as a classroom teacher. For example, ninety-seven percent (97%) of all teachers agree or strongly agree that the Initiative is very important to their work as a classroom teacher. One hundred percent (100%) of the first and fifth grade teachers agree or strongly agree that the Initiative is important to their work as teachers. These results are similar to those reported by teachers in year two of the Initiative. However, just as in year two,

❑ Teachers at grade five reported less agreement that their school is getting the most out to the computers in the classroom. Only seventy-two percent (72%) of year three teachers perceive that they are getting the most out of the computers in contrast to over eighty-percent (80%) of the teachers at other grade levels. However, even at this grade, improvement was seen from the second year study when only fifty seven percent (57%) of the teachers reported that their school is getting the most out of the computers in the classroom.

[Table 4 about here]

Table 4
Teacher Perceptions of their Beliefs and Attitudes Toward using Computers by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
68	Since I have been using computers in my classroom, I enjoy working with my students on the computers.	SA	57%	64%	91%	55%	44%	36%
		A	41%	36%	9%	40%	50%	64%
		D	2%	0%	0%	5%	6%	0%
		SD	0%	0%	0%	0%	0%	0%
69	Since I have been using computers in my classroom, the Computer Initiative has increased my interest in and knowledge about technology.	SA	66%	68%	91%	55%	50%	79%
		A	31%	27%	9%	40%	50%	14%
		D	4%	5%	0%	5%	0%	7%
		SD	0%	0%	0%	0%	0%	0%
70	Since I have been using computers in my classroom, I consider the Computer Initiative as being very important to my work as a classroom teacher.	SA	55%	55%	80%	60%	44%	43%
		A	42%	41%	20%	35%	50%	57%
		D	5%	0%	5%	7%	6%	0%
		SD	0%	0%	0%	0%	0%	0%
71	Since I have been using computers in my classroom, I feel that my school is getting the most out of the computers in the classrooms.	SA	32%	50%	55%	15%	11%	36%
		A	57%	46%	46%	80%	67%	36%
		D	11%	5%	0%	5%	17%	29%
		SD	1%	0%	0%	0%	0%	6%
72	I Since I have been using computers in my classroom, I feel that the computer initiative is worth the cost and time.	SA	49%	64%	73%	40%	39%	36%
		A	44%	27%	27%	45%	56%	64%
		D	6%	9%	0%	10%	6%	0%
		SD	1%	0%	0%	5%	0%	0%
73	Since I have been using computers in my classroom, I am satisfied with the progress I have made since the beginning of the Computer Initiative.	SA	41%	46%	82%	40%%	22%	29%
		A	49%	46%	9%	55%	61%	64%
		D	9%	9%	9%	5%	17%	7%
		SD	0%	0%	0%	0%	0%	0%
74	Since I have been using computers in my classroom, I feel that the Computer Initiative requires too much of me.	SA	6%	14%	9%	0%	0%	7%
		A	14%	14%	9%	20%	11%	14%
		D	63%	57%	36%	70%	72%	71%
		SD	14%	14%	36%	5%	17%	7%
51	I feel that my colleagues are excited about computers in the classroom.	SA	25%	50%	46%	10%	6%	14%
		A	69%	46%	55%	85%	83%	79%
		D	5%	0%	0%	5%	11%	7%
		SD	1%	5%	0%	0%	0%	0%
	Number of Respondents:		85	22	11	20	18	14

Note: Not all item responses will equal 100% due to rounding and/or response errors.

Teachers continue to view the Computer Initiative as worth the cost and time. Ninety-three percent (93%) of all teachers agree or strongly agree that the computers are worth their cost and time. There is complete agreement among teachers at some grade levels. For example, one hundred percent (100%) of second grade and fifth grade teachers agree or strongly agree that the computers are worth the time and expense.

Teachers also continue to enjoy working with their students on the computers. For

example,

- Ninety-one percent (91%) of second grade teachers reported that they enjoy working with their students on the computer. And, sixty-six percent (66%) of all teachers reported being more interested in technology since participating in the Initiative.

Furthermore, teachers continue to be satisfied with their progress they have made since the Computer Initiative was implemented. Overall, this attitude was perceived similarly in the second year of the Initiative.

However, some changing perceptions have been detected in year three of the initiative at some grade levels. For example,

- Fewer teachers at grades four (22%) and five (29%) strongly agree that they are satisfied with their progress than a year ago. In year two, fifty percent (50%) of the teachers at these grades responded that they strongly agreed. On the other hand, eighty-two percent (82%) of the teachers at grade three strongly agree that they are satisfied with their progress compared to forty-two percent (42%) in the previous year.

Teacher integration of the technology into their instructional strategies seems to be less complicated than in year three than in year two. For example, fewer teachers (20%) in year three perceived that the Computer Initiative requires too much of them than teachers (28%) who reported in year two. And, fourteen percent (14%) of the teachers at grade one strongly agreed that the computer initiative required too much of them as compared to less than nine percent (9%) of teachers at other grade levels. This observation by first grade teachers is considerably higher than in year one of the study.

The excitement of having computers in their classrooms is still high (94% of the teachers strongly agree or agree). However, it seems that the intensity of their beliefs have been modified. For example, twenty-five percent of the teachers in year three strongly agree that their colleagues are excited about having computers in their classroom as compared to thirty-three percent (33%) in year two. This change is particularly seen at grades three (10% yr2 teachers strongly agree vs 33% yr3) and four (6% yr2 teachers strongly agree vs 30% yr3).

Significant Changes in Teacher Attitudes. The seven significant changes in teacher attitudes from year one to year three are displayed on Table 5. More teachers in years two and three significantly reported that their interest and knowledge about technology had increased than teachers' in year one of the implementation of the initiative.

[Table 5 about here]

Table 5
Teacher Attitudes that Significantly Changed Over the Three Year Period

Item Year 1	Item Year2	Item Year3	Question	%Year 1	%Year 2	% Year3
68 *** *	67	69	The computer initiative has increased my interest in and knowledge about technology. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=22% A=58% D=12% SD=7%	SA=65% A=33% D=2% SD=0%	SA=66% A=31% D=3% SD=0%
100 *** *	103	102	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that my knowledge of computers is still to weak to use them effectively. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 8% MMD=47% MoD= 39% LMD=5% LD=0%	MD= 2% MMD=6% MoD= 13% LMD=22% LD=57%	MD= 1% MMD=4% MoD= 18% LMD=29% LD=48%
104 *** *	107	106	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that I don't understand the technical side of the initiative. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 4% MMD=40% MoD= 51% LMD=4% LD=0%	MD= 10% MMD=17% MoD= 25% LMD=28% LD=21%	MD= 26% MMD=14% MoD= 11% LMD=20% LD=29%
67 *** *	66	68	I enjoy working with my students on the computer. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=28% A=59% D=13% SD=0%	SA=57% A=39% D=2% SD=2%	SA=57% A=41% D=2% SD=0%

Note: Not all item responses will equal 100% due to rounding and/or response errors.
Paired t-tests were employed for these analyses. Items presented in the table demonstrated significant changes at $p < .05$.
- * Statistically significant difference between year one and year two findings
- ** Statistically significant difference between year two and year three findings
- *** Statistically significant difference between year one and year three findings
- **** Statistically significant difference found each year

Second, significantly fewer teachers in years two and three perceived that their knowledge was a barrier to using the computers effectively in their classrooms than teachers in year one. In particular, significantly more teachers in year three perceive it's their technical knowledge that is a barrier to effectively using computers in their classroom.

Furthermore, significantly more teachers in years two and three reported that they enjoyed working with their students on the computer than in year one.

Predicting Critical Teacher Attitudes. Positive attitudes toward computers and their integration into instruction was seen as a necessary precondition to positive changes in teacher classroom and work behavior and eventually student motivation to learn and perform. Therefore, administrators and developmental staff must understand those

critical factors which predict positive attitudes toward integrating computers into instruction so they may create strategies to support the development of positive teacher classroom and work behavior.

To assist administrators and staff , the researchers identified six attitudinal items on the survey which they thought were critically related to using computers in instruction. Those survey items which were viewed as CRITICAL to the successful instructional use of computers provided by the Initiative were: (1) enjoyment of working with students on computers, (2) importance of the initiative to their work; and feelings of accomplishment (3) increased knowledge and interest, (4) getting the most out of the computers, (5) satisfaction with their progress and (6) that the initiative was worth the cost and time.

Then, an ideal score was created for Teacher Attitude by assuming that each time a teacher strongly agreed with the six critical attitudinal questions they possessed an IDEAL Attitude to integrate computers into their instruction and to implement the Initiative. The further a teacher's score was from the IDEAL the less positive attitudes they possessed toward integration and implementation. Subsequently, a multiple regression was employed to determine which items on the survey predicted the critical TEACHER ATTITUDE profile. The results of these analyses for years two and three are found in Table 6.

[Table 6 about here]

The analyses indicate that over time predictors of teacher attitudinal change. The predictor factors for year one dealt primarily with teachers themselves, their instructional behaviors and how parents perceived computers being used in classrooms. In year two, the predictors changed to whether they believed students profited from their use of computers and how well they were able to integrate technology into their instruction. Their attitudes were also influenced by the amount of planning time that they had to integrate technology into their instruction. The one constant predictor was administrative support. When its present, teacher attitudes are more positive.

Table 6
The Critical Factors which Predict the Ideal Teacher Attitude

Teacher Attitude	Survey Items Selected	
Profile (Composite) Ideal Score = 6	Q68 I enjoy working with my students on the computer. Q69 The Computer Initiative has increased my interest in and knowledge about technology. Q70 I consider the Computer Initiative as being very important to my work as a classroom teacher. Q71 I feel that my school is getting the most out of the computers in the classrooms. Q72 I feel that the computer initiative is worth the cost and time. Q73 I am satisfied with the progress I have made since the beginning of the Computer Initiative.	
Critical Factors (Items that predict the profile)	**Year 2 Results** 82% of the variance explained by: Q16 The Computer Initiative has motivated me to grow professionally as a teacher. Q82 I feel I have adequate support from administration Q71 I am satisfied with the progress I have made since the beginning of Computer Initiative. Q8 The grade level taught by the teacher. Q31 How the teacher uses computers in class. (I.e., Text processing, instructional software, analytical program, games, variety of software.) Q83 My perception is that parents are supportive of computers in the classroom. Q58 Trying out new techniques in instruction is needed for optimizing student learning. Q53 I spend less time with the whole class practicing or reviewing material. Q88 Student attention has improved since the introduction of the Computer Initiative.	**Year 3 Results** 80% of the variance explained by: Q80 As I plan for the subject matter to be presented in a lesson, I also plan how technology can be used to implement the unit. Q90 My average achieving students have profited from initiative. Q67 I have good support from the administration. Q78 The computers have allowed me to better produce products such as newsletters. Q112 Not enough planning time. Q40 Use the computer for understanding science. Q93 Students have improved their research skills. Q98 Students have improved in their ability to work cooperatively with other students since the computer initiative was introduced.

Note1. Strong agreement with each statement is assumed to represent positive movement toward initiative success. Ideal scores for teacher attitude is 6. For example, if a teacher were to answer items 68-73 with strongly agree, that teacher would have a Critical Factor Score (CFS) of 6 points: a point for each instance of strong agreement. For a teacher who answered in this manner, the difference between the CFS and the Ideal Critical Factor Score (ICFS) for teacher attitude (i.e., 6) would be 0. This score represents a perfect match with the ICFS. A teacher with this profile possesses attitudes believed to be more conducive to computer integration than teachers with larger CFSs.

Note2. A multiple regression was employed for these analysis. The criteria for selection was $p < .05$. The above items account for 80% of the variance in the teacher attitude CFSs in this sample. Survey items used to develop the critical teacher attitude profile were excluded from this analysis. Critical Factors appearing near the top of the listing account for more variance than those at the end of the list. The model/profile was completed when the addition items DID NOT account for any more significant amount of variance or predictability in the Critical Factor Scores for teacher attitude.

TEACHER INSTRUCTIONAL BEHAVIOR

The impact of the Computer Initiative on teaching is described by examining teacher responses to survey items in the following categories: curricular focus, instructional strategies, and teacher work behavior.

Curricular Focus

Curricular focus refers to why, and for what purpose, teachers are using computers in their classrooms. Teacher perceptions of the role of computers in their instruction and information regarding why and how teachers use computers in their classrooms are presented in Table 6.

[Table 7 about here]

As found in years one and two, teachers do not see computers as replacing classroom teachers. Most teachers (58% yr2 and 78% yr3) see the purpose for computers in the classroom as being implementing, which means they view computers as a tool for teaching that enhances instruction. In their eyes, computers will enhance instruction but not drastically change instruction. These feelings are stronger at grades three (90%), four (94%), and five (86%) than first (59%) and second(55%).

Fewer Teachers in yr3 than yr2 (22% yr3 and 42% yr2) reported computers in their classroom are a transforming tool which means that computers will enable them to facilitate learning and lecture less. In their eyes, teachers believe that computers will change the teachers' instructional role and classroom structures and processes. There has been a considerable shift in the way the upper grades view the impact of computers on their instruction in year three. In year three, more teachers at grades one (41%) and grade two (45%) than grades three (10%), four (6%) and five (14%) reported that they believed the potential role for computers was transformational. In year two, the range of teacher responses at each grade level was more level (30% to 50%). Comparing the two years indicates a significant change in teacher perception at the upper grade levels.

Table 7
Teacher Perceptions of the Role of Computers in their Classrooms by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
Q28	I believe that the potential role of computers in the classroom is:	Re	0%	0%	0%	0%	0%	0%
	Re-replacing teachers (lessons and testing), Im-implementing (instruction enhancement), Tr-transforming (facilitate learning).	Im	78%	59%	55%	90%	94%	86%
		Tr	22%	41%	45%	10%	6%	14%
Q53	Since I have been using computers in my classroom, goals for integration of computers into my teaching practices are clearly defined.	SA	32%	41%	55%	35%	11%	21%
		A	57%	50%	36%	60%	78%	50%
	SA-strongly agree; A-agree; D-disagree; SD-strongly disagree	D	11%	9%	9%	5%	11%	21%
		SD	1%	0%	0%	0%	0%	7%
Total Respondents to each Question		N	85	22	11	20	18	14

Note: Not all item responses will equal 100% due to rounding and/or response errors.

Additionally, significantly more teachers in year three view the potential role of computers in the schools as "implementing" meaning that it will not alter instruction very much as described on Table 8. An interpretation of this could be the result that changed teacher behavior becomes the norm over the first two years and at year three it they do not see many more changes being made in the way they deliver instruction.

[Table 8 about here]

Table 8
Significant Changes in Teachers Perceptions of the Role Computers in Their Classrooms from Year One to Year Three of the Computer Initiative

Item Year 1	Item Year2	Item Year3	Question	%Year 1	%Year 2	% Year3
Not Available **	26	28	Which best describes the potential role of computers in classrooms? RT =Replacing teachers; Imp = Implementing; Trans =transforming teaching; DK =no response	Not Available	RT=0% Imp=45% Trans=32% DK=23%	RT=0% Imp=78% Trans=22% DK=0%

Note: Not all item responses will equal 100% due to rounding and/or response errors.
Paired t-tests were employed for these analyses. Items presented in the table demonstrated significant changes at p < .05.
- * Statistically significant difference between year one and year two findings
- ** Statistically significant difference between year two and year three findings
- *** Statistically significant difference between year one and year three findings
- **** Statistically significant difference found each year

Curricular Objectives. Curricular objective refers to the teacher's curricular intent when using computers in their classrooms. They were asked to rank the priority they placed on six areas (language arts skills, writing, reading, math skills and math

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application, social studies and science) in instruction.

Table 9 indicates that in the third year of implementation, the primary curricular objective of teachers is improvement of language arts rather than math, social studies or science. For example,

- Fifty-eight percent (58%) of the teachers reporting responded that improving language arts skills was the primary goal for using computers in the classroom. In this area, seventy-four percent (74%) indicated that their primary objective was to use computers to improve writing skills and fifty-two (52%) reported using classroom computers to improve reading skills.

[Table 9 about here]

These third year findings in language arts are just slightly higher than their responses in at the end of year two on the same items.

On the other hand, teachers rated mathematics skills (54%) and application (57%), social studies (58%) and science (54%) as moderate objectives for computer use. These third year results are similar to year two results. The major shift in responses was found in social studies where forty-eight percent (48%) placed a moderate emphasis in year two as compared to the fifty-eight percent in year three.

Table 9
Teacher Perceptions of their Objectives for Computers Use in their Classrooms by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
Q34	My objective for using computers in my classroom is to improve math skills.	PO	26%	27%	64%	26%	11%	14%
		MO	54%	55%	36%	58%	56%	57%
		LO	18%	18%	0%	16%	22%	29%
		NO	2%	0%	0%	0%	11%	0%
		n	85	22	11	19	18	14
Q35	My objective for using computers in my classroom is learning to apply math skills.	PO	37%	55%	46%	25%	28%	29%
		MO	57%	32%	55%	75%	61%	64%
		LO	7%	14%	0%	0%	11%	7%
		NO	0%	0%	0%	0%	0%	0%
Q36	My objective for using computers in my classroom is to improve language arts skills.	PO	58%	82%	82%	55%	33%	36%
		MO	38%	18%	18%	45%	50%	57%
		LO	5%	0%	0%	0%	17%	7%
		NO	0%	0%	0%	0%	0%	0%
Q37	My objective for using computers in my classroom is to improve reading skills.	PO	52%	77%	64%	40%	33%	43%
		MO	35%	23%	36%	45%	50%	21%
		LO	11%	0%	0%	15%	11%	29%
		NO	2%	0%	0%	0%	0%	0%
Q38	My objective for using computers in my classroom is to improve writing skills.	PO	74%	86%	91%	80%	44%	71%
		MO	24%	9%	0%	20%	56%	29%
		LO	2%	5%	9%	0%	0%	0%
		NO	0%	0%	0%	0%	0%	0%
Q39	My objective for using computers in my classroom is to understand social studies.	PO	14%	18%	27%	15%	6%	7%
		MO	58%	46%	36%	65%	28%	79%
		LO	25%	36%	27%	15%	61%	14%
		NO	2%	0%	9%	5%	5%	0%
Q40	My objective for using computers in my classroom is to understand science.	PO	17%	14%	27%	20%	11%	14%
		MO	54%	50%	36%	65%	56%	57%
		LO	27%	36%	27%	10%	33%	29%
		NO	1%	0%	9%	5%	0%	0%
		n	85	22	11	20	18	14

Note: Not all item responses will equal 100% due to rounding and/or response errors.

Additionally, there have been eleven significant changes in teachers views on the importance of curricular objectives since the first year of the initiative. These changes in teacher perceptions are reported on Table 10.

[Table 10 about here]

Table 10
Significant Changes in Teachers Perceptions of Curricular Objectives for using Computers in Their
Classrooms from Year One to Year Three of the Computer Initiative

Item Year 1	Item Year2	Item Year3	Question	%Year 1	%Year 2	% Year3
39 *** *	34	36	Improving language arts skills is an objective for using the computer in the classroom. SA =Strongly Agree; A =Agree; D =Disagree; SD =Strongly Disagree	SA=28% A=46% D=21% SD=5%	SA=55% A=41% D=2% SD=1%	SA=58% A=38% D=5% · SD=0%
41 *** *	36	38	Improving writing skills is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=39% A=43% D=16% SD=2%	SA=68 % A=32% D=0% SD=0%	SA=74% A=24% D=2% SD=0%
37 *** *	32	34	Mastering math skills is an objective for using the computer in the classroom. SA =Strongly Agree; A =Agree; D =Disagree; SD =Strongly Disagree	SA=10% A= 24% D=66% SD=0%	SA=27% A=57% D=11% SD=6%	SA=26% A=54% D=18% SD=2%
38 ***	33	35	Learning to apply math is an objective for using the computer in the classroom. SA =Strongly Agree; A =Agree; D =Disagree; SD =Strongly Disagree	SA=28% A=45% D=22% SD=5%	SA=30% A=57% D=11% SD=2%	SA=37% A= 57% D=7% SD=0%
43 *** *	38	40	Understanding science is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=8% A=36% D=42% SD=14%	SA=13% A=55% D=27% SD=4% DK=1%	SA=17% A=54% D=27% SD=1%
42 *** *	37	39	Understanding social studies is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=85% A=11% D=2% SD=2%	SA=15% A=48% D=31% SD=7%	SA=14% A=58% D=25% SD=2%

Note: Not all item responses will equal 100% due to rounding and/or response errors.
Paired t-tests were employed for these analyses. Items presented in the table demonstrated significant changes at $p < .05$.
- * Statistically significant difference between year one and year two findings
- ** Statistically significant difference between year two and year three findings
- *** Statistically significant difference between year one and year three findings
- **** Statistically significant difference found each year

When comparing the data it is apparent that teachers are primarily using the computer to improve language arts, reading and writing skills. This increased emphasis began in the second year of the Initiative and continued into year three.

The use of the computer mastering math skills and learning to apply also significantly increased over the three year period of the Initiative. However, intensity of the responses indicates that it is not as an important objective as reading and language arts.

All other curricular areas are moderate objectives. Science as an objective for computer use significantly increased in year two and continues at the same level in year three. Social studies as an objective significantly decreased in the second year of the initiative and continued at the same level in year three.

Instructional Goals. Teachers were also asked to respond to the instructional reasons that they used computers in their classrooms. Teachers were asked if they used computers in their classroom to: (1) introduce new concepts, (2) reinforce the core curriculum by providing students with extra practice on material already learned, (2) extend the core curriculum by providing additional information on a topic, and/or (3) remediate the core curriculum by providing appropriate software for students who need additional help on a topic.

As seen in Table 11, teachers report that reinforcing and extending the core curriculum is a MORE IMPORTANT use of computers in their classrooms than remediating the core curriculum and using computers to introduce new concepts. This finding is consistent with findings from year two.

[Table 11 about here]

❑ Thirty-two percent (32%) indicated that their primary goal is to use computers to extend the core curriculum by providing additional information on a topic.

❑ While forty-one percent (41%) indicated that their primary goal is to use computers to reinforce the core curriculum by providing students with extra practice on material already learned.

❑ Teachers in grades two, three, four, and five place more emphasis on reinforcing the core curriculum. Whereas in grade one reinforcing the core curriculum is a less important goal for many teachers.

Primary grade teachers reported that language arts was their chief overall objective.

However, other curricular areas gain priority in the upper grades. For example,

❑ The level of computer use to improve reading is strong at all grade levels. However, those teachers in the primary grades place a greater priority for its use than in the upper grades.

❑ The level of computer use to improve writing is consistently strong across all grades except fifth. However, its priority is greater in the primary grades. Eighty-six percent (86%) of the teachers in grade one and ninety-one percent (91%) of teachers in grade two and eighty percent (80%) in grade three primarily use computers to improve writing skills.

❑ The level of computer use to improve math is moderately strong at all grade levels. However, it is a more of priority at grade one and two than the upper grades.

Table 11
Teacher Perception of Instructional Goals for the Use of Computers in their Classroom by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
29	My goal for using the computers in my classroom is to introduce new concepts	MI	8%	13%	0%	15%	0%	7%
		PG	11%	9%	18%	15%	12%	0%
	Legend: MI=Most Important Goal; PG=Primary Goal; MG=Moderate Goal; LI=Least Important Goal	MG	42%	55%	27%	45%	29%	43%
		LI	38%	23%	46%	25%	59%	50%
30	Reinforce core curriculum.	MI	41%	27%	46%	45%	44%	50%
		PG	46%	64%	27%	45%	50%	29%
	Legend: MI=Most Important Goal; PG=Primary Goal; MG=Moderate Goal; LI=Least Important Goal	MG	13%	9%	27%	10%	6%	21%
		LI	0%	0%	0%	0%	0%	0%
31	Extend core curriculum	MI	32%	36%	64%	20%	28%	21%
		PG	44%	36%	27%	50%	56%	43%
	Legend: MI=Most Important Goal; PG=Primary Goal; MG=Moderate Goal; LI=Least Important Goal	MG	22%	23%	9%	30%	11%	36%
		LI	2%	5%	0%	0%	6%	0%
32	Remediate core curriculum	MI	9%	14%	0%	10%	11%	7%
		PG	28%	9%	27%	45%	22%	43%
	Legend: MI=Most Important Goal; PG=Primary Goal; MG=Moderate Goal; LI=Least Important Goal	MG	37%	46%	36%	20%	50%	29%
		LI	26%	32%	36%	25%	17%	21%
	Total Number of Respondents		85	22	11	20	18	14

Note: Not all item responses will equal 100% due to rounding and/or response errors.

However, as seen in Table 12, significantly more teachers in year three use the computers in their classroom to reinforce the core curriculum. And, fewer teachers are using the computers in their classroom to extend or remediate the core curriculum. This finding could be interpreted as teachers learn how to integrate technology into their instruction, they don't just send students to work on the computers. One interpretation is that teachers in year three are better able to integrate and use this knowledge to use technology to help deliver the core curricular content.

[Table 12 about here]

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Table 12
Significant Changes in Teachers Perceptions of Instructional Goals for the Use of Computers in their
Classrooms from Year One to Year Three of the Computer Initiative

Item Year 1	Item Year2	Item Year3	Question	%Year 1	%Year 2	% Year3
34 *** *	28	30	I use the computers in the classroom to reinforce the core curriculum. MIG=Most Important Goal; PG=Primary Goal; MG=Moderate Goal; LIG=Least Important Goal	MIG=3% PG=31% MG=43% LIG=23%	MIG=37% PG=39% MG=24% LIG=0%	MIG=41% PG=46% MG=13% LIG=0%
35 *** **	29	31	My goal for using the computers in the classroom is to extend the core curriculum. MPI= Most important goal; PG= Primary goal; MG= Moderate goal; LIG= Least important Goal.	MIG=56% PG=39% MG=9% LIG=0%	MIG=45% PG=45% MG=9% LIG=1%	MPI=8% PG=11% MG=42% LIG=38%
36 *** *	30	32	I use the computer in the classroom to remediate core curriculum. MIG=Most Important Goal; PG=Primary Goal; MG=Moderate Goal; LIG=Least Important Goal	MIG=41% PG=52% MG=7% LIG=0%	MIG=12% PG=27% MG=29% LIG=33%	MIG=9% PG=28% MG=37% LIG=26%

Note: Not all item responses will equal 100% due to rounding and/or response errors.
Paired t-tests were employed for these analyses. Items presented in the table demonstrated significant changes at $p < .05$.
- * Statistically significant difference between year one and year two findings
- ** Statistically significant difference between year two and year three findings
- *** Statistically significant difference between year one and year three findings
- **** Statistically significant difference found each year

Instructional Objectives. Teachers were also asked to respond to specific
instructional objectives for computer use such as challenging high ability students,
improving higher order thinking skills, problem solving and student directed learning, or
remediating instruction or otherwise motivating student learning. (See Table 13)

In Table 13, teachers report that they
- place a higher priority on motivating student interest in learning (64%),
- using computers to challenge high ability students (55%),
- improving student directed learning, improving problem solving (44%), and
- improving higher order thinking skills (41%),
- than they do on remediating deficiencies (26%) or rewarding students (11%).

[Table 13 about here]

Table 13 also illustrates that while challenging high ability students and emphasizing
problem solving skills remains a high priority with all teachers, remediation is a
moderate objective of all but fourth grade teachers. It is particularly important at the
fifth grade where seventy-one percent (71%) of the teachers reported it as a moderate
objective.

Table 13
Teacher Perception of Instructional Objectives for Using Computers in their Classroom by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
33	In general which description best matches what your students use computers for most in your class? TP=Text Processing tool; IS=Instructional Software; AP=Analytical or Programming tool G=Games; VU=Variety of Uses	TP	12%	27%	9%	5%	0%	14%
		IS	4%	5%	0%	5%	6%	0%
		AP	5%	5%	0%	0%	11%	7%
		G	2%	0%	9%	5%	0%	0%
		VU	78%	64%	82%	85%	83%	79%
		n	85	22	11	20	18	14
41	Motivating Interest PO=Primary Objective. MO=Moderated Objective. LO=Low Objective. NO-Not an Objective	PO	64%	77%	73%	60%	61%	43%
		MO	31%	23%	27%	35%	39%	29%
		LO	6%	0%	0%	5%	0%	29%
		NO	0%	0%	0%	0%	0%	0%
42	Rewarding completed work PO=Primary Objective. MO=Moderated Objective. LO=Low Objective. NO-Not an Objective	PO	11%	14%	9%	5%	11%	14%
		MO	28%	18%	36%	30%	44%	14%
		LO	22%	27%	9%	20%	11%	43%
		NO	37%	41%	36%	45%	28%	29%
43	Challenging high ability students PO=Primary Objective. MO=Moderated Objective. LO=Low Objective. NO-Not an Objective	PO	55%	59%	73%	65%	60%	43%
		MO	37%	36%	9%	25%	39%	50%
		LO	6%	5%	9%	5%	56%	7%
		NO	2%	0%	9%	5%	6%	0%
44	Remediating deficiencies PO=Primary Objective. MO=Moderated Objective. LO=Low Objective. NO-Not an Objective	PO	26%	32%	36%	30%	0%	14%
		MO	59%	55%	46%	50%	17%	71%
		LO	13%	14%	18%	20%	72%	7%
		NO	2%	0%	0%	0%	6%	7%
45	Improving higher order thinking skills PO=Primary Objective. MO=Moderated Objective. LO=Low Objective. NO-Not an Objective	PO	41%	36%	55%	35%	6%	43%
		MO	46%	36%	46%	50%	44%	50%
		LO	13%	27%	0%	15%	50%	7%
		NO	0%	0%	0%	0%	6%	0%
46	Improving problem solving PO=Primary Objective. MO=Moderated Objective. LO=Low Objective. NO-Not an Objective	PO	44%	36%	46%	35%	44%	64%
		MO	48%	50%	46%	55%	50%	36%
		LO	8%	14%	9%	10%	6%	0%
		NO	0%	0%	0%	0%	0%	0%
47	Improving student directed learning PO=Primary Objective. MO=Moderated Objective. LO=Low Objective. NO-Not an Objective	PO	51%	46%	64%	50%	39%	64%
		MO	42%	36%	36%	40%	61%	36%
		LO	7%	18%	0%	10%	0%	0%
		NO	0%	0%	0%	0%	0%	0%
	Total Number of Respondents	N	85	22	11	20	18	14

Note: Not all item responses will equal 100% due to rounding and/or response errors.

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Finally, as students progress from grade one (46%) to grade five (64%) teachers place more emphasis on using computers in their classrooms to improve student directed learning by using software which allows students to explore, discover, and construct their own learning.

The responses on Table 14 indicate that teacher's instructional objectives for computer used changed over the three-year period. The overall pattern was that significant changes in instructional objectives occurred in year two and remained at those levels in year three. For example,

❑ Motivating interest became a more important instructional objective and rewarding completed work became a less important objective.

[Table 14 about here]

❑ Furthermore, the instructional objective of challenging high ability students significantly increased in year two and remained at that level in year three of the initiative.

❑ Remediating deficiencies, although not as strong an objective as challenging high ability students, also significantly increased in year two and remain at that level in year three.

❑ Finally, improving student directed learning also significantly increased in year two and remained at that level in year three.

Table 14
Significant Changes in Teacher Perceptions of Instructional Objectives for Using Computers in their
Classroom from Year one to Year Three

Item Year 1	Item Year2	Item Year3	Question	%Year 1	%Year 2	% Year3
45 *** *	39	41	Motivating interest is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=14% A=46% D=31% SD=9%	SA=62% A=31% D=6% SD=1%	SA=64% A=31% D=6% SD=0%
46 *** *	40	42	Rewarding completed work is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=68% A=27% D=4% SD=1%	SA=16% A=27% D=33% SD=24% DK=1%	SA=11% A=28% D=22% SD=37%
47 *** *	41	43	Challenging high ability students is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=15% A=22% D=35% SD=28%	SA=48% A=37% D=12% SD=2%	SA=55% A=37% D=6% SD=2%
44 *** *	42	44	Remediating deficiencies is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=7% A=37% D=43% SD=13%	SA=28% A=48% D=19% SD=5%	SA=26% A=59% D=13% SD=2%
50 *** *	45	47	Improving student directed learning is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=37% A=46% D=14% SD=3%	SA=57% A=33% D=10% SD=1%	SA=51% A=42% D=7% SD=0%

Note: Not all item responses will equal 100% due to rounding and/or response errors.
Paired t-tests were employed for these analyses. Items presented in the table demonstrated significant changes at p < .05.
- * Statistically significant difference between year one and year two findings
- ** Statistically significant difference between year two and year three findings
- *** Statistically significant difference between year one and year three findings
- **** Statistically significant difference found each year

Instructional Strategies

Instructional strategies refer to the purpose and manner in which teachers use the computers and software provided by the initiative. In particular, the analyses examines the way computers in classrooms have changed teacher classroom behavior. In examining several questions found on Table 15, its easy to detect that teachers continue to believe that the introduction of five computers into their classroom has caused them to change the way they think about and deliver the instructional program to students in three ways. Teachers are better able:

- ❑ To present more complex material to their students.
- ❑ Use less lecture and whole class instruction, and
- ❑ Use more small group instructional strategies.

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Table 15
Teacher Perceptions of How Computers Changed their Classroom Behavior by Grade level in Year Three

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
81	Since I have been using computers in my classroom, the Computer Initiative has changed my approach to classroom management and instruction. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	22%	18%	46%	30%	11%	14%
		A	60%	68%	46%	50%	72%	57%
		D	18%	14%	9%	20%	17%	29%
		SD	1%	0%	0%	0%	0%	0%
52	Since I have been using computers in my classroom, I am encouraged because we try new ways to use computers in teaching. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree*	SA	48%	59%	46%	50%	39%	21%
		A	51%	32%	56%	50%	56%	71%
		D	4%	9%	0%	0%	0%	7%
		SD	1%	0%	0%	0%	6%	0%
60	Since I have been using computers in my classroom, I believe that trying out new techniques in instruction is needed for optimizing student education. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	48%	50%	55%	70%	17%	50%
		A	51%	50%	46%	30%	78%	50%
		D	1%	0%	0%	0%	6%	0%
61	Since I have been using computers in my classroom, I use computers through-out my instruction (e.g., whenever there is appropriate software) . SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	45%	50%	64%	50%	28%	36%
		A	47%	50%	36%	35%	61%	50%
		D	8%	0%	0%	15%	11%	14%
56	Since I have been using computers in my classroom, I am better able to present more complex material to my students. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	14%	27%	27%	10%	0%	7%
		A	64%	36%	64%	85%	72%	64%
		D	19%	36%	9%	0%	28%	14%
		SD	4%	0%	0%	5%	0%	14%
57	Since I have been using computers in my classroom, I utilize a thematic approach across subject areas. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	27%	50%	64%	20%	0%	7%
		A	53%	36%	27%	75%	56%	64%
		D	20%	14%	9%	5%	44%	29%
58	Since I have been using computers in my classroom, I use learning stations in my instruction. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	41%	50%	100%	35%	11%	29%
		A	39%	46%	0%	55%	44%	29%
		D	19%	5%	0%	5%	44%	29%
		SD	1%	0%	0%	5%	0%	43%
54	Since I have been using computers in my classroom, I spend less time lecturing to the entire class (e.g. whole group instruction). SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	22%	18%	27%	25%	17%	29%
		A	42%	46%	46%	60%	39%	14%
		D	29%	32%	18%	15%	44%	36%
		SD	5%	5%	9%	0%	0%	14%
55	Since I have been using computers in my classroom, I spend less time with the whole class practicing or reviewing material SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	14%	18%	0%	20%	11%	14%
		A	45%	41%	46%	50%	50%	36%
		D	37%	36%	46%	30%	39%	36%
		SD	5%	4.5%	9%	0%	0%	14%
49	Since I have been using computers in my classroom, I am more comfortable with small group activities. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	33%	36%	46%	35%	28%	24%
		A	55%	55%	55%	55%	50%	64%
		D	12%	9%	0%	10%	22%	14%
		SD	1%	0%	0%	0%	0%	0%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

Table 15 continued.
Teacher Perceptions of How Computers Changed their Classroom Behavior by Grade level in Year Three

#	Question	R M	Total	Grade Level				
59	Since I have been using computers in my classroom, I use small group activities in my instruction. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	40%	50%	91%	30%	17%	29%
		A	54%	50%	9%	65%	67%	64%
		D	6%	0%	0%	5%	17%	7%
Total Number of Respondents to Each Question		n	85	22	11	20	18	14

Note - when no responses where recorded in the (SD) strongly disagree category, they were not displayed.
Note: Not all item responses will equal 100% due to rounding and/or response errors.

Teachers reported similar results in years two and three. For example,

❑ When the strongly agree category was combined with the agree category seventy-eight percent (78%) of the teachers in year two and year three agree or strongly agree that they are more able to present more complex material to their students.

❑ Forty percent (40%) of the teachers reporting in year two strongly agreed that they are using more small group instruction as compared to forty percent 40% by year three teachers.

There were twelve significant changes in teacher responses from years one to year three as seen on Table 16. For example,

❑ In year one, significantly more teachers perceived that the Initiative caused them to change their approach to classroom management and instruction than teachers in years two and three. Fewer teachers reported in year three strongly agreed (33%) that the introduction of computers changed their classroom management than year two teachers (22%). It seems that once behavior is changed, teachers no longer see the computers as a causative factor in the delivery of instruction and classroom management.

❑ In year one, significantly more teachers believed that the more they were able to integrate technology into the curriculum the more students are able to manage their instruction than in year two or year three.

❑ In year three, significantly fewer teachers reported that they spend less time lecturing to the whole class (whole class instruction than Year two teachers. Similarly, significantly fewer year three teachers reported that they spend less time with the whole class practicing and reviewing material. These findings indicate that as teachers gain more control over their use of technology they may revert to more comfortable teaching strategies, or they perceive that they needed to increase whole class instruction to meet current needs in using the technology.

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Some other shifts also occurred between year two and year three. For example,

- Forty two percent (42%) of year three teachers strongly agreed that they are more likely to use a thematic approach as compared to twenty-seven percent (27%) in year two.

- Twenty-eight percent (28%) of year three teachers strongly agreed that they are more able to present complex material to their students as compared to fourteen percent (14%) in year two.

- Forty percent (40%) of the year three teachers strongly agreed that they are more comfortable with small group activities as compared to thirty three percent (33%) in year two.

Table 16

Teacher Perceptions of How Computers Changed their Classroom Behavior from Year One to Year Three

Item Year 1	Item Year2	Item Year3	Question	%Year 1	%Year 2	%Year3
77 *** *	79	81	The computer initiative has changed my approach to classroom mgmt and instruction. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=55% A=41% D=3% SD=1%	SA=33% A=49% D=16% SD=2%	SA=24% A=60% D=18% SD=0%
78 *** *	80	82	The more I am able to integrate technology into the curriculum the more students are able to manage their own learning. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=36% A=42% D=21% SD=1%	SA=29% A=45% D=23% SD=2%	SA=21% A=52% D=26% SD=0%
57 **	52	54	I spend less time lecturing to the entire class (whole group instruction). SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=22% A=51% D=26% SD=1%	SA=23% A=52% D=25% SD=0%	SA=22% A=42% D=29% SD=5%
58 ** ***	53	55	I spend less time with the whole class practicing or reviewing material SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=19% A=51% D=29% SD=1%	SA=19% A=51% D=29% SD=1%	SA=14% A=45% D=36% SD=5%
60 *** *	55	57	I use a thematic approach across subject areas. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=16% A=34% D=42% SD=8%	**SA=41%** **A=30%** **D=28%** **SD=1%**	**SA=27%** **A=53%** **D=20%** **SD=0%**

Note: Not all item responses will equal 100% due to rounding and/or response errors.
Paired t-tests were employed for these analyses. Items presented in the table demonstrated significant changes at p < .05.
- * Statistically significant difference between year one and year two findings
- ** Statistically significant difference between year two and year three findings
- *** Statistically significant difference between year one and year three findings
- **** Statistically significant difference found each year

Managing Integration. The integration approach used by teachers depends on the teachers beliefs about the role of the computer in instruction and the instructional objectives they attempt to meet through integration. Once these decisions are made, teachers must decide how long students will be allowed to use the computers at one time, how often they use the computers in a day or week, and how they move students in and out of computer time. Student movement or rotation through the different centers is dictated by how teachers choose to distribute computer time. Teachers who manage the integration of computers through the learning stations strategy must decide (1) the number of students using computers, (2) how long they use them, (3) how often they use them, and (4) the manner and methods teachers use to move students in and out of computer time.

Learning stations (centers) describe a method of instruction in which teachers set up computer centers in the class covering either a variety of topics, or aspects of one topic, depending on the instructional model being employed. Stations are where the learning activities are set-up. The activities at the stations may be assigned to students through a: (1) structured timed rotational approach, (2) a structured task rotational approach, or as an (3) unstructured reward approach where students work on editing products at teacher direction. The timed rotational approach fits nicely with the complete integration model where everyone is focusing on math and different aspects of mathematical concepts. This approach requires a lot of planning time. In the other two approaches where students are working on teacher tasks or student tasks most of the class is doing something else. Observations and focus group interviews produced insights into how teachers use these strategies to move students into and out of computer use.

Forty-one percent of the teachers strongly agree that they use the learning stations strategy. The strategy, however, is used by more teachers in grade one and two where fifty (50%) and one-hundred percent (100%) of the teachers respectively strongly agree that they use learning stations in their instruction. The use of this strategy decreases in intensity through the upper elementary grades. These year three findings indicate a stronger use of learning stations at all grade levels than in year two.

❑ Number of Students. Focus group interviews indicate that teachers prefer four students to a computer when using stations. However, they can live with five students to a computer but feel that six students become unmanageable and cooperation among students become burdensome.

❑ Amount of Computer Time. Focus group interview indicate that most of teachers are finding time to get students on the computer at least every day. Teachers become evasive when asked the exact amount of time. Some teachers who seem

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to have the most difficulty adjusting to it seem to say well, I can't do that all the time? But the teacher who excels, has no problem getting her students to use those computers every day. When pressed for answers teachers give general ballpark figures of 15-25 minutes a day, about 1-2 hours a week.

❑ <u>Curricular Materials - Software</u>. The researchers developed a software survey to determine (1) the frequency of use of software programs, (2) the effectiveness - relationship of each program to the instructional curriculum, (3) student interest in the software programs, and (4) support issues regarding the use of various programs. The survey results will be presented in a separate report. It is suggested that those results be reviewed prior to reading the focus group comments collected by the researchers on software for greater understanding. The comments noted below are representative of our conversations with teachers.

Instructional Barriers. Teachers were also asked to identify instructional barriers to implementing the Computer Initiative in their classrooms. As seen in Table 17, time continues to be seen as the most difficult barrier to implementing the Computer Initiative by teachers in year three as it was in years two and one. Teachers were asked about the length of time to plan, to develop lessons and teach with computers. They responded:

❑ Sixty-five percent (65%) of the year three teachers report that planning time is the most difficult barrier to implementing the initiative. Difficulty is reported highest at grades two and three, and least difficult at grade five.

❑ Fifty-six percent (54%) believe that the most difficult hurdle is the time available to develop lessons. In particular, sixty-four percent (64%) of the teachers at the second grade perceive that the planning time available is not sufficient to develop the lessons that integrate computers into instructional routines.

❑ Time in the school schedule is seen as the most difficult barrier to implementing the technology initiative by fifteen percent (15%) of the teachers. However, this barrier seems greater for teachers in grade five (31%) where teachers see the amount of time in the school schedule as the most difficult barrier to implementing the technology initiative.

Teachers were also asked about the amount and appropriateness of the software available to implement the initiative. They perceive that both the availability and appropriateness of the software provided is seen as a less than moderately difficult barrier to implementing the initiative.

❑ Fifty-five percent (55%) of the teachers perceive that the amount of software available is a less than moderately difficult or least difficult barrier to implementing the Initiative. These perceptions are consistent with perceptions in year two (55% year 3 vs 49% year 2).

[Table 17 about here]

❑ Forty-eight percent (48%) of the year three teachers perceive that the appropriateness of the software available is a less than moderately difficult or least difficult barrier to implementing the Initiative. Teachers in year two perceived these the appropriateness of software as somewhat less difficult (48% year 3 vs 59% year 2).

Table 17
Teacher Perceptions of the Instructional Barriers to Implementing the Computer Initiative by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
Q112	Not enough Planning Time is a CURRENT barrier to effectively using the initiative classroom computers: MD=Most Difficult; MTD=More than Moderately Difficult; MD=Moderately Difficult; LMD=Less than Moderately Difficult; LD=Least Difficult	MD	65%	65%	82%	80%	59%	38%
		MMD	17%	10%	9%	10%	24%	38%
		MoD	7%	5%	0%	5%	12%	15%
		LMD	4%	0%	9%	0%	6%	8%
		LD	6%	20%	0%	5%	0%	0%
Q 99	Not enough Time to develop lessons that use computers is a CURRENT barrier to effectively using the initiative classroom Computers: MD=Most Difficult; MTD=More than Moderately Difficult; MD=Moderately Difficult; LMD=Less than Moderately Difficult; LD=Least Difficult	MD	54%	43%	64%	60%	61%	43%
		MMD	25%	29%	18%	25%	17%	36%
		MoD	19%	24%	18%	10%	22%	21%
		LD	2%	5%	0%	5%	0%	0%
Q109	Not Enough Time in the School Schedule for Computer-Based Instruction is a CURRENT barrier to effectively using the initiative Classroom computers: MD=Most Difficult; MTD=More than Moderately Difficult; MD=Moderately Difficult; LMD=Less than Moderately Difficult; LD=Least Difficult.	MD	15%	5%	9%	16%	18%	31%
		MMD	34%	30%	36%	47%	35%	15%
		MoD	21%	30%	9%	11%	24%	31%
		LMD	23%	25%	18%	26%	18%	23%
		LD	8%	10%	27%	0%	6%	0%
Q110	Not enough Software available is a CURRENT barrier to effectively using the initiative classroom computers: MD=Most Difficult; MTD=More than Moderately Difficult; MD=Moderately Difficult; LMD=Less than Moderately Difficult; LD=Least Difficult	MD	6%	5%	9%	0%	6%	15%
		MMD	16%	20%	9%	16%	24%	8%
		MoD	23%	10%	36%	16%	35%	23%
		LMD	35%	40%	18%	47%	29%	31%
		LD	20%	25%	27%	21%	6%	23%
Q103	Lack of Appropriate Software is a CURRENT barrier to effectively using the initiative classroom computers: MD=Most Difficult; MTD=More than Moderately Difficult; MoD=Moderately Difficult; LMD=Less than Moderately Difficult; LD=Least Difficult	MD	10%	10%	9%	5%	11%	14%
		MTD	16%	10%	18%	10%	28%	14%
		MoD	27%	25%	18%	20%	44%	21%
		LMD	20%	30%	27%	15%	6%	29%
		LD	28%	25%	27%	50%	11%	21%
	Total Number of Respondents	n	83	20	11	20	18	14

Note: Not all item responses will equal 100% due to rounding and/or response errors.

Over the three years, teachers perceived different items as hindering their implementation of the Initiative. As seen in Table 18, teacher perceived instructional barriers differed significantly on six items during the three-year period.

[Table 18 about here]

Table 18

Significant Changes in Instructional Barriers to Most Effectively Using the Initiative's Classroom Computers from Year one to Year Three

Yr 1 Item	Yr2 Item	Yr3 Item	Question	Yr1 %	Year2 %	Year 3 %
98 *** *	101	100	**A CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough help for supervising student computer use. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 19% MMD=57% MoD= 22% LMD=2% LD=0%	MD= 17% MMD=27% MoD=33% LMD=17% LD=7%	MD= 19% MMD=39% MoD= 24% LMD=8% LD=10%
101 *	104	103	**A CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is a lack of appropriate software. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 18% MMD=15% MoD= 17% LMD= 29% LD= 21%	MD= 13% MMD=11% MoD= 16% LMD= 27% LD= 33%	MD= 10% MMD=16% MoD= 27% LMD=21% LD= 28%
113 *	111	110	**A CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough software available. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 13% MMD=27% MoD= 36% LMD= 16% LD= 13%	MD= 11% MMD=15% MoD= 25% LMD= 23% LD= 27%	MD= 6% MMD=16% MoD= 23% LMD=35% LD= 20%
114 ***	112	111	**A CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough hardware available. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 39% MMD=24% MoD= 22% LMD= 7% LD= 8%	MD= 7% MMD=11% MoD= 16% LMD= 36% LD= 30%	MD= 4% MMD=14% MoD= 30% LMD=26% LD= 27%
115 *** *	113	112	**A CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough planning time. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 10% MMD=14% MoD= 25% LMD=32% LD=19%	MD= 57% MMD=22% MoD= 15% LMD=6% LD=1%	MD= 65% MMD=17% MoD= 7% LMD=4% LD=6%
97 *	100	99	**A CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough time to develop lessons that use computers. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 40% MMD=28% MoD= 24% LMD= 5% LD= 3%	MD= 55% MMD=30% MoD= 7% LMD= 5% LD= 2%	MD= 54% MMD=25% MoD= 19% LMD=0% LD= 2%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

Paired t-tests were employed for these analyses. Items presented in the table demonstrated significant changes at p < .05.

- * Statistically significant difference between year one and year two findings
- ** Statistically significant difference between year two and year three findings
- *** Statistically significant difference between year one and year three findings
- **** Statistically significant difference found each year

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☐ Significantly fewer teachers perceived the availability of appropriate software as hindering their ability to effectively using the computers in their classrooms in years one and two than in year one.

☐ The most difficult barrier to overcome by teachers to most effectively using the classroom computers is that there is not enough planning time. Significantly more teachers in year two (57%) and three (65%) rated this barrier the most difficult to overcome than teachers in year one. This finding is also related to the fact that each year teachers reported that time to develop lessons that use computers was the most difficulty barrier hindering their implementation of the Initiative. Furthermore, significantly more teachers in year two and three report that lack of time to develop lessons that use computers as the most difficulty barrier or computer instruction is a barrier to using the initiative than in year one.

Teacher Work Behavior
Teachers were asked if the Computer Initiative changed such work behaviors as planning, working with other teachers, managing student information and grades. Table 19 describes those behaviors that changed in the third year of the Initiative.

[Table 19 about here]

● Thirty-nine percent (39%) of the teachers strongly agree that since they have been using computers in their classrooms as they plan for the subject matter to be presented in a lesson, they also plan how computers can be used to implement the unit. This behavior is strong in the primary grades but less evident in grades four. This finding should continue to be monitored, particularly at the fourth grade, since year three behaviors demonstrate some slippage from year two. For example in year two, thirty one percent (31%) strongly agreed they plan for computer integration and six percent (6%) of the fourth grade teachers make this effort as compared to fourteen percent (14%) the previous year.

● Teachers at all grade levels indicate that they discuss technology ideas with other teachers. However, teachers in the primary grades engage in more cooperative planning with their colleagues than the upper grades. While in general, this finding is similar to the finding in year two, the intensity of the responses is diminishing. For example in year two, twenty-seven percent f the teachers responded that they strongly agreed with the statement as compared to seventeen percent in year three. This reduction could be caused by several factors such as strong feeling of loss of planning time or they have less need to cooperate because their skills have improved.

- Year three results indicate that they continue to be a strong consensus among teachers that the computers have allowed them to create better products such as newsletters. Ninety-eight percent (98%) of the teachers responded that they strongly agreed or agreed with the statement.

- A considerable number of teachers disagreed that computers are helpful to them in managing student information (26% in Year 2 vs 32% in Year 3), and managing student grades (49% in Year 2 vs 45% in Year 3).

Table 19
Teacher Perceptions of How Computers Changed Their Work Behavior by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
83	Since I have been using computers in my classroom, I use the Henrico County Teacher Resource Guide for lesson plan ideas. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	28%	36%	18%	40%	17%	21%
		A	58%	55%	55%	50%	72%	57%
		D	13%	9%	18%	10%	11%	21%
		SD	1%	0%	9%	0%	0%	0%
80	Since I have been using computers in my classroom, as I plan for the subject matter to be presented in a lesson, I also plan how technology (e.g., computers) can be used to implement the unit. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	39%	46%	82%	50%	6%	21%
		A	57%	50%	18%	40%	89%	79%
		D	5%	5%	0%	10%	6%	0%
79	Since I have been using computers in my classroom, the Computer Initiative has encouraged me to plan cooperatively with other staff. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	17%	18%	36%	20%	6%	7%
		A	51%	59%	36%	55%	56%	36%
		D	31%	18%	27%	25%	39%	50%
		SD	1%	5%	0%	0%	0%	0%
75	Since I have been using computers in my classroom, I discuss technology ideas, and resources with other teachers. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	35%	46%	64%	30%	22%	21%
		A	61%	46%	36%	65%	78%	79%
		D	4%	9%	0%	5%	0%	0%
		SD	0%	0%	0%	0%	0%	0%
78	Since I have been using computers in my classroom, the computers have allowed me to better produce products such as newsletters. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	61%	64%	64%	75%	39%	64%
		A	37%	36%	27%	25%	61%	29%
		D	2%	0%	9%	0%	0%	7%
		SD	0%	0%	0%	0%	0%	7%
77	Since I have been using computers in my classroom, the computers are helpful to me in managing student information. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	19%	18%	18%	20%	17%	23%
		A	38%	46%	27%	45%	39%	23%
		D	32%	32%	18%	25%	39%	46%
		SD	8%	5%	27%	5%	6%	8%
76	Since I have been using computers in my classroom, the computers are helpful to me in managing grades. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	18%	9%	18%	30%	17%	15%
		A	13%	9%	0%	25%	11%	15%
		D	45%	55%	27%	30%	61%	46%
		SD	17%	18%	36%	10%	0%	0%
	Total Number of Respondents to each Question	n	84	22	11	20	18	13

Note: Not all item responses will equal 100% due to rounding and/or response errors.

Significant changes from year one to year three in teacher work behavior. Teacher responded significantly different on thirteen teacher work behavior items from year one to year three of the Initiative. They are described in Table 20.

[Table 20 about here]

❑ In year three, significantly more teachers reported that they used the Henrico County Teacher Resource guide than Year two teachers. Overall, teachers are less reliant on the Henrico County Teacher Resource Guide for lesson plan ideas. For instance, in the year three, seventy percent (70%) agree or strongly agreed that they use the resource guide for lesson plan ideas as compared to eighty six percent (86%) in the second year of the initiative. However in year three, there has been an increase in the number of teachers who strongly agree that they are using Henrico County Resource Guide for lesson plan ideas (28% year 3 as compared to 15% in year 2).

❑ Significantly more teachers discuss technology ideas and resources with other teachers in year two than in year one. This behavior continued into year three. However, teachers significantly have reduced their planning behavior with other teachers from year one to year two. This behavior continued into year three. This behavior was also impacted by the perception of significantly more teachers in year two and three that there is not enough time to develop lesson plans that use computers and not enough help to supervise student computer use.

❑ Significantly fewer teachers in years two and three believe that the computers have been helpful in managing grades and student information than teachers in year one. However, significantly more teachers in years two and three agreed that the computers have allowed them to produce better products such as newsletters.

Table 20

<u>Instructional Behavior Survey Items on Which Teacher Responses Significantly Differed from Year 1 to Year</u>
<u>3</u>

Item Year1	Item Year2	Item Year3	Question	% Year1	%Year 2	%Year 3
N/A **	81	83	I use the Henrico County Teacher Resource Guide for lesson plan ideas. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	N/A	SA=15% A=54% D=20% SD=11%	SA=28% A=58% D=13% SD=1%
72 *** *	73	75	I discuss technology, ideas, and resources with other teachers. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=28% A=59% D=13% SD=0%	SA=39% A=58% D=4% SD=0%	SA=35% A=61% D=4% SD=0%
75 *** *	77	79	The Computer Initiative has encouraged me to plan cooperatively with other staff. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=37% A=45% D=16% SD=2%	SA=27% A=40% D=34% SD=0%	SA=17% A=51% D=31% SD=1%
97 *	100	99	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough time to develop lessons that use computers. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 40% MMD=28% MoD= 24% LMD= 5% LD = 3%	MD= 55% MMD=30% MoD= 7% LMD= 5% LD = 2%	MD= 54% MMD=25% MoD= 19% LMD=0% LD = 2%
98 *** *	101	100	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough help for supervising student computer use. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 19% MMD=57% MoD= 22% LMD=2% LD=0%	MD= 17% MMD=27% MoD=33% LMD=17% LD=7%	MD= 19% MMD=39% MoD= 24% LMD=8% LD=10%
73 *** *	74	76	The computers have been helpful to me in managing grades. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=51% A=40% D=8% SD=1%	SA=20% A=11% D=49% SD=21%	SA=18% A=13% D=45% SD=17%
74 *** *	75	77	The computers have been helpful to me in managing student information. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=35% A=39% D=22% SD=2%	SA=19% A=43% D=25% SD=11%	SA=19% A=31% D=32% SD=8%
N/A **	76	78	The computers have allowed me to produce better products such as newsletters. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	N/A	SA=72% A=24% D=1% SD=2%	SA=61% A=37% D=2% SD=0%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

Paired t-tests were employed for these analyses. Items presented in the table demonstrated significant changes at p < .05.

- * Statistically significant difference between year one and year two findings
- ** Statistically significant difference between year two and year three findings
- *** Statistically significant difference between year one and year three findings
- **** Statistically significant difference found each year

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Critical Teacher Instructional Behaviors. Positive teacher classroom and work behaviors toward integrating computers into instruction was seen as a necessary precondition to successful implementation of the Computer Initiative and eventually to improved student motivation and performance. Therefore, it is thought that administrators and developmental staff must understand the critical factors which predict positive teacher classroom and work behaviors so they may create strategies to support the development of positive teacher classroom and work behavior.

The critical instructional factors were identified by analyzing the items where teachers strongly agreed with the five TEACHER INSTRUCTIONAL BEHAVIORS found in Table 19. First, the research team identified five factors viewed as CRITICAL to the successful instructional use of Initiative computers. The factors identified were:

- preparing to use computers in instruction (i.e., survey items: using the Henrico County Resource Guide and planning with other teachers, planning for computer integration when lesson planning),

- using computers in instruction (i.e., survey items: changing the way they manage their classroom and deliver instruction),

- teacher's attitudes (i.e., survey items: enjoyment of working with students on computers, importance of the initiative to their work)

- teacher's feelings of accomplishment (i.e., survey items: increased knowledge and interest, getting the most out of the computers, and satisfaction with their progress) and

- teacher's beliefs that as they become better a integration of computers their students will be better able to manage their own learning.

Then, an ideal score was created for Teacher Instructional Behavior by assuming that each time a teacher strongly agreed with the five critical behavior questions they possessed the Ideal instructional behavior to integrate computers into their instruction and to implement the Computer Initiative. The further a teacher's score was from the IDEAL the less positive instructional behaviors they possessed toward integration and implementation. Finally, multiple regressions were employed to determine which items on the survey predicted the critical TEACHER INSTRUCTIONAL BEHAVIOR. The results of these analyses are found in Table 21.

The results of the critical factors analyses indicates that discussing technology, ideas, and resources with other teachers is the most powerful predictor of improved teacher classroom and work behavior. It appeared as a predictor in year two and three of the

study. The analyses also indicate that different items are more predictive at different stages of the implementation of the Initiative. In year three, teachers had developed a greater capacity to implement the Computer Initiative. And, the factors that predict improved instructional behaviors indicate that improved teacher capacity is related to behaviors of teachers being pleased with their progress, discussing technology and classroom ideas with their colleagues and receiving support from the principal for these new behaviors. It is also noted that the ability to use the computer to help with grades, which was a low behavior by most other teachers, was a factor that predicts improved instructional behavior.

[Table 21 about here]

Table 21
The Critical Factors which Predict the Ideal Teacher Behavior

Teacher Instructional Behavior	Survey Items Selected	
Profile (Composite) Ideal Score = 5	Q79: The Computer Initiative has encouraged me to plan cooperatively with other staff Q83: I use the Henrico County Teacher Resource Guide for lesson plan ideas Q80: As I plan for the subject matter to be presented in a lesson, I also plan how technology (i.e., computers) can be used to implement the unit Q81: The Computer Initiative has changed my approach to classroom management and instruction. Q82: The more I am able to integrate technology (i.e., computers) into the curriculum, the more students are able to manage their own learning)	
Critical Factors (Items that predict the profile)	Year 2 Results 82% of Variance explained by: Q51: Goals for the integration of computers into my teaching practices are clearly defined. Q93: Students have improved in their completion of class assignments since the Computer Initiative was introduced. Q73: I discuss technology, ideas and resources with other teachers. Q52: I spend less time lecturing to the entire class. Q21: The degree of perceived support from the technology assistant. Q32: The degree to which mastering math skills is an objective of computer use. Q44: The degree to which improving problem solving skills is an objective of computer use. Q14: The training I received this year on content software was adequate. Q107: The degree to which the network being down is a barrier. Q45: The degree to which improving student directed learning is an objective of computer use. Q7: Do you teach a multi-grade class. Q33: The degree to which learning to apply math is an objective of computer use.	Year 3 Results 78% of variance explained by: Q73: I am satisfied with the progress I have made since the beginning of the computer initiative. Q75: I discuss technology, ideas, and resources with other teachers Q96: There is an improved student/teacher rapport since the computer initiative was introduced. Q24: The degree of perceived support from the principal. Q111: Not enough hardware available. Q3: Undergraduate major. Q76: The computers have been helpful to me in managing grades.

Note1. Strong agreement with each statement is assumed to represent positive movement toward initiative success. Ideal scores for teacher behavior is 5. For example, if a teacher were to answer items 79-82 with strongly agree, that teacher would have a critical factor score (CFS) of 5 points, a point for each instance of strong agreement. The difference between the CFS and the ideal critical factor score (ICFS) for teacher behavior (i.e., 5) would be 0 or a perfect match with the ICFS and more conducive to computer integration when compared to their counterparts with larger CFSs.

Note2. A multiple regression was employed for these analyses. The criteria for selection was $p < .05$. The above items account for 78% of the variance in the teacher behavior CFSs in this sample. Survey items used to develop the teacher behavior profile were excluded from this analysis. Generally, items included in the equation earlier account for more variance initially. The model / profile is completed when the addition of further items DO NOT account for any more significant amount of variance or predictability in the critical factor scores for teacher behavior.

IMPACT OF THE COMPUTER INITIATIVE ON STUDENTS

The impact of the Computer Initiative on student motivation and behavior was analyzed through the categories of student motivation to learn, behavior and performance.

Motivation to Learn. Teachers were asked if there had been an increase in their student's motivation to learn, read, write, perform math since the Computer Initiative was introduced. Teachers reported that the introduction of five computers into their classrooms has motivated students to write and to a lesser degree to read, learn and to perform math. Table 22 displays that in year three of the Initiative,

❑ fifty-four percent (54%) of the teachers reported that there has been an increase in their students motivation to write as compared to forty-nine percent (49%) in year two. Only four percent (4%) of the teachers disagreed with this assessment. These finding remained strong across grade levels except grade four.

❑ Teachers responded to this increased motivation by expecting more from students in terms of correcting and editing their work. Eighty-six percent (86%) reported that they strongly agreed or agreed that the expect more in this regard from their students. While this response corresponds favorably with year two data, there have been some dramatic shifts when data is analyzed by grade level. Teachers at grades one and two expect more from their students while the intensity of the responses has decreased at the upper grades. For example, teachers at the grades one (55% year three vs 35% year two) strongly agreed that they expect more from their students in correcting and editing. While teachers in grades three (6% year three vs 33% year two) and grade four (43% year three vs 55% year two) and grade five (32% vs 57%) strongly agreed that they expect more from their students in correcting and editing.

[Table 22 about here]

❑ Seventy-six percent of the teachers strongly agreed or agreed that there has been an increase in student motivation to read. However, the intensity of this finding is weak. Only twenty-four percent (24%) of the teachers strongly agreed that there has been an increase in student motivation to read. However, this assessment was stronger in grades five (43% year three vs 29% year).

❑ Twenty-four percent (34%) of the teachers strongly agreed that since they have been using computers in their classrooms there has been an increase in student motivation to learn. This assessment was stronger in grade one (45%) and grade two (55%) and decreased with each succeeding grade level.

Table 22
Teacher Perception of Student Motivation by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
86	Since I have been using computers in my classroom, there has been an increase in student motivation to Learn since the Computer Initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	34%	45%	55%	35%	22%	14%
		A	56%	41%	36%	60%	72%	71%
		D	8%	14%	9%	5%	6%	7%
		SD	1%	0%	0%	0%	0%	7%
84	Since I have been using computers in my classroom, there has been an increase in student motivation to Read since the Computer Initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	24%	18%	27%	15%	22%	43%
		A	52%	64%	55%	60%	44%	29%
		D	24%	18%	18%	25%	33%	21%
		SD	1%	0%	0%	0%	0%	7%
85	Since I have been using computers in my classroom, there has been an increase in student motivation to Write since the Computer Initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	49%	55%	64%	55%	28%	50%
		A	47%	41%	27%	45%	67%	50%
		D	4%	5%	9%	0%	6%	0%
88	Since I have been using computers in my classroom, there has been an increase in student motivation to perform Math since the Computer Initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	20%	18%	30%	20%	17%	21%
		A	64%	50%	60%	75%	78%	57%
		D	14%	27%	10%	5%	6%	21%
		SD	1%	5%	0%	0%	0%	0%
48	Since I have been using computers in my classroom, I can expect more from my students in terms of their pursuing and editing their work. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	32%	18%	55%	50%	6%	43%
		A	59%	68%	18%	45%	89%	57%
		D	8%	9%	27%	5%	6%	0%
		SD	1%	5%	0%	0%	0%	0%
	Total Number of Respondents	N	84	22	11	20	18	13

Note: Not all item responses will equal 100% due to rounding and/or response errors.

Significant changes between years one and three were recorded on two items on the survey and are displayed in Table 23.

[Table 23 about here]

❑ Significantly more teachers reported that there was an increase in student motivation to write since the Initiative was introduced in years two and three than in year one.

❑ Significantly more teachers reported that there was an increase in student motivation to learn since the Initiative was introduced in years two and three than year one.

Table 23
Teacher Perceptions of How Computers Changed Student Motivation to Learn from Year One to Year Three

Item Year 1	Item Year2	Item Year3	Question	%Year 1	%Year 2	% Year3
82 *** *	86	85	There is an increase in student motivation to write since the initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=26% A=45% D=28% SD=2%	SA=53% A=41% D=4% SD=2%	SA=49% A=47% D=4%
83 *** *	87	86	There is an increase in student motivation to learn since the initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=16% A=46% D=37% SD=1%	SA=24% A=60% D=12% SD=3%	SA=34% A=57% D=8% SD=1%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

Critical Motivational Factors. The researchers assumed that positive student motivation to learn leads to improved implementation of Computer Initiative and student performance. The overall assumption was that positive teacher attitudes would lead to positive teacher classroom behaviors which eventually positively impact student motivation. Therefore, it is necessary for teachers and administrators to understand those factors that predict teacher perceptions of student motivation to learn. With this understanding they can focus their supportive efforts to improve student motivation to learn.

The critical student motivation factors were identified by analyzing the data to identify where teachers strongly agreed with the five STUDENT MOTIVATION TO LEARN behaviors which relate to motivation to learn, write, read, and understand math as well as attention in class. These factors were viewed as CRITICAL to the Initiative's success in motivating students to learn.

An ideal score was created for Student Motivation by assuming that students possessed the ideal motivation to learn each time a teacher strongly agreed with the five critical motivation behaviors. The further a teacher's perception was from the IDEAL the less positive the motivation. Then, a multiple regression was employed to determine which items on the survey predicted the critical STUDENT MOTIVATION TO LEARN behaviors. The results of these analyses are found in Table 24.

[Table 24 about here]

Table 24
The Critical Factors which Predict the Ideal Student Motivation

Student Motivation	Survey Items Selected	
Profile (Composite) Ideal Score = 5	Q84: There is an increase in student motivation to read since the Computer Initiative was introduced. Q85: There is an increase in student motivation to write since the Computer Initiative was introduced. Q86: There is an increase in student motivation to learn since the Computer Initiative was introduced. Q87: Student attention has improved since the introduction of the Computer Initiative. Q88: There is an increase in student motivation to understand math since the Computer Initiative was introduced.	
Critical Factors (Items that predict the profile)	Year 2 Results 83% of Variance explained by: Q80: I am more able to integrate technology into the curriculum. Q98: The grades of my students have improved since the Computer Initiative was introduced. Q82: I feel I have adequate support from administration. Q73 I discuss technology, ideas and resources with other teachers. Q105 The degree to which the need for computers to be repaired frequently is seen as hindering use of computers. Q112: The degree to which the lack of software hinders computer use. Q99: Students have improved their ability to work cooperatively with other students since the Computer Initiative was introduced. Q95: Students have improved in their completion of homework assignments since the Computer Initiative was introduced. Q101: The Degree to which there is not enough help for supervising student learning. Q58: Trying out new techniques in instruction is needed for optimizing student learning. Q66: I enjoy working with my students on the computers. Q34: The degree to which improving language arts skills is an objective of computer use.	Year 3 Results 71% of variance explained by: Q98: Students have improved in their ability to work cooperatively with other students since the Computer Initiative was introduced. Q97: The grades of my students have improved since the Computer Initiative was introduced. Q100: The degree to which there is not enough help for supervising student computer use hinders computer use. Q75: I discuss technology, ideas, and resources with other teachers.

Note1. Strong agreement with each statement is assumed to represent positive movement toward initiative success. Ideal scores for student motivation is 5. For example, if a teacher were to answer items 84-88 with strongly agree, that teacher would have a critical factor score (CFS) of 5 points, a point for each instance of strong agreement. The difference between the CFS and the ideal critical factor score (ICFS) for student motivation (i.e., 5) would be 0 or a perfect match with the ICFS and more conducive to computer integration when compared to their counterparts with larger CFSs.

Note2. A multiple regression was employed for these analyses. The criteria for selection was p < .05. The above items account for 71% of the variance in the student motivation CFSs in this sample. Survey items used to develop the student motivation profile were excluded from this analysis. Generally, items included in the equation earlier account for more variance initially. The model / profile is completed when the addition of further items DO NOT account for any more significant amount of variance or predictability in the critical factor scores for student motivation.

Student Behavior. The effect of the Initiative on student behavior was examined by asking teachers if student attention, teacher/student rapport, student ability to manage their own learning and work cooperatively with other students had improved and classroom discipline problems had decreased since they had been using computers in their classrooms. As displayed in Table 25, teachers reported in year three that since the five computers were introduced into their classrooms student ability to work cooperatively and manage their own instruction has been enhanced. However, they see fewer positive effects of computers on student attention and discipline.

[Table 25 about here]

The strongest effect of the Computer Initiative on student behavior has been seen in their ability work cooperatively with other students since the Computer Initiative was introduced. For example,

❑ Twenty-seven percent (27%) of the year three teachers strongly agreed that students ability to work cooperatively with other students had been improved. This finding compares to twelve percent (12%) of year two teacher perceptions. The finding is also stronger as students progress up the grades. For instance at grade one, twenty-seven percent (27%) of the teachers saw no improvement. While at grades two, three, four and five eleven percent (11%) or less saw no improvement.

❑ Twenty-one percent (21%) of the teachers strongly agree that the more they can integrate technology into their classrooms the more students are able to manage their own learning. This effect is felt more at grade one. However, when those who agree are added to those who strongly agree it remains strong across all grades. These percentages have been depressed by teachers who disagree that relationship between integration and managing learning at grades three and four for the last two years of the initiative. For example in grade three, thirty percent (30%) of the year three teachers disagreed that student ability to manage their instruction had improved as compared to twenty-two percent (22%) of the teachers in year two.

❑ Over seventy-two percent (72%) of the year three teachers agree that student discipline has not decreased since the introduction of computers into their classrooms. This perception is similar to year two teachers.

Table 25
Teacher Perception of Student Behavior by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
87	Since I have been using computers in my classroom, student attention has improved since the Computer Initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	11%	9%	10%	25%	0%	7%
		A	46%	50%	40%	40%	50%	50%
		D	41%	41%	50%	30%	50%	36%
		SD	2%	0%	0%	5%	0%	7%
82	Since I have been using computers in my classroom, the more I am able to integrate technology (e. g., computers) into the curriculum, the more students are able to manage their own learning. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	21%	30%	30%	6%	0%	36%
		A	52%	41%	60%	40%	50%	86%
		D	26%	23%	10%	30%	44%	14%
96	Since I have been using computers in my classroom, there has been an improved student/teacher rapport since the Computer Initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	6%	9%	18%	5%	0%	0%
		A	55%	55%	55%	58%	61%	43%
		D	37%	36%	27%	32%	39%	50%
		SD	1%	0%	0%	5%	0%	0%
98	Since I have been using computers in my classroom, students have improved in their ability to work cooperatively with other students since the Computer Initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	27%	32%	46%	26%	17%	21%
		A	57%	41%	46%	63%	67%	71%
		D	14%	27%	9%	11%	11%	7%
		SD	1%	0%	0%	0%	6%	0%
95	Since I have been using computers in my classroom, discipline problems in my classroom have decreased. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	5%	9%	0%	5%	6%	0%
		A	23%	9%	9%	42%	28%	22%
		D	61%	68%	91%	42%	50%	64%
		SD	11%	14%	0%	11%	17%	7%
Total Number of Respondents to Each Question		n	84	22	10	20	18	14

Note: Not all item responses will equal 100% due to rounding and/or response errors.

Significant changes were recorded on two items over the three-year period as exhibited in Table 26. The most dramatic change was found in teachers' perceptions of the impact of the Initiative to reduce student discipline problems in their classroom. Either the impact wore off in years two and three, or the improvement of student discipline problems perceived in year one remained consistent. A similar effect was noted on the Initiative's ability to improve student/teacher rapport.

[Table 26 about here]

Table 26
Teacher Perceptions of How Computers Changed Student Behavior from Year One to Year Three

Item Year 1	Item Year2	Item Year3	Question	%Year 1	%Year 2	% Year3
93 *** *	96	95	Discipline problems in my classroom have decreased since I began using computers in my teaching. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA 50% A=49% D=1%	SA=6% A=18% D=58% SD=17%	SA=5% A=23% D=61% SD=11%
94 *** *	97	96	There is improved student/teacher rapport since the computer initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=47% A=44% D=7% SD=2%	SA=12% A=33% D=47% SD=7%	SA=6% A=55% D=37% SD=1%
N/A **	99	98	Students have improved in their ability to work cooperatively with other students since the computer initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	N/A	SA=12% A=61% D=22% SD=4%	SA=27% A=57% D=14% SD=1%
84 *** *	88	87	Student attention improved since the initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=26% A=63% D=10% SD=1%	SA=15% A=28% D=52% SD=5%	SA=11% A=46% D=41% SD=2%

Note: Not all item responses will equal 100% due to rounding and/or response errors.
Paired t-tests were employed for these analyses. Items presented in the table demonstrated significant changes at p < .05.
- * Statistically significant difference between year one and year two findings
- ** Statistically significant difference between year two and year three findings
- *** Statistically significant difference between year one and year three findings
- **** Statistically significant difference found each year

On a positive note, the significant changes indicate that the Initiative had a positive effect on student ability to work cooperatively with other students. Teacher responses were high in the second year of the Initiative and significantly improved in year three.

Improvement in student attention in class was harder to maintain. In year one, eighty-nine percent (89%) of the teachers reporting agreed that student attention had improved since the Initiative was introduced. In years two and three significantly less teachers agreed that the Initiative was responsible for improvement in student attention in class.

Student Performance. Teachers were asked if high-achieving, average-achieving and low-achieving students had profited since they have been using computers in the classroom. They reported, just as they did in year two, that students in every category had profited. For example, Table 27 indicates that:

❑ Fifty-three percent (53%) of the teachers strongly agree that high-achieving students had profited. This finding is strong across all grade levels. In fact, no

teacher at grade two, three, four and five reported that their high ability students did not profit from the Initiative. These year three perceptions, while still favorable, are diminished from year two perceptions where sixty-six percent (66%) of the teachers strongly agreed that their high-ability students had profited from the Initiative.

❏ Forty-six percent (46%) of the teachers strongly agreed that the performance of their average achieving student improved since they have been using computers in their classrooms. This finding remains strong across all grades and is consistent with teacher perceptions from the year two study.

❏ Forty-one percent (41%) of the teachers strongly agreed that their low achieving student's performance improved. This finding remains strong in grades one to three but diminishes in grade four (28%) and grade five (21%). These year two findings are similar to perceptions of year two teachers at grades one, three, four and five. However, teachers in grade two (73% year three vs 54% year two) shows the most improvement.

[Table 27 about here]

Teachers in year three reported that research skills have improved. However overall, they see little improvement in grades, class assignments, completion of homework assignments since the introduction of computers in their classrooms.

❏ Ninety-one percent (91%) of the year three teachers perceive that their student's research skills have improved since they have used computers in their classrooms. This perception is similar to year two teachers (93%).

❏ Fifty-three percent (53%) of all teachers agree that grades have not been improved since the computer initiative has been introduced to the classroom. However, fewer teachers hold this perception in year three than in year two (53% year three vs 62% year two).

❏ Eighty percent (80%) of the teachers agree that completion of homework assignments have not improved since they have used computers in their classrooms. This finding stays constant across all grade levels. It is also consistent with year two teacher perceptions(80% year three vs 82% year two).

Table 27
Teacher Perceptions of Impact of Computers on Student Performance by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
				%	%	%	%	%
Q89	My high-achieving students profited from initiative.	SA	53%	59%	73%	50%	39%	50%
		A	46%	36%	27%	50%	61%	50%
		D	1%	5%	0%	0%	0%	0%
Q90	My average achieving students have profited from initiative.	SA	46%	55%	64%	47%	33%	36%
		A	54%	46%	36%	53%	67%	64%
Q91	My low-achieving students have profited from the initiative.	SA	41%	55%	73%	35%	28%	21%
		A	58%	41%	27%	65%	72%	79%
		D	1%	5%	0%	0%	0%	0%
Q97	The grades of my students have improved because technology was introduced	SA	6%	9%	9%	5%	0%	7%
		A	41%	41%	18%	68%	28%	36%
		D	52%	50%	73%	21%	72%	57%
		SD	1%	0%	0%	5%	0%	0%
Q93	Students have improved their research skills.	SA	31%	32%	36%	40%	11%	36%
		A	60%	46%	55%	60%	83%	57%
		D	9%	23%	9%	0%	6%	7%
Q92	Students have improved in completing class assignments.	SA	13%	27%	9%	10%	6%	7%
		A	48%	46%	55%	45%	67%	29%
		D	38%	23%	36%	45%	28%	64%
		SD	1%	5%	0%	0%	0%	0%
Q94	Students have improved in their completion of homework assignments since the computer initiative was introduced	SA	4%	5%	0%	5%	6%	0%
		A	14%	5%	9%	20%	17%	22%
		D	61%	64%	55%	60%	72%	50%
		SD	19%	27%	27%	15%	6%	21%
	Total Number of Respondents to Each Question	n	85	22	11	20	18	14

Note: Not all item responses will equal 100% due to rounding and/or response errors.

The Computer Initiative significantly impacted seven survey items related to student performance according to teacher perceptions. These significant changes are reported below on Table 28.

[Table 28 about here]

Teachers reported that they believe that their high, average and low achieving students profited from the Initiative.

High-achieving students were significantly impacted each of the three years. In comparisons from year one to year two there was significantly more teachers who believed that their high-achieving students than in year one. The comparison from year one to year three remained significant. However, in year three, significantly less teachers strongly agreed that their high-achieving students profited from the Initiative than in year two.

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Table 28
Teacher Perceptions of the Impact of the Computer Initiative on Student Performance from Year One to Year Three

Item Year 1	Item Year2	Item Year3	Question	%Year 1	%Year 2	% Year3
85 ****	90	89	My high achieving students have profited from the initiative. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=17% A=63% D=17% SD=2%	SA=65% A=35% D=0% SD=0%	SA=53% A=46% D=1%
86 *** *	91	90	My average achieving students have profited from the initiative. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=25% A=52% D=21% SD=3%	SA=43% A=55% D=1% SD=0%	SA=46% A=54% D=0% SD=0%
87 *** *	92	91	My low-achieving students have profited from the initiative. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=29% A=47% D=20% SD=4%	SA=45% A=47% D=7% SD=1%	SA=41% A=58% D=1% SD=0%
90 *** *	93	92	Students have improved in completing class assignments. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=27% A=66% D=5% SD=2%	SA=16% A=36% D=46% SD=2%	SA=13% A=48% D=38% SD=1%
91 *** *	95	94	Students have improved in their completion of their homework assignments since the computer initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=55% A=42% D=3% SD=0%	SA=4% A=13% D=70% SD=13%	SA=4% A=14% D=61% SD=19%
54 ***	46	48	Since I have been using computers in the classroom, I can expect more from my students in terms of their pursuing and editing their work. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=47% A=45% D=5% SD=2%	SA=45% A=45% D=11% SD=0%	SA=32% A=59% D=8% SD=1%
96 *** *	98	97	The grades of my students have improved because technology was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=20% A=54% D=24% SD=2%	SA=8% A=27% D=59% SD=4%	SA=6% A=41% D=52% SD=1%

Note: Not all item responses will equal 100% due to rounding and/or response errors.
Paired t-tests were employed for these analyses. Items presented in the table demonstrated significant changes at p < .05.
- * Statistically significant difference between year one and year two findings
- ** Statistically significant difference between year two and year three findings
- *** Statistically significant difference between year one and year three findings
- **** Statistically significant difference found each year

❑ Average-achieving students, on the other hand, were not seen as profiting as much as high-achieving students in the first year. The comparisons from year one to year two and three indicate that significantly more teachers reported that their average-achieving students profited from the Initiative in year two and three than in year one.

❑ Teachers reported on the impact of the Initiative on low-achieving students in a similar way as they did for average-achieving students. Significantly more teachers reported that their low-achieving students profited from the Initiative in year two and

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three than year one.

- ❏ The Initiative has little effect on completion of student assignments in class or at home. Significantly fewer teachers in years two and three believe that student classroom homework assignments improved than teachers in year one.

- ❏ Year one teachers believed that grades of their students improved since the computers were introduced into the classroom. However, significantly fewer teachers believed that the computer had a positive effect on student grades in year two and three. Furthermore, year three data indicates that a rather even split between teachers who believe that student grades have increased and those who don't.

Critical Student Performance Factors. It was assumed that student performance would be influenced positively by teacher attitude, classroom behaviors and student motivation to learn. Therefore, it is felt that teachers and administrators would benefit by understanding factors which predict the critical student performance. With this understanding they can focus their efforts to improve student performance.

The critical factors were identified by analyzing the data to identify where teachers strongly agreed with the ten STUDENT PERFORMANCE behaviors which relate to improvement in learning, class and homework assignments, research skills, grades, as well as student/teacher rapport and discipline. These factors were viewed as CRITICAL factors for improving student performance.

An ideal score was created for Student Performance by assuming that each time a teacher strongly agreed with the ten critical items student performance was positively impacted. The further their score was from the IDEAL the less positive performance. Then a multiple regression was employed to determine which items on the survey predicted the critical STUDENT PERFORMANCE behaviors. The results of these analyses are found in Table 29.

[Table 29 about here]

Table 29
The Critical Factors which Predict the Ideal Student Performance

Student Performance	Survey Items Selected	
Profile (Composite) Ideal Score = 10	Q89: My high-achieving students have profited from the Computer Initiative Q90: My average-achieving students have profited from the Computer Initiative Q92: My low-achieving students have profited from the Computer Initiative Q92: Students have improved in their completion of class assignments since the Computer Initiative was introduced Q93: Students have improved in their research skills since the Computer Initiative was introduced Q94: Students have improved in their completion of homework assignments since the Computer Initiative was introduced Q95: Discipline problems in my classroom have decreased since I began using computers in my teaching Q96: There is an improved student/teacher rapport since the Computer Initiative was introduced Q97: The grades of my students have improved since the Computer Initiative was introduced Q98: Students have improved in their ability to work cooperatively with other students since the Computer Initiative was introduced.	
Critical Factors (Items that predict the profile)	86% of variance explained by: Q88: Student attention has improved since the introduction of the Computer Initiative. Q66: I enjoy working with my students on the computers. Q48: I have an awareness of the creative uses of computers in education. Q44: The degree to which improving problem solving skills is an objective of computer use. Q18: The degree of perceived support of the school computer contact. Q84: I feel like I can ask colleagues without hesitation for help when needed. Q65: My principal provides feedback concerning my efforts to integrate computers into instruction. Q114: The degree to which a lack of building level leadership hinders computer use. Q15: My training on the software to assist with the development of materials and the administration of the classroom meets my needs. Q56: I utilize a thematic approach across subject areas. Q52: I spend less time lecturing to the entire class (e.g., whole group instruction)	85% of variance explained by: Q86: There is an increase in student motivation to learn since the initiative was introduced. Q25: Have received adequate technical support. Q87: Student attention improved since the initiative. Q99: Have time to develop lessons. Q79: The computer initiative has encouraged me to plan cooperatively with other staff. Q80: As I plan for the subject matter to be presented in a lesson, I also plan how to implement the unit. Q71: I feel that my school is getting the most out of the computers in the classroom.

Note1. Strong agreement with each statement is assumed to represent positive movement toward initiative success. Ideal scores for student performance is 10. For example, if a teacher were to answer items 89--98 with ?strongly agree,? that teacher would have a critical factor score (CFS) of 10 points, a point for each instance of strong agreement. The difference between the CFS and the ideal critical factor score (ICFS) for student performance (i.e., 10) would be 0 or a perfect match with the ICFS and more conducive to computer integration when compared to their counterparts with larger CFSs.

Note2. A multiple regression was employed for these analyses. The criteria for selection was $p < .05$. The above items account for 85% of the variance in the teacher behavior CFSs in this sample. Survey items used to develop the student performance profile were excluded from this analysis. Generally, items included in the equation earlier account for more variance initially. The model / profile is completed when the addition of further items DO NOT account for any more significant amount of variance or predictability in the critical factor scores for student performance.

- The most powerful indicator to teachers that student performance is being positively impacted by the Initiative is that student attention has improved. If teachers perceive that student attention is improving they seem to assume that performance is also improving.

- The data also indicates that the more teacher's perceive the computer is able to motivate students to learn, the more they believe that student importance is improved.

- Finally, the data indicate that over time, teachers attribute improved student performance to their own ability to integrate technology into their instructional planning and working with other teachers.

ADMINISTRATIVE SUPPORT FOR THE INITIATIVE

Administrative support refers to the leadership, management structures and processes, personnel, staff development opportunities provided to support the implementation of the computers into the instructional program. Teachers were asked their opinions on the level of support they received to implement the Initiative from other teachers, computer contacts, technology committee representatives, technology instructors, computer instructional assistant, and principals. They were also asked to rate the staff development opportunities they were provided. In the following paragraphs, administrative support is presented under three categories: instructional support, administrative support and the barriers to fully implementing the initiative.

Instructional Support

Instructional support is discussed through the categories of training and support. Training refers to the number, nature and benefit of the staff development opportunities the school division has provided. Support refers to the benefits teachers have received from the provision of services by staff assigned to provide instructional support for the initiative.

Training. Teachers were asked their perception of the adequacy of training provided by the school division and technology instructors to support the implementation of the Initiative. Table 30 displays teachers' responses. In general, ninety-one percent (91%) of the teachers believe the training has adequate. These perceptions are similar across all grade level.

[Table 30 about here]

Table 30
Teacher Perceptions of Instructional Support for the Initiative by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
26	I have received Adequate Instructional Training Support 2% of the total sample did not respond	Yes	91%	95%	100	80%	94%	86%
		No	7%	5%	0%	15%	6%	14%
13	I Benefited greatly from the 2-days of technology training. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	35%	32%	58%	35%	33%	21%
		A	61%	64%	33%	60%	61%	79%
		D	5%	5%	8%	5%	6%	0%
14	I have benefited greatly from the ½ day technology planning session held at my school. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	46%	57%	67%	53%	33%	21%
		A	48%	33%	25%	47%	61%	71%
		D	4%	5%	0%	0%	6%	7%
		SD	2%	5%	8%	0%	0%	0%
15	The courses offered by my school system met my needs. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	44%	55%	42%	37%	50%	29%
		A	53%	41%	42%	63%	50%	71%
		D	4%	5%	17%	0%	0%	0%
16	Technology workshops held at my school met my needs. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	39%	46%	73%	42%	28%	14%
		A	52%	46%	18%	58%	61%	71%
		D	7%	5%	9%	0%	11%	14%
		SD	1%	5%	0%	0%	0%	0%
17	Instruction offered on-site by the technology instructor met my needs.	SA	46%	55%	55%	47%	44%	29%
		A	52%	41%	46%	53%	56%	71%
		D	1%	5%	0%	0%	0%	0%
	Total number of Respondents to Each Question	n	85	22	11	20	18	14

Note: Not all item responses will equal 100% due to rounding and/or response errors.

Division level courses delivered by the technology instructors on-site and the ½ day teacher planning session received the highest ratings. For example, in year three:

❑ Forty-four percent (44%) of the year three teachers strongly agreed that school system courses met their needs. This response compares favorable to year two responses where thirty-five percent of the teachers strongly agreed to the statement.

❑ Forty-six percent (46%) of the year three teachers strongly agreed that courses delivered by the technology instructors on-site. This response compares favorably to year two responses where thirty-five percent (35%) of the teachers strongly agreed to the statement.

❑ Technology workshops, held at the school site, received the lowest ratings. However, these ratings improved markedly in year three. For example, thirty-nine percent (39%) of the year three teachers strongly agreed that workshops held at their school met their needs. This response compares favorably to year two responses where twenty-nine percent (29%) of the teachers strongly agreed to the statement.

Teachers at grade five report the lowest degrees of satisfaction with the training opportunities at the district and school levels. For example,

❑ For district level training, twenty-nine percent (29%) of year three fifth grade teachers strongly agreed that the training met their needs as compare to fourteen percent (14%) in year two.

❑ School level training conducted by the technology instructors was rated at the same level by year two and three teachers. In year three, twenty-nine percent (29%) of the teachers strongly agreed that training by the technology instructors met their needs as compared to twenty-nine percent (29%) of year two teachers.

As seen in Table 31, teacher perceptions changed significantly on six survey items related to the instructional support received to implement the Computer Initiative.

[Table 31 about here]

In general significantly fewer teachers believed they received adequate instructional training in year two when compared to year one teachers. However, a dramatic reversal of perceptions occurred in year three. Significantly more (91% Yes) teachers in year three believed they received adequate instructional training in year three than year two teachers. More specific significant changes occurred over the three year period of the Initiative.

❑ Significantly more teachers reported that they received training through classes, conferences and workshops on their own time in years two and three than in year one.

❑ Significantly less teachers reported that they benefited greatly from the 2 days of training in year two and three than in year one.

❑ Significantly more teachers reported that they benefited greatly from the half day technology planning session held at their school in year three than in year two.

❑ Significantly more teachers in year three perceive the courses offered by their school system as meeting their needs than teachers in year one.

Table 31
<u>Teacher Perceptions of Training Received to Implement the Computer Initiative</u>

Item Year 1	Item Year2	Item Year3	Question	%Year 1	%Year 2	% Year3
30 ** *	24	26	Have you received adequate instructional training support?	Y=68% N=22% DK=10%	Y=40% N=51% DK=9%	Y=91% N=7% DN=2%
10 *** *	10	10	I received computer training at classes, conferences and workshops on my own time.	Yes=75% No=25%	Yes = 0% No = 10%	Yes=87% No=12%
14 *** *	13	13	I benefited greatly from the 2 days of training SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=96% A=4% D=0% SD=0%	SA=36% A=35% D=7% SD=1%	SA=35% A=61% D=5% SD=0%
NA **	63	14	I benefited greatly from the ½ day technology planning session held at my school. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	Not Available	SA= 29% A=57% D=14% SD=0%	SA= 46% A=48% D=4% SD=2%
64 ***	62	15	The courses offered by my school system met my needs. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=37% A=54% D=8% SD=1%	SA=29% A=45% D=3% SD=1%	SA=44% A=53% D=4% SD=0%
65 ** ***	15	16	My training on the software to assist with the development of materials and the administration of the classroom meets my needs. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=19% A =54% D =23% SD=5%	SA=13% A =64% D =21% SD=2%	SA=39% A=52% D=7% SD=1%
99 *** *	102	101	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough training to learn how to fully integrate software. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 60% MMD=39% MoD= 1% LMD=0% LD=0%	MD= 7% MMD=22% MoD= 40% LMD=28% LD=4%	MD= 9% MMD=13% MoD= 27% LMD=35% LD=16%

Note: Not all item responses will equal 100% due to rounding and/or response errors.
Paired t-tests were employed for these analyses. Items presented in the table demonstrated significant changes at p < .05.
- * Statistically significant difference between year one and year two findings
- ** Statistically significant difference between year two and year three findings
- *** Statistically significant difference between year one and year three findings
- **** Statistically significant difference found each year

❑ Training that related to the development of materials and the administration of the classroom were seen as meeting the needs of significantly more teachers in years two and three. Significantly more teachers in year three strongly agree that training on the software to assist with the development of materials and the administration of the classroom than teachers do in years one and two. Additionally, significantly fewer teachers in years two and three perceive that not enough training to learn how to fully integrate software is a barrier to most effectively using computers provided by the initiative. Only nine percent (9%) indicate it is the most difficult

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barrier in year three compared to sixty percent (60%) in year one.

Instructional Support Services. Teachers were asked their satisfaction with the instructional support they received from other teachers, computer contacts, technology specialists and elementary instructional specialists. The results are reported in Table 32. In general, the ratings of other teachers and technology specialists remained stable at a high level in year three. However, the ratings of elementary specialist improved markedly. And, the ratings of computer contacts decreased. In particular,

[Table 32 about here]

❏ Teachers report similarly high levels of satisfaction with the support they received from other teachers. For example, fifty-two percent (52%) of year three teachers rated the support from other teachers as excellent as compared to forty-nine percent (49%) in year two.

❏ Technology specialists received higher ratings in year three than year two (year three 55% rated the support as excellent vs 48% year two).

❏ Elementary instructional specialists received higher ratings in year three than year two (year three 40% rated the support as excellent vs 27% in year two. This perception is held more strongly by grade two teachers where fifty-five percent (55%) of the teachers agreed that the elementary specialist provide integration services.

❏ Computer contacts received lower ratings in year three than year two (year three 43% rated the support as excellent vs 54% year two). This rating year three fluctuated by grade level. For instance, sixty percent (60%) of the teachers at grade three rate the computer contact service as excellent. While thirty-two percent (32%) of the teachers at grade one feel that the computer contact service is excellent.

Nearly all teachers received instruction from other teachers. For instance, ninety-seven percent (97%) of all teachers report that they have received instruction from fellow teachers. Fifty-four percent (54%) believe they can ask for this help without hesitation. Teacher evaluation of support from colleagues, however, is mixed. For instance,

❏ Forty-seven percent (47%) of them strongly agree that their colleagues are a good source of support. And, fifty-two percent (52%) rate their colleagues support as excellent meaning it is proactive and is there when you need it. These ratings tend to hold at the primary grades and decrease in grades four and five.

Table 32

Teacher Perceptions of Instructional Support Received by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
11	I received Instruction from other Teachers	Yes	97%	95%	100%	95%	94%	100%
		No	3%	5%	0%	5%	6%	0%
66	Since I have been using computers in my classroom, I feel like I can ask colleagues without hesitation for help when needed.	SA	54%	55%	73%	45%	56%	50%
		A	44%	45%	27%	55%	33%	50%
	SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	D	2%	0%	0%	0%	11%	0%
63	Since I have been using computers in my classroom, fellow teachers provide a good source of support.	SA	47%	50%	64%	55%	33%	36%
		A	52%	50%	36%	45%	61%	64%
	SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SD	1%	0%	0%	0%	6%	0%
19	The Support I received from Other Teachers (day-to-day) is:	E	52%	50%	55%	65%	50%	36%
	E=Excellent Support (There when you need it/proactive) A=Average Support (There when you ask for it/reactive) LA=Less than Average (Not there when needed or asked) NS=No Support DK=Don't Know	A	46%	45%	45%	35%	44%	64%
		LA	1%	0%	0%	0%	6%	0%
20	The Support I received from the School Computer Contact is:	E	42%	32%	45%	60%	33%	43%
	E=Excellent Support (There when you need it/proactive) A=Average Support (There when you ask for it/reactive) LA=Less than Average (Not there when needed or asked) NS=No Support DK=Don't Know	A	54%	64%	45%	40%	61%	57%
		LA	2%	5%	9%	0%	0%	0%
		NS	1%	0%	0%	0%	6%	0%
62	Since I have been using computers in my classroom, the Elementary Specialists provide support for technology integration and provide suggestions.	SA	40%	45%	55%	40%	28%	38%
		A	52%	41%	36%	60%	67%	54%
		D	6%	9%	9%	0%	6%	8%
	SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SD	1%	5%	0%	0%	0%	0%
12	I received Instruction on-site from Technology Instructor	Yes	99%	100%	100%	95%	100%	100%
		No	1%	0%	0%	5%	0%	0%
22	The Support I received from the Technology Instructor (conducts training, introduces software, helps with technology integration efforts, etc.) is: E=Excellent Support (There when you need it/proactive) A=Average Support (There when you ask for it/reactive) LA=Less than Average (Not there when needed or asked) NS=No Support DK=Don't Know	ES	55%	64%	46%	50%	50%	64%
		AS	40%	32%	46%	45%	44%	36%
		LA	5%	5%	9%	5%	6%	0%
	Total Number of Respondents to Each Question	N	82	26	13	9	20	14

Note: Not all item responses will equal 100% due to rounding and/or response errors.

❑ Teachers in grade two are particularly complementary to the support they receive from their colleagues. Seventy-three percent (73%) of these teachers feel they can request help of other teachers without hesitation. Sixty-four percent (64%) find them a good source of support. And, fifty-nine percent (59%) rate the assistance they receive from colleagues as excellent.

As seen in Table 33, teacher's satisfaction with the instructional support differed significantly on six items during the three-year period.

[Table 33 about here]

❑ Significantly more teachers reported that fellow teachers provided a good source of support in years two and three than in year one. Additionally, significantly more teachers in years two and three rate the support they get from fellow teachers as excellent than in year one. It appears that as teacher capacity to implement the initiative increased, the support they are able to give to each other was more sought out and was more well received.

❑ Significantly more teachers in year three report receiving excellent support from the technology instructor than teachers in years one or two. Additionally, significantly fewer year two teachers believed that instruction offered on-site by technology instructors met their needs than year one teachers. However, in year three a reversal occurred. Significantly more year three teachers believed that instruction offered on-site by the technology instructors met their needs than year two teachers.

❑ The most dramatic increase in instructional support was recorded by teacher perceptions of the support they received from elementary specialists. Significantly more teachers (42%) strongly agreed that the elementary specialists provided support for the integration of technology into instruction than teachers in years one (22%) and year two (27%).

The support that teachers perceived they were getting from principals in year three was greater than the support they received in year two. However, significantly fewer teachers perceived that they were getting excellent support in years two and three. While this support did increase in year three, the increase was not statistically significant. This factor should be monitored yearly since administrative support was found to be a strong predictor of teacher attitudes and classroom behaviors.

Table 33
Instructional Support Survey Items on which Teacher Responses Significantly Differed

Item Year 1	Item Year2	Item Year3	Question	%Year 1	%Year 2	% Year3
62 *** ▪▪▪▪	61	63	Fellow teachers provide a good source of support. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=31% A=35% D=32% SD=2%	SA=39% A=42% D=17% SD=2%	SA=47% A=52% D=0% SD=1%
23 *** *	17	19	I would rate the support received from teachers day-to-day as: ES=Excellent Support; AS=Average support; LAS=Less than average support; NS=No Support; DK=Don't know.	ES=6% AS =54% LAS =33% NS=5% DN=1%	ES=37% AS =36% LAS =4% NS=0% DN=0%	ES=52% AS=46% LAS =1% NS=1%
66 ** *	64	17	Instruction offered on-site by the technology instructor met my needs. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=50% A =37% D =4% SD=1%	SA=35% A =52% D =13% SD=0%	SA=46% A =52% D =1% SD=0%
26 *** *	20	22	I would rate the support received from technology instructor as: ES=Excellent Support; AS=Average support; LAS=Less than average support; NS=No Support; DK=Don't know.	ES=39% AS =37% LAS =8% NS=5% DN=10%	ES=37% AS =36% LAS =3% NS=0% DN=1%	ES=55% AS=40% LAS =5% NS=0%
61 ***	60	62	The elementary specialists provide support for technology integration and provide suggestions. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=22% A=54% D=21% SD=4%	SA=27% A=54% D=18% SD=1%	SA=41% A=52% D=6% SD=1%
28 *** *	22	24	I would rate the support received from the principal as: ES=Excellent Support; AS=Average support; LAS=Less than average support; NS=No Support; DK=Don't know.	ES=41% AS =39% LAS =15% NS=1% DN=4%	ES=17% AS =47% LAS =18% NS=13% DN=5%	ES=21% AS=52% LAS =9% NS=7% DN=10%

Note: Not all item responses will equal 100% due to rounding and/or response errors.
Paired t-tests were employed for these analyses. Items presented in the table demonstrated significant changes at p < .05.
- *Statistically significant difference between year one and year two findings
- ** Statistically significant difference between year two and year three findings
- *** Statistically significant difference between year one and year three findings
- **** Statistically significant difference found each year

Administrative Support.
Administrative support for implementing the initiative was examined by reviewing teacher ratings of administrative services and the administrative barriers they perceive impede the Computer Initiative.

Administrative Services. Teachers were asked to rate the support they received from administrators in general, their principal, and their technology committee representative. Table 34 presents the teachers perceptions of the adequacy of administrative support they are receiving.

[Table 34 about here]

❑ Teachers in year three, perceived that support they received from their representative on the school technology committee excellent (39%) or average (47%). These ratings are similar to those from year two.

Table 34
Teacher Perceptions of Administrative Support for the Initiative by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
22	The Support I received from the Principal is: E=Excellent Support (There when you need it/proactive) A=Average Support (There when you ask for it/reactive) LA=Less than Average (Not there when needed or asked) NS=No Support DK=Don't Know	E	21%	23%	18%	35%	11%	14%
		A	52%	59%	45%	45%	50%	57%
		LA	9%	0%	9%	15%	17%	7%
		NS	7%	9%	0%	5%	6%	14%
		DK	11%	9%	27%	0%	17%	7%
65	Since I have been using computers in my classroom, my principal provides feedback concerning my efforts to integrate computers into instruction. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	24%	32%	27%	25%	17%	15%
		A	50%	41%	55%	60%	56%	38%
		D	19%	23%	9%	5%	22%	38%
		SD	7%	5%	9%	10%	6%	8%
19	The Support I received from the School Technology Committee Representative is: E=Excellent Support (There when you need it/proactive) A=Average Support (There when you ask for it/reactive) LA=Less than Average (Not there when needed or asked) NS=No Support DK=Don't Know	E	39%	41%	36%	40%	39%	36%
		A	47%	45%	55%	50%	33%	57%
		LA	9%	9%	9%	5%	17%	7%
		NS	2%	0%	0%	5%	6%	0%
		DN	2%	5%	0%	0%	6%	0%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

Overall, seventy-three percent of the teachers rate their principal's service as adequate or excellent.

❑ Twenty-one percent (21%) of the teachers see the principal's support as excellent and proactive mean support is there when teachers need it. This rating improved from year two to year three (16% year 2 vs 21% year 3).

❑ Fifty-two percent (53%) of the teachers see the principal support as average and reactive meaning support is there when they ask for it. This rating showed a modest increase in year three (48% year 2 vs 53% year 3).

The nature of principal support which seems to distinguish the service rating in the eyes of the teachers is the provision of feedback by the principal concerning their

efforts to integrate computers into their instruction. For instance,

❑ Seventy-four percent (74%) of all teachers strongly agreed or agreed that their principal provided feedback. A sharp increase in principal feedback was noted in year three compared to year two (74% year 3 vs 63% year 2).

However, where principal support was rated higher, teachers strongly agree that their principal provides feedback. For instance,

❑ In grade one where twenty-three percent (23%) of the teachers rated their principal's support as excellent, eighty-two percent (82% strongly agreed or agreed that their principal provided feedback regarding their efforts to integrate computers into instruction.

❑ A similar finding was noted in grade three. Thirty-five percent (35%) of the teachers rated their principal's support as excellent. And, eighty percent (80%) strongly agreed or agreed that their principal provided feedback regarding their efforts to integrate computers into instruction.

More teachers in 1998 perceive building level leadership as a less difficult barrier to implementing the initiative than teachers reporting in 1997. However, the rate of teachers who perceived building level leadership as the more than moderately difficult remains unchanged. For instance,

● Significantly more teachers in year two (43%) identified the lack of building level leadership as the least difficult barrier to most effectively using the Initiative's classroom computers than teachers in year one (58%).

[Table 35 about here]

❑ Significantly more teachers in year three (58%) identified the lack of building level leadership as the least difficult barrier to most effectively using the Initiative's classroom computers than teachers in year two (43%).

These reported levels of difficulty are seen as a correction of a developing problem discovered in year two of the study. In year two, lack of building leadership was seen as a more difficult barrier to using the Initiative's classroom computers than year one.

Table 35
Administrative Support Survey Items on which teacher responses significantly differed from Year 1 to Year 3

Item Year 1	Item Year2	Item Year3	Question	Year 1	Year 2	Year3
28 *** *	22	24	I would rate the support received from the principal as: ES=Excellent Support; AS=Average support; LAS=Less than average support; NS=No Support; DK=Don't know.	ES=41% AS =39% LAS =15% NS=1% DN=4%	ES=17% AS =47% LAS=18% NS=13% DN=5%	ES=21% AS=52% LAS =9% NS=7% DN=10%
127 ****	114	113	**A CURRENT barrier to most effectively using the Initiative's classroom computers is the lack of building level leadership.** MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 2% MMD=6% MoD= 8% LMD=25% LD=58%	MD= 6% MMD=7% MoD= 22% LMD=22% LD=43%	MD= 5% MMD=4% MoD= 20% LMD=14% LD=58%
112 ***	110	109	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough time in the school schedule for computer based instruction. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 18% MMD=15% MoD= 17% LMD=29% LD=21%	MD= 7% MMD=35% MoD= 22% LMD=17% LD=9%	MD= 15% MMD=34% MoD= 21% LMD=23% LD=8%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

Technical Services. The level of technical services provided by the school division was examined by asking teachers if technical services and the availability and repair of hardware and printers was adequate. Technical barriers such as network being down, computers needing repair and response time for computer repair appear to be moderate or less than moderately difficult barriers for most teachers. But, when they are a problem, the use of technology in classrooms stops. For instance,

❑ Response to computer repair is seen as a CURRENT barrier to effectively using the initiative classroom computers by thirty-one percent (31%) of the year three teachers as compared to twenty-two percent (22%) of year two teachers.

[Table 36 about here]

❑ The network being down too often is seen as a CURRENT barrier to effectively using the initiative classroom computers by thirty-two percent (32%) of the year three teachers as compared to twenty-seven percent (27%) of year two teachers.

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Table 36
Teacher Perceptions of Administrative Barriers to Implementing the Computer Initiative by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
107	The Network being Down too often is a CURRENT barrier to effectively using the initiative classroom computers: MD=Most Difficult; MTD=More than Moderately Difficult; MD=Moderately Difficult; LMD=Less than Moderately Difficult; LD=Least Difficult	MD	8%	5%	9%	16%	0%	8%
		MTD	24%	20%	18%	21%	35%	23%
		MoD	30%	40%	36%	21%	35%	15%
		LMD	25%	25%	9%	21%	24%	46%
		LD	14%	10%	27%	21%	6%	8%
112	Not enough Hardware available is a CURRENT barrier to effectively using the initiative classroom computers: MD=Most Difficult; MTD=More than Moderately Difficult; MD=Moderately Difficult; LMD=Less than Moderately Difficult; LD=Least Difficult	MD	4%	5%	0%	0%	0%	15%
		MTD	14%	20%	18%	10%	12%	8%
		MoD	30%	20%	27%	35%	35%	31%
		LMD	26%	20%	36%	15%	35%	31%
		LD	27%	35%	18%	40%	18%	15%
105	Computers Need to be Repaired is a CURRENT barrier to effectively using the initiative classroom computers: MD=Most Difficult; MTD=More than Moderately Difficult; MD=Moderately Difficult; LMD=Less than Moderately Difficult; LD=Least Difficult	MD	13%	15%	9%	11%	18%	8%
		MTD	21%	35%	18%	16%	6%	31%
		MoD	26%	20%	36%	32%	24%	23%
		LMD	13%	10%	9%	11%	18%	15%
		LD	28%	20%	27%	32%	35%	23%
109	The Response to Computer Repair is too Long is a CURRENT barrier to effectively using the initiative classroom computers: MD=Most Difficult; MTD=More than Moderately Difficult; MD=Moderately Difficult; LMD=Less than Moderately Difficult; LD=Least Difficult	MD	21%	30%	9%	26%	24%	8%
		MTD	10%	10%	9%	5%	18%	8%
		MoD	18%	15%	18%	16%	18%	23%
		LMD	24%	25%	27%	21%	18%	31%
		LD	28%	20%	36%	32%	24%	31%
106	Frequent Problems with Printers is a CURRENT barrier to effectively using the initiative classroom computers: MD=Most Difficult; MTD=More than Moderately Difficult; MD=Moderately Difficult; LMD=Less than Moderately Difficult; LD=Least Difficult	MD	19%	25%	18%	16%	12%	23%
		MTD	11%	15%	18%	11%	6%	8%
		MoD	20%	15%	9%	21%	35%	15%
		LMD	33%	35%	36%	47%	18%	23%
		LD	18%	10%	18%	5%	29%	31%
	Total Number of Respondents to Each Question	**n**	**100**	**22**	**12**	**20**	**18**	**14**

Note: Not all item responses will equal 100% due to rounding and/or response errors.

Over the three-year period, there was a dramatic change in teacher perceptions regarding technical support. For instance,

☐ Significantly more year three teachers believed they had adequate technical support than teachers in years one and two. the greatest improvement in technical services was seen in problems with printers (see Table 37). Eighty-seven percent of teachers in year three believed they received adequate technical services compared to thirty percent (30%) in year-one and thirty-seven percent (37%) in year two.

❑ Significantly fewer year three teachers believed that problems with the printers was the most difficult barrier to using the Initiative's computers. In year two, forty-nine percent (49%) of the teachers perceived that problems with printers was their most difficult or more than moderately difficult barrier to effectively using the initiative classroom computers. In year three, thirty percent (30%) of the teachers perceived problems with the printers in the same way.

Table 37
Technical Support Survey Items on Which Teacher Responses Significantly Differed from Year 1 to Year 3

Item Year 1	Item Year2	Item Year3	Question	Year 1	Year 2	Year3
29 *** ** *	23	25	Have you received adequate technical support?	Y=30% N=31% DN=39%	Y=36% N=57% DN=7%	Y=87% N=13%
105 *** *	108	107	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that the network is down to often. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 9% MMD=55% MoD= 30% LMD=7% LD=0%	MD= 18% MMD=15% MoD= 16% LMD=24% LD=28%	MD= 8% MMD=24% MoD= 30% LMD=25% LD=14%
102 *** *	105	104	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that there are frequent problems with the printers. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 6% MMD=23% MoD= 61% LMD=10% LD=0%	MD= 17% MMD=21% MoD= 28% LMD=23% LD=12%	MD= 19% MMD=11% MoD= 20% LMD=33% LD=18%
106 *** *	109	108	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that the response to computer repair is to long. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 39% MMD=55% MoD= 4% LMD=2% LD=0%	MD= 10% MMD=13% MoD= 23% LMD=27% LD=28%	MD= 21% MMD=10% MoD= 18% LMD=24% LD=28%
103 ***	106	105	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that the computers need repairing too frequently. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 7% MMD=62% MoD= 28% LMD=3% LD=0%	MD= 27% MMD=22% MoD= 27% LMD=10% LD=15%	MD= 13% MMD=21% MoD= 26% LMD=13% LD=28%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

❑ Significantly fewer year three teachers believed that the network being down was a current barrier to using the Initiative's computers. The change began in the second year where fifty-two percent (52%) of the teachers believed that the network being down was a less than moderately difficult problem to implementing the Initiative. This trend continued in year three.

❑ Significantly fewer year three teachers believed that computers need to be repaired too frequently was a current barrier to using the Initiative's computers. Forty-two percent (42%) of year three teachers believed it was less than moderately difficult compared to three percent (3%) in year one. Similarly, Significantly fewer year three teachers perceived that the length of response time to repair the computers was a current barrier to using the Initiative's computers.

❏ Significantly more teachers in year three than in year one report that supply of hardware is not a barrier to using the computers in the classroom.

Parental Support

Parental support for the Initiative has been high throughout the first two years of the Initiative and remains high in year three as judged by teachers (See Table 38). For instance:

[Table 38 about here]

● Ninety-five percent (95%) of the year three teachers at all grade levels agree or strongly agree that parents are supportive of computers in the classrooms. This year three finding compares favorably with the ninety-six percent (96%) of the year two teachers who reported in the same fashion.

Table 38
Teacher Perceptions of Parental Support for the Initiative by Grade Level

#	Question	RM	Total	Grade Level				
				1	2	3	4	5
83	Since I have been using computers in my classroom, my perception is that parents are supportive of computers in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA	42%	45%	73%	45%	17%	43%
		A	53%	50%	27%	45%	83%	50%
		D	5%	5%	0%	10%	0%	7%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

THE COMPUTER INITIATIVE:
A SUMMARY OF THE MAJOR FINDINGS FROM THREE YEARS OF IMPLEMENTATION

The Computer Initiative dramatically improved the ability of Henrico County teachers to use computers in their classrooms. In fact, non technology-using teachers were eliminated after the first year of the initiative. By the third year, close to fifty percent (50%) of the teachers classified themselves as advanced meaning that they can perform numerous tasks on the computer such as word-processing, graphics, and information management quite well and are familiar with the software's capabilities. Another twenty-seven percent (27%) of the third year teachers classified themselves as accomplished computer users meaning they know a great deal about computer software and hardware and can perform many tasks using a variety of software.

By the end of the third year, a full seventy-seven percent (70%) of the Henrico elementary teaching force were capable of infusing technology into their instruction as opposed to twelve percent (12%) of the teaching force before the project began. However, while teacher knowledge of the instructional side of the Initiative greatly improved each year, their knowledge of the technical side of the Initiative is still relatively weak by comparison. Over a relatively short time, previous computer and teaching experience was equalized and no is longer a determining factor in predicting a teacher's ability to use computers in the classroom.

One of the reasons for this dramatic increase in knowledge can be attributed to school division efforts such as training, instructional and administrative support. This strong showing by the school division is supported by the high satisfaction scores teachers gave to the: (1) courses offered by the school system, (2) training on the software which aided them in the development of materials and the administration of their classroom, (3) training support from the technology instructors, elementary supervisors and their fellow teachers, (4) support they received from their principals, and (5) the technical support they received by the district.

The school division overcame first year concerns of forty-nine percent (49%) of the elementary teaching force that there was not enough training to learn how to fully integrate software in their classrooms. At the end of the third year of implementation, only twenty-one percent of the teachers felt that software training was among the most difficult barriers to implementing the Initiative. Plus, ninety one percent (91%) of the teachers believed that they had received adequate instructional training support. Moreover, only five percent (5%) of the teachers reported at the end of the third year that their knowledge of computers was still to weak to use them effectively as compared to fifty-five percent (55%) in year one.

The school division also made strong efforts to overcome technical problems generally associated with the infusion of technology into schools. In fact, by the third year of the Initiative eighty-seven (87%) percent of the teachers reported that they received adequate technical support. Additionally, strong improvements were made by the school division in repairing computers and the problems with printers reported as barriers to most effectively using the Initiative's computers in the first year of the Initiative.

The second reason for the dramatic increase in teacher knowledge can be attributed to teacher efforts to pursue the necessary knowledge and their positive beliefs and attitudes as to the worth of the Initiative. By the end of third year, teacher's increased their satisfaction with: (1) working with students on computers and (2) their increased knowledge about technology, (3) the importance of the Initiative to teacher work, and (4) their progress thus far. For example, ninety-eight percent (98%) of the teachers in third year of the Initiative reported that they enjoy working with their students on the computer as compared to eighty-one percent (81%) of the teachers in the first year. And, ninety-seven percent (97%) reported that the Initiative increased their interest in and knowledge about technology as compared to eighty percent (80%) the first year of the Initiative. At the end of the third year, teachers continued to believe that that: (1) the school division is getting most out of Initiative and (2) that it is worth the cost and time.

The second major conclusion is that teachers used the computers as a tool to improve their instructional delivery. They do not see computers as replacing teachers. The primary teacher objective in using the computers was to (1) improve language arts, reading and writing skills, (2) reinforce and extend the core curriculum, (3) motivate interest rather than reward completed work. To a lesser degree, teachers used the computers to improve (1) mathematics, (2) social studies and (3) science.

As the implementation of the Computer Initiative proceeded, teachers placed more emphasis on using the computers to: (1) challenge high-ability students, (2) motivate student interest, (3) improve student directed learning, and (4) remediate deficiencies. They also placed significantly less emphasis on using the computer to reward student for completing their work.

By the end of the third year, teachers also reported that the computers permitted them to be better able to: (1) present more complex material, (2) use a more thematic approach, (3) use less lecture and whole class instruction, and (4) use more small group instruction. While this overall pattern was evident in each of the three years of the study, it should also be noted that a need to present material to the whole class increased slightly in the third year.

Additionally, teachers reported that the computers caused them to: (1) plan how to integrate computer into subject matter delivery and (2) produce better teacher products. Other work behaviors remained unchanged. For example, there was still a relatively low emphasis on: (1) the Henrico Resource Guide, (2) planning cooperatively with colleagues and (3) computers in managing grades. Interestingly, most teachers still have not used the computers to manage grades or student information. But, most of them use the computers to produce better newsletters and bulletin boards material.

The third major conclusion is that major barriers still exist to fully exploiting the use of computers to improve instruction and student outcomes. A clear majority of the teachers for each of the three years have reported that there was not enough time to develop lessons that use computers. In fact, it was the biggest barrier in year one, two and three of the study. Clearly, the grade level meetings supported by the school division were seen as helpful. However, rather than getting better, teacher perceptions on this issue are at a three year high. For instance, eighty-two percent (82%) of the teachers in year three reported that the unavailability of planning time was a more than moderately difficult barrier to overcome as compared to only twenty-four percent (24%) in year one. Obviously, as teacher capacity to use computers more effectively increased, their frustration with lack of planning time also increased.

A fourth major conclusion of the study is that teachers attributed improvements in (1) student motivation, (2) student work behavior, and (3) student performance to the Computer Initiative. For example, teachers perceived that student motivation to: (1) write and learn strongly increased, (2) read moderately increased, and (3) perform math, increased very little. Furthermore, ninety-six percent (96%) of the teachers at the end of year three reported that there was an increase in student motivation to write as compared to seventy-one percent (71%) at the end of the first year of the study. Similarly, ninety-one percent (91%) of the teachers at the end of year three attributed increased student motivation to learn to the computers in the classroom as compared to sixty-two percent (62%) in year one.

The student work behaviors teachers saw improve was the ability of students to work cooperatively together and manage their own learning. Obviously, with five computers and twenty-five students forced cooperative behaviors. And, the computer gave students a tool to use in learning. However, several student work behaviors (1) student attention, (2) student teacher rapport, and (3) classroom discipline were resistant to improvement. In fact, ninety-nine percent (99%) of the teachers agreed or strongly agreed that classroom discipline decreased when the computers were placed in the classroom. However, by the third year, seventy-two percent (72%) disagreed or strongly disagreed that student classroom discipline had improved.

Additionally, teachers indicated that all ability levels of students profited from the

computer initiative. For example: in year one teachers reported that eighty percent (80%) of their high achieving students profited from the computers in the classroom as compared to ninety-nine percent (99%) at the end of the third year. Similarly, in the first year, seventy-seven percent (77%) of the teachers reported that their average ability students profited from the Initiative as compared to one-hundred percent (100%) at the end of the third year. By the same token, seventy-six percent (76%) of the teachers reported that their low-achieving students profited from the initiative as compared to ninety-nine percent of the teachers at the end of the third year. However, teachers did not attribute an increase in student grades, completion of class assignments or homework to the computer initiative.

The fifth and final conclusion of this three year look at changing teacher perceptions firmly supports the notion that the school division fully reviewed the recommendations at the end of each year and initiated strategies and actions to improve the implementation of the initiative. For example, when reduction in principal support was noted at the end of year two, division staff initiated training sessions to acquaint principals with techniques to support the initiative. When satisfaction with some of the training, services, availability of software, printer and network problems were reported, division staff addressed the issues and there were noteworthy improvements the following year.

Even in the one persistent area of planning time, strategies were instituted to make use available schedule time for grade level meetings. However, more attention must be given to planning time as it is perceived as the biggest barrier to continual improvement in the teacher's ability to integrate computers and other technologies into their instructional routines.

Finally, the research team makes two recommendations that enable the teachers to continually improve their integration of technology. However, because of their budgetary implications these recommendations are not easily remedied. First, a renewed effort must be given to the issue of planning time. Grade level meetings should continue but teachers need the time and opportunity to plan for the integration of technology as well as other state and division initiatives they must integrate into their instructional routines. Second, teacher use of computers to improve their own productivity would be improved if they had a computers at home which had similar software on it as their computers at school. The availability of this tool could also be seen as a way to give teachers more time to plan instructional routines.

APPENDICES

Table 39
Instructional Support Survey Items on which Teacher Responses Significantly Differed Over Three Years of Study

Item Year 1	Item Year2	Item Year3	Question	%Year 1	%Year 2	% Year3
10 *** *	10	10	I received computer training at classes, conferences and workshops on my own time.	Yes=75% No=25%	Yes = 90% No = 10%	Yes=87% No=12%
14 *** *	13	13	I benefited greatly from the 2 days of technology. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=96% A=4% D=0% SD=0%	SA=36% A=35% D=7% SD=1%	SA=35% A=61% D=5% SD=0%
Yr1 Not Available **	63	14	I benefited greatly from the ½ day technology planning session held at my school. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	Yr1 Not Available	SA= 29% A=57% D=14% SD=0%	SA= 46% A=48% D=4% SD=2%
64 ***	62	15	The courses offered by my school system met my needs. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=37% A=54% D=8% SD=1%	SA=29% A=45% D=3% SD=1%	SA=44% A=53% D=4% SD=0%
65 ** ***	15	16	My training on the software to assist with the development of materials and the administration of the classroom meets my needs. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=19% A =54% D =23% SD=5%	SA=13% A =64% D =21% SD=2%	SA=39% A=52% D=7% SD=1%
66 ** *	64	17	Instruction offered on-site by the technology instructor met my needs. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=50% A =37% D =4% SD=1%	SA=35% A =52% D =13% SD=0%	SA=46% A =52% D =1% SD=0%
23 *** *	17	19	I would rate the support received from teachers day to day as: ES=Excellent Support; AS=Average support; LAS=Less than average support; NS=No Suport; DK=Don't know.	ES=6% AS =54% LAS =33% NS=5% DN=1%	ES=37% AS =36% LAS =4% NS=0% DN=0%	ES=52% AS=46% LAS =1% NS=1%
26 *** *	20	22	I would rate the support received from technology instructor as: ES=Excellent Support; AS=Average support; LAS=Less than average support; NS=No Suport; DK=Don't know.	ES=39% AS =37% LAS =8% NS=5% DN=10%	ES=37% AS =36% LAS =3% NS=0% DN=1%	ES=55% AS=40% LAS =5% NS=0%
28 *** *	22	24	I would rate the support received from the principal as: ES=Excellent Support; AS=Average support; LAS=Less than average support; NS=No Suport; DK=Don't know.	ES=41% AS =39% LAS =15% NS=1% DN=4%	ES=17% AS =47% LAS =18% NS=13% DN=5%	ES=21% AS=52% LAS =9% NS=7% DN=10%
29 *** ** *	23	25	Have you received adequate technical support?	Y=30% N=31% DN=39%	Y=36% N=57% DN=7%	Y=87% N=13%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

30 ** *	24	26	Have you received adequate instructional training support?	Y=68% N=22% DK=10%	Y=40% N=51% DK=9%	Y=91% N=7% DN=2%
Yr1 Not Available **	26	28	Which best describes the potential role of computers in classrooms? RT=Replacing teachers; Imp= Implimenting; Trans=transforming teaching; DK=no response	Yr1 Not Available	RT=0% Imp=45% Trans=32% DK=23%	RT=0% Imp=78% Trans=22% DK=0%
34 *** *	28	30	I use the computer in the classroom to reinforce the core curriculum. MIG=Most Important Goal; PG=Primary Goal; MG=Moderate Goal; LIG=Least Important Goal	MIG=3% PG=31% MG=43% LIG=23%	MIG=37% PG=39% MG=24% LIG=0%	MIG=41% PG=46% MG=13% LIG=0%
35 *** **	29	31	My goal for using the computers in the classroom is to extend the core curriculum. MPI= Most important goal; PG= Primary goal; MG= Moderate goal; LIG= Least important Goal.	MIG=56% PG=39% MG=9% LIG=0%	MIG=45% PG=45% MG=9% LIG=1%	MPI=8% PG=11% MG=42% LIG=38%
36 *** *	30	32	I use the computer in the classroom to remediate core curriculum. MIG=Most Important Goal; PG=Primary Goal; MG=Moderate Goal; LIG=Least Important Goal	MIG=41% PG=52% MG=7% LIG=0%	MIG=12% PG=27% MG=29% LIG=33%	MIG=9% PG=28% MG=37% LIG=26%
37 *** *	32	34	Mastering math skills is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=10% A= 24% D=66% SD=0%	SA=27% A=57% D=11% SD=6%	SA=26% A=54% D=18% SD=2%
38 ***	33	35	Learning to apply math is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=28% A=45% D=22% SD=5%	SA=30% A=57% D=11% SD=2%	SA=37% A= 57% D=7% SD=0%
39 *** *	34	36	Improving language arts skills is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=28% A=46% D=21% SD=5%	SA=55% A=41% D=2% SD=1%	SA=58% A=38% D=5% SD=0%
41 *** *	36	38	Improving writing skills is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=39% A=43% D=16% SD=2%	SA=68% A=32% D=0% SD=0%	SA=74% A=24% D=2% SD=0%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

42 *** *	37	39	Understanding social studies is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=85% A=11% D=2% SD=2%	SA=15% A=48% D=31% SD=7%	SA=14% A=58% D=25% SD=2%
43 *** *	38	40	Understanding science is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=8% A=36% D=42% SD=14%	SA=13% A=55% D=27% SD=4% DK=1%	SA=17% A=54% D=27% SD=1%
45 *** *	39	41	Motivating interest is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=14% A=46% D=31% SD=9%	SA=62% A=31% D=6% SD=1%	SA=64% A=31% D=6% SD=0%
46 *** *	40	42	Rewarding completed work is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=68% A=27% D=4% SD=1%	SA=16% A=27% D=33% SD=24% DK=1%	SA=11% A=28% D=22% SD=37%
47 *** *	41	43	Challenging high ability students is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=15% A=22% D=35% SD=28%	SA=48% A=37% D=12% SD=2%	SA=55% A=37% D=6% SD=2%
44 *** *	42	44	Remediating deficiencies is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=7% A=37% D=43% SD=13%	SA=28% A=48% D=19% SD=5%	SA=26% A=59% D=13% SD=2%
50 *** *	45	47	Improving student directed learning is an objective for using the computer in the classroom. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=37% A=46% D=14% SD=3%	SA=57% A=33% D=10% SD=1%	SA=51% A=42% D=7% SD=0%
54 ***	46	48	Since I have been using computers in the classroom, I can expect more from my students in terms of their pursuing and editing their work. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=47% A=45% D=5% SD=2%	SA=45% A=45% D=11% SD=0%	SA=32% A=59% D=8% SD=1%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

80

57 **	52	54	I spend less time lecturing to the entire class (whole group instruction). SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=22% A=51% D=26% SD=1%	SA=23% A=52% D=25% SD=0%	SA=22% A=42% D=29% SD=5%
58 ** ***	53	55	I spend less time with the whole class practicing or reviewing material. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=19% A=51% D=29% SD=1%	SA=19% A=51% D=29% SD=1%	SA=14% A=45% D=36% SD=5%
60 *** *	55	57	I use a thematic approach across subject areas. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=16% A=34% D=42% SD=8%	SA=41% A=30% D=28% SD=1%	SA=27% A=53% D=20% SD=0%
Yr 1 Not Available **	58	60	Trying out new techniques in instruction is needed for optimizing student education. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	Yr 1 Not Available	SA=60% A=40% D=0% SD=0%	SA=48% A=51% D=1% SD=0%
61 ***	60	62	The elementary specialists provide support for technology integration and provide suggestions. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=22% A=54% D=21% SD=4%	SA=27% A=54% D=18% SD=1%	SA=41% A=52% D=6% SD=1%
62 *** ■■■■■■	61	63	Fellow teachers provide a good source of support. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=31% A=35% D=32% SD=2%	SA=39% A=42% D=17% SD=2%	SA=47% A=52% D=0% SD=1%
67 *** *	66	68	I enjoy working with my students on the computer. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=28% A=59% D=13% SD=0%	SA=57% A=39% D=2% SD=2%	SA=57% A=41% D=2% SD=0%
68 *** *	67	69	The computer initiative has increased my interest in and knowledge about technology. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=22% A=58% D=12% SD=7%	SA=65% A=33% D=2% SD=0%	SA=66% A=31% D=3% SD=0%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

72 *** *	73	75	I discuss technology, ideas, and resources with other teachers. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=28% A=59% D=13% SD=0%	SA=39% A=58% D=4% SD=0%	SA=35% A=61% D=4% SD=0%
73 *** *	74	76	The computers have been helpful to me in managing grades. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=51% A=40% D=8% SD=1%	SA=20% A=11% D=49% SD=21%	SA=18% A=13% D=45% SD=17%
74 *** *	75	77	The computers have been helpful to me in managing student information. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=35% A=39% D=22% SD=2%	SA=19% A=43% D=25% SD=11%	SA=19% A=31% D=32% SD=8%
Yr 1 N/A **	76	78	The computers have allowed me to better produce products such as newsletters. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	Yr 1 N/A	SA=72% A=24% D=1% SD=2%	SA=61% A=37% D=2% SD=0%
75 *** *	77	79	The computer initiative has encouraged me to plan cooperatively with other staff. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=37% A=45% D=16% SD=2%	SA=27% A=40% D=34% SD=0%	SA=17% A=51% D=31% SD=1%
77 *** *	79	81	The computer initiative has changed my approach to classroom mgmt and instruction. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=55% A=41% D=3% SD=1%	SA=33% A=49% D=16% SD=2%	SA=24% A=60% D=18% SD=0%
78 *** *	80	82	The more I am able to integrate technology into the curriculum the more students are able to manage their own learning. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=36% A=42% D=21% SD=1%	SA=29% A=45% D=23% SD=2%	SA=21% A=52% D=26% SD=0%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

82 *** *	86	85	There is an increase in student motivation to write since the initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=26% A=45% D=28% SD=2%	SA=53% A=41% D=4% SD=2%	SA=49% A=47% D=4%
Yr 1 N/A **	81	83	I use the Henrico County Teacher Resource Guide for lesson plan ideas.	Yr1 N/A	SA=15% A=54% D=20% SD=11%	SA=28% A=58% D=13% SD=1%
83 *** *	87	86	There is an increase in student motivation to learn since the initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=16% A=46% D=37% SD=1%	SA=24% A=60% D=12% SD=3%	SA=34% A=57% D=8% SD=1%
84 *** *	88	87	Student attention improved since the initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=26% A=63% D=10% SD=1%	SA=15% A=28% D=52% SD=5%	SA=11% A=46% D=41% SD=2%
85 ****	90	89	My high achieving students have profited from the initiative. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=17% A=63% D=17% SD=2%	SA=65% A=35% D=0% SD=0%	SA=53% A=46% D=1%
86 *** *	91	90	My average achieving students have profited from the initiative. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=25% A=52% D=21% SD=3%	SA=43% A=55% D=1% SD=0%	SA=46% A=54% D=0% SD=0%
87 *** *	92	91	My low-achieving students have profited from the initiative. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=29% A=47% D=20% SD=4%	SA=45% A=47% D=7% SD=1%	SA=41% A=58% D=1% SD=0%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

90 *** *	93	92	Students have improved in completing class assignments. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=27% A=66% D=5% SD=2%	SA=16% A=36% D=46% SD=2%	SA=13% A=48% D=38% SD=1%
91 *** *	95	94	Students have improved in their completion of their homework assignments since the computer initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=55% A=42% D=3% SD=0%	SA=4% A=13% D=70% SD=13%	SA=4% A=14% D=61% SD=19%
93 *** *	96	95	Discipline problems in my classroom have decreased since I began using computers in my teaching. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=50% A=49% D=1%	SA=6% A=18% D=58% SD=17%	SA=5% A=23% D=61% SD=11%
94 *** *	97	96	There is improved student/teacher rapport since the computer initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=47% A=44% D=7% SD=2%	SA=12% A=33% D=47% SD=7%	SA=6% A=55% D=37% SD=1%
96 *** *	98	97	The grades of my students have improved because technology was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	SA=20% A=54% D=24% SD=2%	SA=8% A=27% D=59% SD=4%	SA=6% A=41% D=52% SD=1%
Yr 1 N/A **	99	98	Students have improved in their ability to work cooperatively with other students since the computer initiative was introduced. SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree	Yr 1 N/A	SA=12% A=61% D=22% SD=4%	SA=27% A=57% D=14% SD=1%
7 *	100	99	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough time to develop lessons that use computers. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 40% MMD=28% MoD= 24% LMD= 5% LD= 3%	MD= 55% MMD=30% MoD= 7% LMD= 5% LD= 2%	MD= 54% MMD=25% MoD= 19% LMD=0% LD= 2%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

98 *** *	101	100	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough help for supervising student computer use. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 19% MMD=57% MoD= 22% LMD=2% LD=0%	MD= 17% MMD=27% MoD=33% LMD=17% LD=7%	MD= 19% MMD=39% MoD= 24% LMD=8% LD=10%
99 *** *	102	101	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough training to learn how to fully integrate software. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 60% MMD=39% MoD= 1% LMD=0% LD=0%	MD= 7% MMD=22% MoD= 40% LMD=28% LD=4%	MD= 9% MMD=13% MoD= 27% LMD=35% LD=16%
100 *** *	103	102	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that my knowledge of computers is still to weak to use them effectively. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 8% MMD=47% MoD= 39% LMD=5% LD=0%	MD= 2% MMD=6% MoD= 13% LMD=22% LD=57%	MD= 1% MMD=4% MoD= 18% LMD=29% LD=48%
101 *	104	103	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is a lack of appropriate software. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 18% MMD=15% MoD= 17% LMD= 29% LD= 21%	MD= 13% MMD=11% MoD= 16% LMD= 27% LD= 33%	MD= 10% MMD=16% MoD= 27% LMD=21% LD= 28%
102 *** *	105	104	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that there are frequent problems with the printers. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 6% MMD=23% MoD= 61% LMD=10% LD=0%	MD= 17% MMD=21% MoD= 28% LMD=23% LD=12%	MD= 19% MMD=11% MoD= 20% LMD=33% LD=18%
103 ***	106	105	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that the computers need repairing too frequently. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 7% MMD=62% MoD= 28% LMD=3% LD=0%	MD= 27% MMD=22% MoD= 27% LMD=10% LD=15%	MD= 13% MMD=21% MoD= 26% LMD=13% LD=28%
104 *** *	107	106	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that I don't understand the technical side of the Iniative. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 4% MMD=40% MoD= 51% LMD=4% LD=0%	MD= 10% MMD=17% MoD= 25% LMD=28% LD=21%	MD= 26% MMD=14% MoD= 11% LMD=20% LD=29%

Note: Not all item responses will equal 100% due to rounding and/or response errors.

105 *** *	108	107	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that the network is down to often. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 9% MMD=55% MoD= 30% LMD=7% LD=0%	MD= 18% MMD=15% MoD= 16% LMD=24% LD=28%	MD= 8% MMD=24% MoD= 30% LMD=25% LD=14%
106 *** *	109	108	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that the response to computer repair is to long. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 39% MMD=55% MoD= 4% LMD=2% LD=0%	MD= 10% MMD=13% MoD= 23% LMD=27% LD=28%	MD= 21% MMD=10% MoD= 18% LMD=24% LD=28%
112 ***	110	109	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough time in the school schedule for computer based instruction. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 18% MMD=15% MoD= 17% LMD=29% LD=21%	MD= 7% MMD=35% MoD= 22% LMD=17% LD=9%	MD= 15% MMD=34% MoD= 21% LMD=23% LD=8%
113 *	111	110	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough software available. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 13% MMD=27% MoD= 36% LMD=16% LD= 13%	MD= 11% MMD=15% MoD= 25% LMD= 23% LD= 27%	MD= 6% MMD=16% MoD= 23% LMD=35% LD= 20%
114 ***	112	111	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough hardware available. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 39% MMD=24% MoD= 22% LMD= 7% LD= 8%	MD= 7% MMD=11% MoD= 16% LMD= 36% LD= 30%	MD= 4% MMD=14% MoD= 30% LMD=26% LD= 27%
115 *** *	113	112	A **CURRENT** barrier to most effectively using the Initiative's classroom computers is that there is not enough planning time. MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 10% MMD=14% MoD= 25% LMD=32% LD=19%	MD= 57% MMD=22% MoD= 15% LMD=6% LD=1%	MD= 65% MMD=17% MoD= 7% LMD=4% LD=6%
127 ****	**114**	**113**	**A CURRENT barrier to most effectively using the Initiative's classroom computers is the lack of building level leadership.** MD=Most Difficult; MMD=More than Moderately Difficult; MoD=Moderately Difficult ; LMD=Less than Moderately Difficult; LD=Least Difficult	MD= 2% MMD=6% MoD= 8% LMD=25% LD=58%	MD= 6% MMD=7% MoD= 22% LMD=22% LD=43%	MD= 5% MMD=4% MoD= 20% LMD=14% LD=58%

Note: Not all item responses will equal 100% due to rounding and/or response errors.
- * Statistically significant difference between year one and year two findings
- ** Statistically significant difference between year two and year three findings
- *** Statistically significant difference between year one and year three findings
- **** Statistically significant difference found each year

Paired t-tests were employed for these analyses. Items presented in the table demonstrated significant changes at p < .05.

Table 40
Survey Item Response by School

		School Code								
		50.00	60.00	210.00	400.00	470.00	490.00	570.00	660.00	Total
q1backgr Gender	male	0%	8%	0%	14%	0%	0%	0%	11%	6%
	female	100%	92%	100%	86%	100%	100%	100%	89%	94%
q2backgr Ethnicity	Caucasian	43%	100%	67%	100%	100%	80%	100%	50%	83%
	African American	57%	0%	33%	0%	0%	20%	0%	39%	15%
	Other	0%	0%	0%	0%	0%	0%	0%	11%	2%
q3backgr Undergraduate major	education	57%	92%	33%	100%	73%	80%	60%	88%	80%
	liberal arts	14%	4%	0%	0%	0%	20%	10%	6%	6%
	psychology	29%	0%	33%	0%	27%	0%	10%	0%	8%
	science	0%	0%	33%	0%	0%	0%	0%	0%	1%
	other	0%	4%	0%	0%	0%	0%	20%	6%	5%
q4backgr Years of teaching experience	less than 2 years	14%	0%	0%	0%	0%	0%	36%	29%	12%
	3-5 years	29%	17%	33%	0%	36%	0%	9%	6%	15%
	6-9 years	29%	13%	33%	14%	18%	0%	9%	18%	15%
	10-13 years	0%	17%	0%	0%	0%	20%	18%	12%	11%
	13 + years	29%	54%	33%	86%	45%	80%	27%	35%	47%
q5backgr Computer at home for professional use	yes	57%	79%	100%	71%	82%	60%	64%	78%	74%
	no	43%	21%	0%	29%	18%	40%	36%	17%	24%
	5.00	0%	0%	0%	0%	0%	0%	0%	6%	1%
q6backgr Number of years you have used computers in teaching	less than 2	14%	4%	0%	0%	18%	0%	36%	44%	19%
	3-5 years	71%	57%	67%	14%	45%	80%	45%	28%	47%
	6-9 years	14%	17%	33%	71%	27%	0%	18%	17%	22%
	10-13 years	0%	17%	0%	14%	9%	20%	0%	6%	9%
	14 years +	0%	4%	0%	0%	0%	0%	0%	6%	2%
q7backgr What grade do you teach (check the lowest grade)?	first	14%	21%	0%	43%	27%	40%	27%	28%	26%
	second	0%	21%	33%	0%	18%	0%	18%	11%	14%
	third	43%	21%	33%	14%	18%	20%	36%	17%	23%
	fourth	14%	21%	0%	29%	18%	40%	9%	28%	21%
	fifth	29%	17%	33%	14%	18%	0%	9%	17%	16%

		School Code								
		50.00	60.00	210.00	400.00	470.00	490.00	570.00	660.00	Total
q8backgr How many students are in your class?	less than 20	71%	0%	33%	43%	18%	0%	9%	0%	14%
	20 - 25	14%	83%	67%	57%	64%	100%	91%	94%	77%
	more than 25	14%	17%	0%	0%	18%	0%	0%	6%	9%
q9comtrn Self taught	yes	43%	63%	67%	43%	73%	20%	64%	61%	58%
	no	57%	38%	33%	57%	27%	80%	36%	39%	42%
q10comtr Classes, conferences, workshops	yes	57%	92%	100%	71%	91%	100%	100%	83%	87%
	no	43%	8%	0%	29%	9%	0%	0%	11%	12%
	4.00	0%	0%	0%	0%	0%	0%	0%	6%	1%
q11comtr Peer instruction	yes	100%	100%	100%	100%	100%	100%	91%	89%	97%
	no	0%	0%	0%	0%	0%	0%	9%	11%	3%
q12comtr Technology instructor training	yes	100%	100%	100%	100%	91%	100%	100%	100%	99%
	no	0%	0%	0%	0%	9%	0%	0%	0%	1%
q13comtr Benefited greatly from the 2 day of technology training this year.	strongly agree	14%	50%	33%	43%	9%	40%	36%	33%	35%
	agree	86%	46%	67%	57%	82%	60%	55%	61%	60%
	disagree	0%	4%	0%	0%	9%	0%	9%	6%	5%
q14comtr I benefited greatly from the 1/2 day technology planning session held at my school.	strongly agree	33%	50%	33%	57%	36%	50%	45%	50%	46%
	agree	67%	46%	33%	43%	64%	50%	45%	39%	48%
	disagree	0%	4%	0%	0%	0%	0%	9%	6%	4%
	strongly disagree	0%	0%	33%	0%	0%	0%	0%	6%	2%

		School Code								
		50.00	60.00	210.00	400.00	470.00	490.00	570.00	660.00	Total
q15comtr The courses offered by my school system met my needs.	strongly agree	33%	42%	67%	57%	27%	60%	55%	39%	44%
	agree	67%	54%	0%	43%	73%	40%	45%	56%	53%
	disagree	0%	4%	33%	0%	0%	0%	0%	6%	4%
q16comtr Technology workshops held at my school met needs.	strongly agree	17%	42%	33%	43%	36%	60%	45%	35%	39%
	agree	83%	54%	33%	57%	64%	40%	45%	41%	52%
	disagree	0%	4%	33%	0%	0%	0%	9%	18%	7%
	strongly disagree	0%	0%	0%	0%	0%	0%	0%	6%	1%
q17comtr Instruction offered on-site by the technology instructor met my needs.	strongly agree	50%	38%	67%	57%	55%	80%	45%	35%	46%
	agree	50%	63%	33%	43%	45%	20%	45%	65%	52%
	disagree	0%	0%	0%	0%	0%	0%	9%	0%	1%
q18comtr The computer initiative has motivated me to grow professionally.	strongly agree	57%	50%	67%	43%	45%	80%	45%	41%	49%
	agree	43%	50%	33%	57%	55%	20%	36%	53%	47%
	disagree	0%	0%	0%	0%	0%	0%	18%	6%	4%
q19suppt Other teachers (day to day).	excellent support	43%	67%	67%	29%	91%	80%	18%	29%	52%
	average support	57%	33%	33%	71%	9%	20%	73%	65%	46%
	less than average support	0%	0%	0%	0%	0%	0%	0%	6%	1%
	no support	0%	0%	0%	0%	0%	0%	9%	0%	1%

		School Code								
		50.00	60.00	210.00	400.00	470.00	490.00	570.00	660.00	Total
q20suppt School computer contact.	excellent support	57%	50%	33%	14%	73%	40%	27%	29%	42%
	average support	43%	46%	67%	86%	27%	60%	73%	59%	54%
	less than average support	0%	4%	0%	0%	0%	0%	0%	6%	2%
	no support	0%	0%	0%	0%	0%	0%	0%	6%	1%
q21suppt Technology support technician.	excellent support	29%	46%	33%	71%	55%	60%	18%	18%	39%
	average support	57%	50%	33%	29%	45%	40%	64%	41%	47%
	less than average support	14%	0%	33%	0%	0%	0%	18%	24%	9%
	no support	0%	0%	0%	0%	0%	0%	0%	12%	2%
	don't know	0%	4%	0%	0%	0%	0%	0%	6%	2%
q22suppt Technology instructor (conducts training, introduces software, helps with technology integration efforts, etc).	excellent support	71%	63%	33%	71%	55%	60%	27%	53%	55%
	average support	29%	33%	33%	29%	45%	20%	73%	41%	40%
	less than average support	0%	4%	33%	0%	0%	20%	0%	6%	5%
q23suppt Technology assistant (corrects tech problems)?	excellent support	29%	38%	33%	57%	27%	40%	9%	18%	29%
	average support	43%	58%	67%	43%	55%	60%	73%	53%	56%
	less than average support	14%	0%	0%	0%	9%	0%	18%	24%	9%
	don't know	14%	4%	0%	0%	9%	0%	0%	6%	5%

		School Code								
		50.00	60.00	210.00	400.00	470.00	490.00	570.00	660.00	Total
q24suppt Principal?	above average support	29%	33%	33%	0%	9%	40%	18%	12%	21%
	average support	71%	42%	33%	29%	64%	60%	64%	53%	52%
	less than average support	0%	0%	0%	29%	18%	0%	0%	24%	9%
	no support	0%	0%	0%	29%	0%	0%	18%	12%	7%
	don't know	0%	25%	33%	14%	9%	0%	0%	0%	11%
q25suppt Have you received adequate technical support?	yes	86%	92%	67%	100%	91%	100%	82%	76%	87%
	no	14%	8%	33%	0%	9%	0%	18%	24%	13%
q26suppt Have you received adequate instructional training support?	yes	71%	92%	100%	100%	91%	100%	82%	94%	91%
	no	29%	8%	0%	0%	0%	0%	18%	0%	7%
	3.00	0%	0%	0%	0%	9%	0%	0%	6%	2%
q27suppt Which statement best describes your level of computer expertise today?	I can only perform simple tasks with difficulty	0%	0%	0%	0%	0%	0%	0%	6%	1%
	I can perform basic tasks well without using software fully	29%	25%	0%	43%	18%	60%	36%	0%	24%
	I can perform many tasks well and am familiar with software	71%	42%	67%	14%	36%	20%	55%	71%	48%
	I know a lot about hard & soft-ware and use variety of softw	0%	33%	33%	43%	45%	20%	9%	24%	27%

		School Code								Total
		50.00	60.00	210.00	400.00	470.00	490.00	570.00	660.00	
q28poten In your opinion which item best describes the potential role of computers in classrooms?	implementing (enhance instruction, not change)	86%	88%	33%	86%	45%	100%	91%	71%	78%
	transforming (teachers facilitate learning; change tch role)	14%	13%	67%	14%	55%	0%	9%	29%	22%
q29tprac Introduce new concepts.	most important goal	14%	9%	33%	0%	9%	0%	0%	12%	8%
	primary goal	29%	0%	0%	29%	9%	0%	9%	18%	11%
	moderate goal	29%	57%	33%	29%	27%	80%	45%	29%	42%
	least important goal	29%	35%	33%	43%	45%	20%	45%	41%	38%
	5.00	0%	0%	0%	0%	9%	0%	0%	0%	1%
q30tprac Reinforce core curriculum.	most important goal	57%	25%	33%	43%	45%	80%	18%	59%	41%
	primary goal	29%	54%	67%	57%	45%	20%	55%	35%	46%
	moderate goal	14%	21%	0%	0%	9%	0%	27%	6%	13%
q31tprac Extend core curriculum.	most important goal	29%	25%	33%	29%	36%	20%	55%	29%	32%
	primary goal	57%	54%	0%	57%	36%	60%	36%	29%	44%
	moderate goal	14%	13%	67%	14%	27%	20%	9%	41%	22%
	least important goal	0%	8%	0%	0%	0%	0%	0%	0%	2%

		School Code								
		50.00	60.00	210.00	400.00	470.00	490.00	570.00	660.00	Total
q32tprac Remediate core curriculum.	most important goal	0%	8%	0%	0%	9%	20%	9%	18%	9%
	primary goal	43%	21%	33%	43%	27%	20%	18%	35%	28%
	moderate goal	14%	54%	0%	43%	36%	40%	45%	18%	36%
	least important goal	43%	17%	67%	14%	27%	20%	27%	29%	26%
q33tprac In general which description best matches what your students use computers for most in your class?	text processing tools	0%	8%	0%	14%	0%	40%	9%	24%	12%
	instructional software	0%	4%	33%	0%	0%	0%	0%	6%	4%
	analytical or programming tools	0%	8%	0%	0%	9%	0%	0%	6%	5%
	games	0%	0%	0%	0%	9%	20%	0%	0%	2%
	I use a variety of the categories of software	100%	79%	67%	86%	82%	40%	91%	65%	78%
q34objec Mastering math skills	primary objective	50%	17%	67%	14%	36%	20%	36%	18%	26%
	moderate objective	50%	54%	0%	57%	64%	80%	45%	53%	54%
	low objective	0%	29%	33%	14%	0%	0%	18%	24%	18%
	not an objective	0%	0%	0%	14%	0%	0%	0%	6%	2%
q35objec Learning to apply math	primary objective	57%	21%	0%	29%	55%	40%	36%	47%	36%
	moderate objective	43%	75%	67%	71%	36%	60%	64%	35%	56%
	low objective	0%	4%	33%	0%	9%	0%	0%	18%	7%

		School Code								
		50.00	60.00	210.00	400.00	470.00	490.00	570.00	660.00	Total
q36objec Improving language arts skills	primary objective	57%	38%	67%	86%	64%	20%	82%	65%	58%
	moderate objective	43%	54%	33%	14%	27%	80%	9%	35%	38%
	low objective	0%	8%	0%	0%	9%	0%	9%	0%	5%
q37objec Improving reading skills	primary objective	57%	29%	100%	57%	64%	20%	82%	53%	52%
	moderate objective	29%	50%	0%	29%	27%	80%	0%	41%	35%
	low objective	14%	13%	0%	14%	9%	0%	18%	6%	11%
	5.00	0%	8%	0%	0%	0%	0%	0%	0%	2%
q38objec Improving writing skills	primary objective	86%	63%	67%	86%	73%	40%	73%	94%	74%
	moderate objective	14%	33%	0%	14%	27%	60%	27%	6%	24%
	low objective	0%	4%	33%	0%	0%	0%	0%	0%	2%
q39objec Understanding social studies	primary objective	0%	4%	33%	0%	27%	0%	45%	12%	14%
	moderate objective	100%	71%	33%	57%	64%	60%	36%	35%	58%
	low objective	0%	21%	33%	29%	9%	20%	18%	53%	25%
	not an objective	0%	4%	0%	14%	0%	0%	0%	0%	2%
	5.00	0%	0%	0%	0%	0%	20%	0%	0%	1%
q40objec Understanding science	primary objective	14%	8%	33%	0%	18%	20%	45%	12%	16%
	moderate objective	86%	58%	33%	86%	55%	20%	36%	47%	54%
	low objective	0%	29%	33%	14%	27%	40%	18%	41%	27%
	not an objective	0%	4%	0%	0%	0%	0%	0%	0%	1%
	5.00	0%	0%	0%	0%	0%	20%	0%	0%	1%
q41objec Motivating interest	primary objective	43%	46%	100%	86%	45%	40%	82%	88%	64%
	moderate objective	43%	46%	0%	14%	45%	60%	9%	12%	31%
	low objective	14%	8%	0%	0%	9%	0%	9%	0%	6%

		School Code								
		50.00	60.00	210.00	400.00	470.00	490.00	570.00	660.00	Total
q42objec Rewarding completed work	primary objective	14%	0%	0%	43%	9%	40%	9%	6%	11%
	moderate objective	29%	38%	33%	14%	27%	20%	27%	24%	28%
	low objective	29%	21%	33%	29%	9%	0%	18%	35%	22%
	not an objective	29%	38%	33%	0%	55%	40%	45%	35%	36%
	5.00	0%	4%	0%	14%	0%	0%	0%	0%	2%
q43objec Challenging high ability students	primary objective	43%	46%	67%	71%	45%	40%	82%	59%	55%
	moderate objective	57%	38%	0%	29%	45%	40%	18%	41%	36%
	low objective	0%	17%	0%	0%	9%	0%	0%	0%	6%
	not an objective	0%	0%	33%	0%	0%	20%	0%	0%	2%
q44objec Remediating deficiencies	primary objective	14%	21%	67%	14%	27%	20%	36%	29%	26%
	moderate objective	86%	54%	33%	71%	73%	80%	27%	59%	59%
	low objective	0%	17%	0%	14%	0%	0%	36%	12%	13%
	not an objective	0%	8%	0%	0%	0%	0%	0%	0%	2%
q45objec Improving higher order thinking skills	primary objective	29%	33%	67%	57%	27%	0%	64%	53%	41%
	moderate objective	71%	50%	33%	14%	64%	80%	36%	29%	46%
	low objective	0%	17%	0%	29%	9%	20%	0%	18%	13%
q46objec Improving problem solving	primary objective	57%	29%	100%	57%	36%	0%	55%	53%	44%
	moderate objective	43%	58%	0%	43%	36%	100%	45%	41%	48%
	low objective	0%	13%	0%	0%	27%	0%	0%	6%	8%

		School Code								
		50.00	60.00	210.00	400.00	470.00	490.00	570.00	660.00	Total
q47objec Improving student directed learning (eg students use software to explore, discover, and construct their own learning)	primary objective	57%	46%	67%	57%	45%	0%	55%	65%	51%
	moderate objective	43%	46%	33%	29%	55%	60%	36%	35%	42%
	low objective	0%	8%	0%	14%	0%	40%	9%	0%	7%
q48gener I can expect more from my studentsin terms of their pursuing and editing their work.	strongly agree	43%	38%	33%	29%	27%	20%	27%	29%	32%
	agree	57%	54%	67%	57%	55%	80%	55%	65%	59%
	disagree	0%	8%	0%	14%	18%	0%	9%	6%	8%
	strongly disagree	0%	0%	0%	0%	0%	0%	9%	0%	1%
q49gener I am more comfortable with small group activities.	strongly agree	57%	42%	0%	14%	27%	40%	36%	24%	33%
	agree	43%	33%	100%	86%	73%	40%	55%	65%	55%
	disagree	0%	25%	0%	0%	0%	20%	9%	12%	12%
q50gener I have an awreness of the creative uses of computers in education.	strongly agree	29%	46%	33%	14%	45%	40%	45%	35%	39%
	agree	71%	54%	67%	86%	45%	60%	55%	65%	60%
	disagree	0%	0%	0%	0%	9%	0%	0%	0%	1%
q51gener I feel that my colleagues are excited about computers in the classroom.	strongly agree	43%	29%	33%	29%	18%	20%	18%	18%	25%
	agree	57%	67%	67%	71%	82%	80%	73%	65%	69%
	disagree	0%	4%	0%	0%	0%	0%	0%	18%	5%
	strongly disagree	0%	0%	0%	0%	0%	0%	9%	0%	1%

		School Code								
		50.00	60.00	210.00	400.00	470.00	490.00	570.00	660.00	Total
q52gener I am encouraged at my school to try new ways to use computers in my teaching.	strongly agree	43%	58%	33%	29%	55%	60%	27%	35%	45%
	agree	57%	42%	67%	71%	45%	40%	64%	47%	51%
	disagree	0%	0%	0%	0%	0%	0%	9%	12%	4%
	strongly disagree	0%	0%	0%	0%	0%	0%	0%	6%	1%
q53gener Goals for the integration of computers into my teaching proactices are clearly defined.	strongly agree	57%	38%	33%	14%	45%	20%	9%	29%	32%
	agree	43%	46%	67%	86%	55%	80%	55%	59%	56%
	disagree	0%	13%	0%	0%	0%	0%	36%	12%	11%
	strongly disagree	0%	4%	0%	0%	0%	0%	0%	0%	1%
q54ctime I spend lesstime lecturing to the entire class (whole group instruc).	strongly agree	43%	25%	0%	29%	36%	20%	9%	12%	22%
	agree	14%	33%	100%	43%	45%	80%	45%	41%	42%
	disagree	43%	29%	0%	29%	18%	0%	27%	47%	29%
	strongly disagree	0%	13%	0%	0%	0%	0%	9%	0%	5%
	5.00	0%	0%	0%	0%	0%	0%	9%	0%	1%
q55ctime I spend less time with the whole class practicing or reviewing material.	strongly agree	14%	17%	0%	29%	18%	20%	0%	12%	14%
	agree	71%	33%	33%	57%	27%	60%	45%	53%	45%
	disagree	14%	38%	67%	14%	55%	20%	45%	35%	36%
	strongly disagree	0%	13%	0%	0%	0%	0%	9%	0%	5%

		School Code								
		50.00	60.00	210.00	400.00	470.00	490.00	570.00	660.00	Total
q56tstyl I am better able to present more complex materials to my students.	strongly agree	0%	8%	33%	14%	0%	20%	36%	18%	14%
	agree	86%	67%	33%	57%	91%	40%	45%	59%	64%
	disagree	14%	17%	33%	29%	0%	40%	18%	24%	19%
	strongly disagree	0%	8%	0%	0%	9%	0%	0%	0%	4%
q57tstyl I utilize a thematic approach across subject areas.	strongly agree	29%	38%	33%	0%	36%	40%	18%	18%	27%
	agree	57%	50%	0%	86%	36%	40%	64%	59%	53%
	disagree	14%	13%	67%	14%	27%	20%	18%	24%	20%
q58tstyl I use learning stations in my instruction.	strongly agree	57%	38%	100%	14%	45%	40%	36%	41%	41%
	agree	29%	29%	0%	71%	36%	60%	55%	35%	39%
	disagree	14%	33%	0%	14%	9%	0%	9%	24%	19%
	strongly disagree	0%	0%	0%	0%	9%	0%	0%	0%	1%
q59tstyl I sue small group activities in my instruction.	strongly agree	57%	38%	100%	14%	36%	60%	27%	41%	40%
	agree	43%	54%	0%	71%	55%	40%	64%	59%	54%
	disagree	0%	8%	0%	14%	9%	0%	9%	0%	6%
q60tstyl Trying out new techniques in instruction is needed for optimizing student education.	strongly agree	86%	50%	100%	14%	36%	20%	64%	41%	48%
	agree	14%	46%	0%	86%	64%	80%	36%	59%	51%
	disagree	0%	4%	0%	0%	0%	0%	0%	0%	1%
q61tstyl I use computers throughout my instruction (when there is appropriate software).	strongly agree	57%	54%	33%	14%	55%	40%	36%	41%	45%
	agree	43%	42%	67%	86%	45%	40%	45%	41%	47%
	disagree	0%	4%	0%	0%	0%	20%	18%	18%	8%

		School Code								
		50.00	60.00	210.00	400.00	470.00	490.00	570.00	660.00	Total
q62perce The elementary specialists provide support for technology integration and provide suggestions	strongly agree	57%	48%	33%	43%	27%	20%	36%	41%	40%
	agree	43%	43%	33%	57%	73%	80%	45%	53%	52%
	disagree	0%	4%	33%	0%	0%	0%	18%	6%	6%
	strongly disagree	0%	4%	0%	0%	0%	0%	0%	0%	1%
q63perce Fellow teachers provide a good source of support	strongly agree	86%	58%	33%	29%	64%	60%	36%	18%	47%
	agree	14%	42%	67%	71%	36%	40%	64%	76%	52%
	strongly disagree	0%	0%	0%	0%	0%	0%	0%	6%	1%
q64perce My principal provides feedback concerning my efforts to integrate computers into instruction	strongly agree	43%	26%	33%	0%	18%	40%	36%	12%	24%
	agree	57%	61%	33%	43%	45%	60%	27%	53%	50%
	disagree	0%	13%	0%	57%	27%	0%	18%	24%	19%
	strongly disagree	0%	0%	33%	0%	9%	0%	18%	12%	7%
q65perce My principal provides feedback concerning my efforts to integrate computers in the classroom	strongly agree	71%	54%	67%	0%	27%	20%	73%	24%	42%
	agree	29%	46%	33%	86%	64%	80%	27%	65%	53%
	disagree	0%	0%	0%	14%	9%	0%	0%	12%	5%
q66perce I can ask colleagues for help with technology when needed without hesitation	strongly agree	57%	63%	33%	57%	82%	40%	55%	29%	54%
	agree	43%	38%	67%	43%	18%	60%	45%	59%	44%
	disagree	0%	0%	0%	0%	0%	0%	0%	12%	2%
Table Total		100%	100%	100%	100%	100%	100%	100%	100%	100%

Computers in the Classroom Initiative: A Survey

In the past two years, teachers at your school completed a survey about their experience with computers. We learned much from the responses to those surveys and ask that you provide us feedback just one more time! Having input for the first three years of the elementary school initiative is an important cycle. A copy of the Executive Summary from last year is enclosed for your information. Please wait to read this summary until after you complete the survey.

The survey was shortened a little from last year. However, we need your input on many topics so the survey is still long! We will give much attention to your responses to the questions/statements on the following pages. We will also carefully review any additional feedback that you write on the accompanying comment sheet. Your responses will be totally anonymous; there is no way to trace your responses so you can be candid and constructive.

Most of the responses should go on the accompanying blue "GENERAL PURPOSE ANSWER SHEET." Please mark this sheet with a No. 2 pencil. (Do not mark your name or other identifying information on the answer sheet.)

This material is coming to you in an envelope that can be used to return the answer sheet and comments to us on the county Pony. Please return your responses to Research & Planning Department on the Pony by May 22, 1998.

We have made arrangements with the Metropolitan Educational Research Consortium (MERC), based at VCU, to assist in this survey which explains why their name is found below.

WE THANK YOU FOR YOUR ASSISTANCE AND PROFESSIONALISM IN COMPLETING THIS SURVEY.

A Survey prepared by the
Metropolitan Educational Research Consortium (MERC)
for Henrico County Public Schools

Section 2. **Questions 9 through 12 deal with How You Receive Training to use Computers.**

Personal Training, Etc.

9.   Self-taught (e.g., practice on the computer at home)
     A.   yes   B.   no

10. Classes, conferences, and workshops (on own time)
     A.   yes   B.   no

11. Instruction from other teachers
     A.   yes   B.   no

12. Instruction on site by technology instructor
     A.   yes   B.   no

For items 13 through 18 fill in the response that best reflects your level of agreement with the item, using the response modes below:

		Strongly Agree	Agree	Dis-agree	Strongly Disagree
13.	I benefited greatly from the 2 days of technology training this year.	A	B	C	D
14.	I benefited greatly from the ½ day technology planning session held at my school	A	B	C	D
15.	The courses offered by my school system meet my needs.	A	B	C	D
16.	Technology workshops/courses held at my school met my needs.	A	B	C	D
17.	Instruction offered on-site by the technology instructor meets my needs.	A	B	C	D
18.	The computer initiative has motivated me to grow professionally.	A	B	C	D

28.	In your opinion which item below BEST describes the POTENTIAL role of computers in classrooms.

    A.	Replacing teachers (computers become the "teachers," teaching lessons and giving computerized tests, etc.)

    B.	Implementing (a tool for teaching that will enhance instruction, but not drastically change it.)

    C.	Transforming (teachers facilitate learning; they do not lecture, there is a great impact on changing the teacher's role and school structure.)

Teaching Practices

**Section 4.	Why do you use it?**

Questions 29 through 33 deal with the **Goals of Most of your Computer Work** and you are to select one choice only for each item. What do you use computers for in your classroom? What is your first goal, your second, and your third goal, etc. concerning computer use in the classroom? (Mark only one A, one B, one C, or D for questions 30, 31, and 32). **READ ALL ITEMS BEFORE RESPONDING.**

    A.	most important goal
    B.	primary goal
    C.	moderate goal
    D.	least important goal

29.	Introduce new concepts (e.g., prepare students for instruction on a topic by using an appropriate software package)

30.	Reinforce core curriculum (e.g., provide students with extra practice on material already learned)

31.	Extend core curriculum (e.g., provide additional information on a topic)

32.	Remediate core curriculum (e.g., provide an appropriate software package for students who need additional help)

33.	In general which description below BEST <u>matches what your students use computers for most in your class?</u>
    A.	Text processing tools (e.g., word processing)
    B.	Instructional Software (e.g., WorldGeograph and Bodyscope)
    C.	Analytical or Programming tools (e.g., Hyperstudio and spreadsheets)
    D.	Games
    E.	I use a variety of the categories of software listed above

Section 6. SINCE I HAVE BEEN USING COMPUTERS in my classroom, how has my teaching environment changed?

For the items 48 through 61 below, indicate the degree to which you agree or disagree with the statement. The response mode for the scoring sheet is as follows:

	Strongly Agree	Agree	Dis-agree	Strongly Disagree
General areas				
48. I can expect more from my students in terms of their pursuing and editing their work.	A	B	C	D
49. I am more comfortable with small group activities.	A	B	C	D
50. I have an awareness of the creative uses of computers in education.	A	B	C	D
51. I feel that my colleagues are excited about computers in the classroom.	A	B	C	D
52. I am encouraged at my school to try new ways to use computers in my teaching.	A	B	C	D
53. Goals for the integration of computers into my teaching practices are clearly defined.	A	B	C	D
Class time				
54. I spend less time lecturing to the entire class (e.g., whole group instruction).	A	B	C	D
55. I spend less time with the whole class practicing or reviewing material.	A	B	C	D
Teaching style				
56. I am better able to present more complex material to my students.	A	B	C	D
57. I utilize a thematic approach across subject areas.	A	B	C	D
58. I use learning stations in my instruction.	A	B	C	D
59. I use small group activities in my instruction.	A	B	C	D
60. Trying out new techniques in instruction is needed for optimizing student education.	A	B	C	D
61. I use computers throughout my instruction (e.g., whenever there is appropriate software).	A	B	C	D

		Strongly Agree	Agree	Dis-agree	Strongly Disagree

Instructional Behavior (Teacher Work Behavior)

79. The computer initiative has encouraged me to plan cooperatively with other staff. A B C D

80. As I plan for the subject matter to be presented in a lesson, I also plan how technology (i.e., computers) can be used to implement the unit. A B C D

81. The computer initiative has changed my approach to classroom management and instruction. A B C D

82. The more I am able to integrate technology (i.e., computers) into the curriculum the more students are able to manage their own learning. A B C D

83. I use the Henrico County Teacher Resource Guide for lesson plan ideas. A B C D

Motivation (Student Work Behavior)

84. There is an increase in student motivation to read since the computer initiative was introduced. A B C D

85. There is an increase in student motivation to write since the computer initiative was introduced. A B C D

86. There is an increase in student motivation to learn since the computer initiative was introduced. A B C D

87. Student attention has improved since the introduction of the computer initiative. A B C D

88. There is an increase in student motivation to understand math since the computer initiative was introduced. A B C D

Performance

89. My high-achieving students have profited from the computer initiative. A B C D

90. My average-achieving students have profited from the computer initiative. A B C D

91. My low-achieving students have profited from the computer initiative. A B C D

92. Students have improved in their completion of class assignments. A B C D

93. Students have improved in their research skills. A B C D

Section 8B. Examine the CURRENT barriers to most effectively using the initiative classroom computers.   Use each rank only once in items 104-108.

(Look over all the items in the category and then rank them. Rank: "A"=most difficult barrier to "E"=least difficult barrier)

A.	most difficult
B.	more than moderately difficult
C.	moderately difficult
D.	less than moderately difficult
E.	least difficult

Hardware

104.   Computers need to be repaired too frequently.

105.   There are frequent problems with printers

106.   The network is down too often.

107.   I don't understand the technical side of the initiative.

108.   Response to computer repair is too long.

Section 8C. Examine the CURRENT barriers to most effectively using the initiative classroom computers FOR INSTRUCTION.   Use each rank only once in items 109-113.

(Look over all the items in the category and then rank them. Rank: "A"=most difficult barrier to "E"=least difficult barrier)

A.	most difficult **now**
B.	more than moderately difficult **now**
C.	moderately difficult **now**
D.	less than moderately difficult **now**
E.	least difficult **now**

109.   Not enough time in the school schedule for computer-based instruction.

110.   Not enough software available.

111.   Not enough hardware available.

112.   Not enough planning time.

113.   Lack of building level leadership.

Many thanks are extended to you for pursuing this survey to the end. Your responses are extremely important.
FORMA98.HEN