
THE IMPACT OF PORTABLE TECHNOLOGIES ON TEACHING AND LEARNING: YEAR FOUR REPORT

Prepared For:
Athens Academy

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THE IMPACT OF PORTABLE TECHNOLOGIES ON TEACHING AND LEARNING: YEAR FOUR REPORT

INTRODUCTION

In the summer of 1999, faculty members in the Department of Instructional Technology at The University of Georgia were contracted by technology leaders at Athens Academy to conduct a long-term evaluation of the use of portable technologies in their school. This document describes the results from year four of this four-year evaluation project.

This document begins with background information about the origins of the portable technologies initiative and highlights from year three of the evaluation effort (2001-2002). Next, we present a brief overview of the primary project activities carried out during this fourth year followed by a description of the evaluation activities conducted during year four (participants, data collection and analysis efforts). Next, there is a presentation of results from the data collection and a review of findings from year four. Finally, we summarize key points from the year four evaluation and make recommendations for the continuing work related to technology integration at Athens Academy. Additional recommendations will be provided in a separate overall project report that presents a summary of all four years of the evaluation.

BACKGROUND

Athens Academy has been a center of innovation for the integration of technology and media into the classroom since 1990 when the Academy formed an international educational partnership with the Bertelsmann Foundation to expand the ways students learn with all forms of media. The heart of what came to be known as the Media Across the Curriculum Project (MACP) is integrating media and technology into the Academy's liberal arts college preparatory curriculum.

The final phase of MACP began in 1999 and ends in 2003. This final phase of MACP has three primary goals:

1. expanding the innovative practices with the integration of personal technologies (laptop computers),
2. enhancing and developing models for faculty development, and
3. developing and implementing an evaluation to document the impact and the effectiveness of the personal technologies on teaching and learning.

As described in the Year Three Report, the original vision established in the rationale for infusion of laptop computers into Athens Academy focused on creating "... a 'toolset' that could be effectively used in almost every curriculum area" and could be used anywhere, anytime to facilitate writing, communication, and resource use (Keith & Smith, 1997). It was believed at the onset of the project that, by providing each teacher and student with portable technology and ubiquitous access to the Internet, their day-to-day learning tasks would be facilitated, communications would be enhanced, and the goal of learning anywhere, anytime would become a reality. These beliefs continue to inspire the learners, faculty and staff engaged in this innovative project. The laptop initiative at the Academy, along with similar initiatives (Bartel, 2002; Ubiquitous Computing Evaluation Consortium, 2003), continues to be predicated on the belief that computing has become an essential tool for critical thinking, problem-solving, and learning in the 21st Century. Accordingly, the evaluation team was committed from the onset to revealing best practices for creating and sustaining the ubiquitous computing environment at Athens Academy.

Year three of the evaluation included the following major activities:

- extending data collection efforts and technology integration activities with individual teachers, and
- providing one-on-one assistance for individual teachers through partnerships with University of Georgia Instructional Technology graduate students.

The major results of the year three data collection can be summarized as follows:

- participants (teachers, students, administrators, and technology staff) remained enthusiastic about the project,
- several positive aspects were reported: increased communication, more convenient access to the Internet, increased use of the Internet, and enhanced computer literacy skills,
- there was a general consensus that the project should support a move toward a more learner-centered classroom, and it appeared that there was a slight shift away from a completely teacher-centered model in the Middle School,
- logistics (e.g., reliability of the hardware, unit weight, power cables in the classroom) continued to be a concern,
- the technology team at the Academy once again provided extensive technological and pedagogical support for the teachers and their laptops,
- teachers reported a need for forums and mechanisms to discuss integration ideas, and
- the goal of making laptops "invisible" within the overall teaching and learning environment continued to remain elusive.

YEAR FOUR PROGRAM ACTIVITIES

The fourth year of the laptop initiative was once again preceded by a summer filled with technology training and planning activities for use of the laptops in the

classrooms. Mike Callinan and other members of the technology team met with teachers on an individual basis throughout the summer to assist them with developing plans for integration and creating resources with the laptops. This activity was once again an intensive time investment on the part of the technology staff as well as the teachers. Yet, it was an investment whose return continued to be felt ten-fold when the teachers returned to campus in August. Teachers continued to express more comfort with the technology and their use of the laptops demonstrated an increase in technology literacy skills.

As the new school year got underway, the technology staff members were quickly submersed in the preparation for new students and seventh graders to receive their laptops at the beginning of the school year. The rollout was once again acknowledged as a success and the new students and 7th grade students joined the rest of the school in this exciting ubiquitous computing initiative.

YEAR FOUR EVALUATION ACTIVITIES

As with the previous three years, the fourth year of the evaluation project was filled with a variety of activities across campus, once again bringing an exponential growth in data! Overall, it was a busy year of data collection year with the cooperation of teachers and students. Table 1 provides an overview of the data collection efforts for the year.

Table 1. Data collection activities during 2002-2003.

Fall Semester	
Teachers	Students
MS Observations	MS Observations
US Observations	US Observations
MS Surveys (initial)	MS Surveys (initial)
US Surveys (initial)	US Surveys (initial)
MS Focus Group	MS Focus Group
US Focus Group	US Focus Group
Spring Semester	
Teachers	Students
MS Observations	MS Observations
US Observations	US Observations
MS Surveys (end of year)	MS Surveys (end of year)
US Surveys (end of year)	US Surveys (end of year)
MS Focus Group	MS Focus Group
US Focus Group	US Focus Group

All together, the evaluation team engaged in four different types of data collection activities: (1) questionnaires (Appendices A and C), (2) interviews/focus groups (Appendices B and D), (3) observations (Appendix E), and (4) analysis of test scores. Three other major data collection and technology integration activities provided insight into the laptop initiative: Shiang Kwei Wang's dissertation research, UGA-IT

graduate student research projects, and the Faculty Development Day. Our major evaluation focus areas and questions were as follows:

Enhancing the Teaching and Learning Environment

- Are there differences in roles/responsibilities that can be attributed to the ubiquitous computing environment?
- Are there differences in the processes of learning that can be attributed to the ubiquitous computing environment?
- What are the affective implications of the ubiquitous computing environment?

Enhancing Achievement and Performance

- How much is learned in English, History/Geography, Math, and Science that can be attributed to the ubiquitous computing environment?

Enhancing Key Qualifications for the Information Age

- Are there differences in cognitive skills that can be attributed to the ubiquitous computing environment?
- Are there differences in media literacy skills that can be attributed to the ubiquitous computing environment?

YEAR FOUR EVALUATION PARTICIPANTS

Teachers

Two cohorts of teachers participated in the fourth year of the evaluation. There were 8 middle school teachers (grades 7 and 8), and 23 upper school teachers (grades 9 through 12).

Middle School Cohort. The cohort of eight participating middle school teachers, four 7th grade and four 8th grade teachers. The Middle School teachers:

1. completed questionnaires (see Appendix A for a copy of the instrument),
2. enabled classroom observations by members of our evaluation team,
3. participated in individual interviews, and
4. participated in focus group interviews (see Appendix B for a copy of the protocol).

The teachers' main subject areas were: mathematics (two teachers), science (two teachers), geography (one teacher), history (one teacher), and English (two teachers). These subjects represented the targeted subject-areas for the evaluation. These eight teachers all teach about the same number of students each day (approximately 66), and deal with the same average size of classes (16 - 17). Teaching experience varies greatly in the sample ranging from a minimum of 1 year to a maximum of 30 years of prior experience. The average teaching experience of these eight teachers by the end of 2003 was 10 years.

Upper School Cohort. The cohort of 23 participating upper school teachers represented four grade areas: 9th grade, 10th grade, 11th grade, and 12th grade. Although the evaluation is focused primarily on 9th and 10th grade learners, all four grades have been included in the teacher data because many teachers teach across grade levels. The Upper School teachers:

1. completed questionnaires (see Appendix A for a copy of the instrument),
2. enabled classroom observations by members of our evaluation team,
3. participated in individual interviews, and
4. participated in focus group interviews (see Appendix C for a copy of the protocol).

The teachers' main subjects come under the fields of science as well as the humanities and languages, with the following subjects being represented the targeted core areas for the evaluation: mathematics (7), science (2), history (4), and English (4). These 23 teachers all teach about the same number of students each day (approximately 75), and deal with the same average size of classes (approximately 15). Teaching experience varies greatly in the sample from a minimum of 2 years of prior teaching experience to a maximum of 34 years of prior experience. The average teaching experience of these 23 teachers by the end of 2003 was 14 years.

Learners

Two main cohorts of learners participated in the fourth year of the evaluation. The middle school students (grades 7 and 8) were one cohort. Cohort two was comprised of students in the upper school (grades 9 and 10).

Middle School Cohort. The middle school learner sample consisted of 132 students (66 7th grade and 66 8th grade). The students participating in the evaluation completed a variety of data collection activities:

1. beginning of the year questionnaires (for all 7th grade students and new 8th grade students) (see Appendix B for a copy of the instrument),
2. classroom observations (see Appendix D for a copy of the instrument), and
3. focus group interviews (see Appendix C for a copy of the protocol).

The seventh grade sample (summarized in Table 2) included 53 percent female and 47 percent male students (that is 34 female and 30 male students). The students' age ranged between 11 and 13, with an average age of 12 years. Out of the 53 students in the seventh grade sample, 89 percent are Caucasian, 5 percent Asian-American, and 5 percent African-American (that is 59 Caucasian, 3 Asian-American, and 3 African-American students). One did not report ethnicity.

Table 2. 7th grade demographics.

7th Graders		
Gender	Number of Students	Percent
Females	34	53%
Males	30	47%
Ethnicity		
Caucasian	59	89%
Asian-American	3	5%
African-American	3	5%

The eighth grade sample included 42 percent female and 58 percent male students (that is 28 female and 39 male students). The students' age ranged between 12 and 14, with an average age of 13 years. Out of the 66 students in the eighth grade sample, 85 percent were Caucasian and 14 percent Asian-American (that is 56 Caucasian and 9 Asian-American students) (1 did not report ethnicity) (see Table 3 for a summary).

Table 3. 8th grade demographics

8th Graders		
Gender	Number of Students	Percent
Females	28	42%
Males	39	58%
Ethnicity		
Caucasian	56	85%
Asian-American	9	14%

Upper School Cohort. Two grade-levels were included in the upper school cohort: 9th (n=66) and 10th (n=77) grade. The ninth grade sample included 46 percent female and 54 percent male students (that is 30 female and 36 male students). The students' ages ranged between 13 and 15, with an average age of 14 years. Out of the 66 students in the ninth grade sample, 85 percent are Caucasian, 6 percent Asian-American, 6 percent African-American, and 3 percent Hispanic (that is 54 Caucasian, 4 Asian-American, 4 African-American and 2 Hispanic students) (see the summary in Table 4).

Table 4. 9th grade demographics

9th Graders		
Gender	Number of Students	Percent
Females	30	54%
Males	36	45%
Ethnicity		
Caucasian	54	85%
Asian-American	4	6%
African-American	4	6%
Hispanic	2	3%

The tenth grade sample included 57 percent female and 43 percent male students (that is 43 female and 32 male students). The students' age ranged between 14 and 16, with an average age of 15 years. Out of the 77 students in the tenth grade sample, 79 percent are Caucasian and 16 percent Asian-American (that is 55 Caucasian and 11 Asian-American; 6 indicated "other" for ethnicity) (see summary in Table 5).

Table 5. 10th grade demographics.

10th Graders		
Gender	Number of Students	Percent
Females	43	57%
Males	32	43%
Ethnicity		
Caucasian	55	79%
Asian-American	11	16%
Other	6	5%

METHODS

Data Collection

We first collected data for the fourth year of the evaluation project at the beginning of the school year in the Middle and Upper schools, and ended our data collection near the end of the school year in April 2003 with final interviews with the middle school teachers. Our fourth year evaluative efforts were focused on ascertaining the degree to which the project was reaching three key goals:

- enhancing the teaching and learning environment at Athens Academy,
- enhancing achievement and performance, and
- enhancing key qualifications for the information age.

Specific questions and data collection methods are displayed in Figure 1. Copies of instruments used during the fourth year are in the Appendices (A: teacher questionnaire, B: student questionnaire, C: teacher focus group protocol, D: student focus group protocol, E: observation protocol).

Questions	Methods	questionnaire	interview	focus groups	observations
Impact on teaching & learning?					
Impact on achievement and performance?					
Impact on information age qualifications?					

Figure 1. Data collection matrix.

Data Analysis

Several methods of analysis were used to enable our interpretation of the data. Responses to the teacher questionnaires and student surveys were imported into SPSS so that descriptive statistics could be generated. Factor analysis and ANOVA were also used to help inform the results when needed. Tapes from the interviews and focus groups were analyzed and themes were identified through inductive analysis and coding. Each member of the evaluation team who participated in the interviews, focus group meetings and classroom observations recorded reflective notes. The reflective notes were used to substantiate the themes identified from the analysis of the focus group tapes and checklists from the observations. The results of the analysis from the year four data collection are discussed in the next section of this report.

FINDINGS TO DATE

The Findings to Date section of the report is organized around several major themes. These have been divided into two main sections: the middle school cohort and the upper school cohort. Each section is then further divided into two main subsections: themes related to teachers and themes related to learners. Main themes described in the subsections include:

Teachers

- 1) The teaching and learning environment
- 2) Impact on achievement and performance
- 3) Views on information age qualifications

Learners

- Computer use and expertise
- Attitudes toward school and using laptops for learning
- The learning environment
- Impact on performance

Each theme is reported in a separate section that includes the following information:

- 1) A quotation from the literature relevant to the theme
- 2) An **Introduction** to the theme and its key points
- 3) **Data** revealed by the evaluation to date (e.g., percentages from surveys)
- 4) The evaluators' **Interpretation** of the data, and
- 5) A recommendation captured in **Next Steps**.

In the case of information technologies, teachers make choices by asking practical questions that computer programmers, corporate executives, or educational policymakers seldom ask.

Here are some of the questions teachers ask:

- Is the machine or software program simple enough for me to learn quickly?*
- Is it versatile, that is, can it be used in more than one situation?*
- Will the program motivate my students?*
- Does the program contain skills that are connected to what I am expected to teach?*
 - Are the machine and software reliable?*
- If the system breaks down, is there someone else who will fix it?*
 - Will the amount of time I have to invest in learning to use the system yield a comparable return in student learning?*
 - Will student use of computers weaken my classroom authority?*

*- Larry Cuban,
Oversold and Underused:
Computers in the Classroom,
2001*

MIDDLE SCHOOL TEACHERS: THE TEACHING AND LEARNING ENVIRONMENT

Introduction

This theme captures teachers' attitudes toward the teaching process and how they create their learning environment. This includes teaching methods, activities, and how laptops are used in the classroom.

Data

Three primary sources of data were used to inform this area: observations in the classroom, questionnaires, and beginning and end of the year focus groups.

Observations. Observations revealed that the majority of the middle school teachers continued to use the laptops in their classrooms during the 2002-2003 school year. Highest use occurred in three primary subject areas: English, geography, and history. Other teachers of core subject areas, science and math, made use of the laptops, but not as extensively as the English, geography, and history teachers.

Observations also revealed that having access to the laptops in the classroom enabled three primary activities: word processing, presentations and information seeking. Students took notes on a regular basis with the laptops. Students developed presentations to represent their understanding of concepts and ideas. Students were also engaged in information seeking activities using Web-based resources such as search engines and databases. In addition, teachers made use of the laptops to do presentations with and for students, particularly in geography. These activities were the same as those reported in the year three report.

Questionnaires. Teachers reported using the laptops between one and five days a week, with a median of 3.5 days. Teachers reported using their laptops for demonstrations in class as well as for the facilitation of important administrative tasks, including e-mail communications, grading, and creating tests/resources for use in class. They also used the computers for lesson planning and gathering resources for use during a specific lesson or unit.

Programs used included Outlook, Explorer, MicroGrade, Word, PowerPoint, and Excel. Time spent on tasks utilizing laptops generally ranged from 10 minutes to over an hour within one day.

Focus Group. Teachers reported using the laptops in a variety of ways during the focus group interviews, with e-mail and the Web continuing to lead the way as in year three. Other applications included word processing and databases. Teachers also reported that they were using the laptops for keeping track of grades (e.g., MicroGrade).

The laptops have continued to have an impact on the day-to-day activities in the classroom. Most teachers reported that the laptops are a daily tool and an important part of the teaching and learning environment. They also indicated that the laptops are not as “big a production” as they might have been in the past. The laptops are increasingly becoming a part of the classroom landscape, although they have certainly not become “invisible” in the sense that “technologies” such as white boards and textbooks have been for many years.

The Middle School teachers stated that they feel the laptops enable them to do more student centered activities. They also mentioned that the laptops help them teach. For example, several teachers indicated that the laptops made planning easier. One teacher commented that planning takes a long time, but it makes doing projects faster, smoother and easier. The teachers indicated that this was a good thing for the students.

In terms of obstacles, the teachers mentioned that the laptop technical problems also make achieving curriculum goals a challenge at times. One teacher stated it was hard to get started with class if a student’s computer has problems and they are trying to fix it. With the limited class period, it is not always easy to handle technical challenges associated with the laptops.

Interpretation

Since the laptops were first introduced during the spring of 2000, the teaching and learning environment at Athens Academy continues to evolve at the Middle School level. As in year three, the laptops are being used more and for a wider variety of activities. Teachers continue to critically examine the use of the laptop, seeking best applications of the technology to assist their students.

Perhaps the greatest change from year three to year four in regards to how the teachers are using the laptops in the middle school relates to their perceptions of the laptop. This final year of the evaluation found more teachers referring to the laptop as a “tool” and referring to it as another essential component of the classroom environment. Although certainly challenges remain in terms of seamless and non-

problematic use, overall, it appears that most of the middle school teachers are very comfortable with having the laptops in the classroom, and they would not willingly give them up.

Questionnaire, interview, and focus group data continue to indicate that the teachers primarily use the laptop for administrative-related activities (e-mail, planning, grading). There is a continued emphasis on the tool for teacher productivity versus use with their students or student-generated work. The opportunity to use the laptops for increased productivity by the students in all subjects has yet to be realized. There are notable exceptions, but the predominant focus in the teaching and learning environment remains teacher-centric.

As indicated in the first three years, change in practice and application of technology takes time. The teachers continue to indicate a willingness to integrate the laptops into their classroom. But the issue that was reported as key to holding back progress in the first three years was once again indicated in this final year: limited time to plan for integration of the technology. The teachers also continued to express some frustration with the hardware and with Internet access, indicating that the system could not be trusted 100% of the time, making it difficult to use it within the classroom context in which time pressures demand reliability. It is also important to note that other factors could be contributing to the frustration with the system, including skill and comfort level with the technology.

Next Steps

As reported in year three, to realize the full benefits of technology integration, a variety of teaching methods and learning techniques will need to be demonstrated, implemented and practiced by the teachers. Teachers need examples and models of teaching and learning techniques that have been proven to be effective in technology-enhanced learning environments. The data suggests that providing support to teachers as they learn these new methods and techniques will greatly assist with their implementation and adoption. Indeed, the teachers are eager to receive this support, not so much in terms of overall professional development sessions but rather via Idea Sharing and Brainstorming – sessions where teachers and students can talk about how they are using the laptops, sparking new ideas, and nurturing collaborations among faculty and students, within and across grade levels.

Another activity that could help facilitate the use of the tools are sessions in which contingency plans are discussed for when the laptops and/or Internet access is interrupted. Having ideas for working around the inevitable challenges would be useful for everyone.

One concern teachers raised in this study was that student-centered programs may not support student acquisition of the body of factual knowledge that up until now has been the focus of standardized tests.

Even if these tests change, teachers are likely to judge the effectiveness of instructional materials based at least in part on how much factual information students acquire, even though this runs counter to constructivist views of learning, where learners are expected to acquire facts only as they become useful to the task at hand. Still, there is no reason that student-centered learning cannot lead to factual knowledge acquisition.

However, the facts students learn in student centered learning environments (SCLE) may not be easy to assess through standardized tests. Students may not all acquire the same facts with an SCLE and they may be unable to apply their newly acquired knowledge to respond correctly to objective questions as used in standardized tests.

*- Susan Pedersen & Min Liu,
Teachers' Beliefs about
Issues in the Implementation
of a Student-Centered
Learning Environment,
2003*

MIDDLE SCHOOL TEACHERS: IMPACT ON ACHIEVEMENT AND PERFORMANCE

Introduction

This theme captures information concerning teachers' attitudes toward the laptop program and its impact on achievement and performance. The theme relates to the impact on the teachers themselves as well as the impact on their students.

Data

Two primary sources of data were used to inform this area: observations in the classroom and an end of the year focus group.

Observations. The teachers continue to make extensive use of the laptops to assist them with their instructional and administrative tasks. Observations in a variety of classrooms and at various times revealed that while teachers are using the laptops with their students, this type of use is limited, both in terms of different applications and time on task.

Focus Group. During the end of the year focus group, the teachers once again reported that they continue to see an increase in a variety of computer skills – both their own and those of their students – as well as an increase in comfort level. The teachers indicated that they are relying more on the technology to complete teaching tasks. While the teachers emphasized the benefits to their instructional and administrative tasks, teachers also indicate that the ubiquitous technologies are making some tasks for the students easier, including communication and writing.

Interpretation

While the laptops are having an impact on what students are doing in the classroom and how they are completing the tasks, particularly out of the classroom, the overall impact on student achievement, as traditionally measured, continues to be limited. There are two factors that may be contributed to the limited impact. First, the performance of students at Athens Academy is traditionally quite high in terms of assessment (e.g., classroom tests, standardized tests). It is unlikely that the scores will dramatically increase as a result of the laptops.

Second, it is important to note that the low impact on achievement is not unusual in a laptop infused learning environment. Other laptop evaluation and research efforts have indicated similar findings (e.g., Bartels, 2002; Rockman et al., 1999). Indeed, from an historical perspective, it seems unrealistic to expect that the use of technology will have an impact on achievement on traditional measures (e.g., standardized tests) when the activities that learners engage with the technology are not “traditional.” As stated by John Bransford, former director of the Cognitive and Technology Group at Vanderbilt, the fact that the integration of technology (i.e., laptops) is not having a negative impact on traditional achievement measures is significant as long as there is evidence that other types of outcomes, e.g., problem solving and information skills, are improving.

As we have noted in previous reports, when the use of the laptops begins to influence how assessment is conducted in schools, we should be able to get better indications of how the technology is impacting the achievement and performance of the students. But as long as the assessments remain the same, a direct link between technology integration and achievement tests is unlikely to be found.

Next Steps

Teachers continue to indicate that greater use of laptops in the classroom was both desirable and do-able. Steps were taken during year four that moved this goal forward. However, as indicated in the year three report, efforts should be continued to provide models and ideas for how best to use the laptops in the classroom so that teachers can continue to extend and expand their perspectives on how to integrate the laptops into the classroom. The teachers also continue to need time to practice these strategies and techniques so that they can become comfortable with new methods. It is also obvious that the teachers of some subjects (e.g., social studies) feel more comfortable with the type of constructionist pedagogy that can take advantage of ubiquitous computing whereas teachers of other subjects (e.g., mathematics) remain uncomfortable with pedagogical strategies that require technology integration or are more comfortable with pedagogy that requires no technological support. For the latter teachers, it may be necessary to bring in outside experts who have managed to integrate effective pedagogy with technology for intensive workshops.

Computers can be the technical foundation of a new and dramatically enhanced literacy, which will act in many ways like the current literacy and which will have penetration and depth of influence comparable to what we have already experienced in coming to achieve a mass, text-based literacy...If a true computational literacy comes to exist, it will be infrastructural in the same way current literacy is in current schools. Students will be learning and using it constantly through their schooling careers and beyond in diverse scientific, humanistic, and expressive pursuits. Outside of schools, a computational literacy will allow civilization to think and do things that will be new to us in the same way that the modern literate society would be almost incomprehensible to preliterate cultures.

*- Andrea A. diSessa,
Changing Minds: Computers,
Learning, and Literacy,
2000*

MIDDLE SCHOOL TEACHERS: VIEWS ON INFORMATION AGE QUALIFICATIONS

Introduction

This theme captures teachers' perceptions regarding key qualifications of the information age and the impact of the laptop initiative for enabling and enhancing these skills.

Data

Two primary sources of data were used to inform this area: observations in the classroom and an end of the year focus group.

Observations. Observations during year four revealed that teachers and students were engaged in some activities that would enhance key information age qualifications, specifically information seeking, information evaluation, and information presentation. On a personal level, teachers made extensive use of the Web for planning, looking for resources they could bring into their classroom as well as for breaking news about world events. Some teachers also used the Web with their students, guiding them in looking for information as well as helping students evaluate the information once it is retrieved. Teachers also assisted learners in working to present the information in ways that were meaningful and relevant with respect to specific tasks.

Focus Group

One of the points the teachers once again emphasized during the focus group interview was the extensive use of Web-based resources to assist them with enhancing their classroom practice. Teachers continued to indicate that the Web enabled them to bring **real** and **multiple** resources into their classrooms easily. The teachers also mentioned that use of the laptops enabled students to build skills like critical thinking, analysis, and independent thinking.

While primarily positive, the teachers also expressed that while access to the resources is a good thing, they are concerned about student over-reliance on electronic resources. Teachers are concerned that students may be assuming that easy access to information via the laptops is sufficient for research.

Interpretation

Of the areas examined in the final year of the laptop evaluation, this is perhaps the area that has shown the greatest growth since the beginning of the initiative. Teachers recognize the value of the laptop as a powerful information tool. Moreover, some of the teachers are shifting what happens in their classrooms to take advantage of this powerful information tool. For example, one teacher encouraged the students to look at different ways they could link information together. Another teacher enabled students to work together in teams to learn the material, sharing Internet resources. The Middle School teachers continue to make significant strides toward using the laptop as an information age tool to extend and enhance the teaching and learning environment in their classrooms and beyond.

Next Steps

Teachers remain eager and willing to make use of the laptop as an information tool in their classroom. What remains are two of deterrents mentioned during year three: ideas and time. Once again, in the end of year focus group the teachers emphasized that they need and want ideas for what Web-based resources to use and how to make them work efficiently and effectively in their classrooms. They also emphasized a need for time to review Web sites that may be useful in their classrooms. While the Technology Staff at Athens Academy have done a commendable job in assisting teachers (e.g., creating teacher Web pages with links, working with teachers to identify information and build Web pages), continuing to find ways to help support teachers in this effort will greatly enhance the laptop initiative. Some teachers also may need additional support in enabling their students to develop better skills in judging the quality of information they find on the Web, and the importance of checking alternate resources such as the school media center or local libraries.

... just because every child at Mott Hall has a computer doesn't mean that the computers are used by every teacher, or that they're used every day, as the experiences of an 8th grade class on a recent Wednesday suggest. In their social studies and mathematics classes, the students left their laptops under their desks. In a community-service class, one girl used a laptop and TV monitor to show the class a World Wide Web site she had created about volunteering at a local elementary school. In science, the students used laptops in groups for word processing or generating charts and graphs, to revise project reports based on their teachers' written comments. In English, the students created empty tables on their laptop screens in the beginning of the period, conducted a discussion about the novel *To Kill a Mockingbird*, and returned to the laptops only during the last few minutes of the period to plug in a few words. With the exception of the science class, where the computers were truly used as a tool, the fact that the students had laptops seemed irrelevant.

– *Laptops for all doesn't mean they're always used* (Zehr, 2000).
Education Week
 (<http://www.edweek.org/ew/ewstory.cfm?slug=39laptop.h19>)

MIDDLE SCHOOL LEARNERS: COMPUTER USE AND EXPERTISE

Introduction

This theme relates to where learners are using computers, the activities in which they are engaged with computers, and their perceptions of their own expertise with using computers.

Data

Three primary sources of data were used to inform this area: observations in the classroom, focus group interviews with 7th and 8th graders, and an end of the year survey. To help further delineate the data, the information is presented below in three categories: Computer Use at School, Computer Use at Home, and Expertise with Computer Applications.

Computer Use at School. The students reported a high use of the laptops, both at home and at school, with 96% of the 7th graders reporting almost daily use and 94% of the 8th graders reporting almost daily use (an increase of 20% since last year). The majority of the students also reported *often* or *sometimes* getting to decide when to use the laptops (77% in 7th grade and 79% in 8th grade). Some students indicated *almost daily* use of computers other than their laptops (19% in the 7th grade and 15% in the 8th grade) although a significant percentage indicated that they never use a computer other than their laptop at school (37% in the 7th grade and 42% in the 8th grade). This may indicate that the laptop has become their main computer.

Both 7th and 8th grade students expressed ownership of many decisions related to their laptops. For example, 48% of the 7th and 8th graders reported that they decide when to use the laptop to work on an assignment. They are also taking ownership outside of class-based activities. 46% of the 7th grade and 79% of the 8th grade students indicated that they *often* or *always* decide when they want to use the laptop for non-academic activities (see Tables 6 and 7 for a more detailed report of use of the laptops for grades 7 and 8).

Table 6. 7th grade students' use of and decisions related to laptops

7th Grade Experience with Laptops					
Frequency in Percent					
	Never	Rarely	Sometimes	Often	Always
1. Student decides when he or she wants to use the laptop to work on an assignment.	0	9.2	33.8	47.7	9.2
2. Student decides when he or she wants to use the laptop for non-academic activities.	10.6	7.6	36.4	25.8	19.7

Table 7. 8th grade students' frequency of using laptops

8th Grade Experience with Laptops					
Frequency in Percent					
	Never	Rarely	Sometimes	Often	Always
3. Student decides when he or she wants to use the laptop to work on an assignment.	0	4.5	29.9	47.8	17.9
4. Student decides when he or she wants to use the laptop for non-academic activities.	10.4	10.4	38.8	10.4	29.9

Responses to questions regarding how the computers are being used in school were also revealing. 80% of the 7th graders and 75% of the 8th graders reported that they use the laptop to do school work almost daily (an increase of 25-30% from last year). Students also reported their use of a variety of tools, including use of the Internet *almost daily* to send e-mail (80% - 7th graders; 41% - 8th graders) and searching for information (34% *almost daily* and 39% *weekly* for the 7th graders; 36% *almost daily* and 52% *weekly* for the 8th grade). The students also reported a high use of the Microsoft Word application for word processing *almost daily* (63% of the 7th graders; 78% of the 8th graders) or *weekly* (37% of the 7th graders and 17% of the 8th graders). Instant messaging was also widely used with 36% of the 7th grade reporting *almost daily* use (19% *weekly*) and 27% of the 8th grade reporting *almost daily* use (21% *weekly*) (see Table 8 and 9 for a breakdown of the tools used by grade level).

Table 8. 7th grade students' use of tools

7th Grade Frequency of Use with Computer Applications					
Frequency in Percent					
	Never	Once or Twice a Year	Monthly	Weekly	Almost Daily
1. Play games	3	3.0	13.6	54.5	25.8
2. Do schoolwork	0	0	1.5	18.5	80
3. Word processing	0	0	0	36.8	63.2
4. Spreadsheets	0	9.1	31.8	57.6	1.5
5. Presentations	0	6.9	75.9	15.5	1.7
6. Multimedia & Webpages	67.2	21.9	7.8	3.1	0
7. Search for information on Web	0	1.6	25.8	38.7	33.9
8. Email	1.5	0	3	15.2	80.3
9. Instant messaging	40.6	1.6	3.1	18.8	35.9
10. Tutorials/drill & practice	61.5	23.1	9.2	4.6	1.5
11. Graphics	11.7	18.3	16.7	40	13.3

Table 9. 8th grade students' use of tools

8th Grade Frequency of Use with Computer Applications					
Frequency in Percent					
	Never	Once or Twice a Year	Monthly	Weekly	Almost Daily
1. Play games	13.4	10.4	26.9	31.3	17.9
2. Do schoolwork	0	0	1.5	23.9	74.6
3. Word processing	1.6	0	1.6	17.2	79.7
4. Spreadsheets	20	52.3	21.5	6.2	0
5. Presentations	0	0	68.8	29.7	1.6
6. Multimedia & Webpages	59.7	29.9	7.5	3	0
7. Search for information on Web	0	0	12.1	51.5	36.4
8. Email	1.5	1.5	12.1	43.9	40.9
9. Instant messaging	40.9	1.5	12.1	21.2	27.3
10. Tutorials/drill & practice	70.1	19.4	7.5	3	0
11. Graphics	21.5	29.2	16.9	23.1	9.2

This data was echoed in the focus groups where students described the most frequently used applications as being the Internet/Web, Word, and PowerPoint. Our observations are also aligned with the data reported by the students. When using the computers, students were frequently observed connecting to the Internet and/or Web. We were also able to observe them using various other tools during the academic year, particularly Word.

While the laptops are receiving a considerable amount of use in school for structured class activities, our observations, as well as comments in the focus group by the students (n=4 7th graders and n=4 8th graders), indicate that this is not all the computer activity that is occurring in the classroom. In school, the students reported using the laptops for writing, sending e-mail, and finding resources. Students also stated they are playing games, however this has decreased since year three (26% of the students in the 7th grade reported playing games *almost daily* on the end of year

four survey (versus 40% in year three) and 18% of the 8th graders reporting similar activities (versus 25% in year three)). The students also mentioned using the laptops to listen to music.

Computer Use at Home. In terms of computer use at home, 67% of the 7th graders reported *almost daily* use at home while only 49% of the 8th graders reported *almost daily* use at home. This is somewhat explained by the learners response to the question of *how often do you use a computer other than a laptop at home* to which 32% of the 7th grade learners reported *almost daily* use of another computer and 49% of the 8th grade learners reported *almost daily* use of another computer at home.

This is a significant shift for the 8th grade learners, where only 8% reported use of another computer at home during year 3. While some students mentioned experiencing technical problems with the laptops at home during the focus group, other factors may be contributing to the problems. The shift was not well-explained by the data gathered during the final year of the evaluation.

Expertise with Computer Applications. As in previous year-end reports, the students reported a high level of expertise with a variety of applications. 82% of the 7th graders and 57% of the 8th graders reported that they *rarely* or *never* need help with word processing. Similar percentages reported that they *rarely* or *never* need help with PowerPoint (74% - 7th grade; 62% - 8th grade). A few students described possessing exceptionally advanced technology skills such as pressing their own music CDs and advanced levels of online game participation.

The students' expertise is spotlighted with Internet and Web-based applications. 31% of the 7th graders and 39% of the 8th graders consider themselves to be *experts* with Web-based applications (i.e., Explorer). They also view themselves as highly proficient with e-mail applications, with 27% of the 7th graders and 36% of the 8th graders reporting themselves to be *experts* with Outlook (see Tables 10 and 11 for a more detailed representation of levels of expertise).

Table 10. 7th graders expertise with applications

7th Grade Expertise with Computer Applications					
Frequency in Percent					
	I always need help.	I sometimes need help	I rarely need help.	I never need help.	I can help other. I am an expert.
1. Games	0	3.1	21.5	52.3	23.1
2. Word processing	0	6.2	43.1	38.5	12.3
3. Spreadsheets	0	35.9	50	6.3	7.8
4. Presentations	0	10.8	46.2	27.7	15.5
5. Multimedia & Webpages	43.1	19.6	13.7	17.6	5.9
6. Email	0	0	16.7	56.1	27.3
7. Instant messaging	0	1.6	8.1	53.2	37.1
8. Search engines	0	3.1	18.5	47.7	30.8
9. Browser	1.6	9.7	29.0	45.2	14.5
10. Tutorials/drill & practice	12	22	28	32	6
11. Graphics & pictures	7	12.3	54.4	17.5	8.8

Table 11. 8th graders expertise with applications

8th Grade Expertise with Computer Applications					
Frequency in Percent					
	I always need help.	I sometimes need help	I rarely need help.	I never need help.	I can help other. I am an expert.
1. Games	0	21.2	16.7	39.4	22.7
2. Word processing	0	9	23.9	32.8	34.3
3. Spreadsheets	12.1	33.3	33.3	12.1	9.1
4. Presentations	0	6.1	31.8	30.3	31.8
5. Multimedia & Webpages	29.5	36.1	13.1	11.5	9.8
6. Email	0	4.5	7.5	52.2	35.8
7. Instant messaging	0	6.2	10.8	44.6	38.5
8. Search engines	1.5	3	11.9	44.8	38.8
9. Browser	3	6	17.9	46.3	26.9
10. Tutorials/drill & practice	16.4	20	18.2	32.7	12.7
11. Graphics & pictures	9.5	19	28.6	23.8	19

Interpretation

Computer Use at School. From the students' perspective, the use of the laptops at school has seen a significant increase from year three to year four. Further, a variety of applications are being used, and students are expressing confidence in their expertise with common applications. While this is a promising trend, how the laptops are being used should be further examined. In the focus groups, students reported using the laptop primarily for, writing, sending e-mail, and locating Internet resources. While each of these activities is important, exactly what they are doing should be explored. For example, students indicate that they are keeping notes with the laptop (63% of the 7th graders and 67% of the 8th graders report *often* or *almost always* using their notes kept on the laptop). Keeping notes is an important skill that students need for high school, college, and many careers. In the focus groups, the students also indicated that the laptops have helped them with keeping their school work organized. But are note-taking and organization skills enough? It appears that the students are not spending a great deal of time **creating** original projects with the laptops, nor are they showing indications of going beyond what is required or asked by the teacher (54% of the 7th graders and 47% of the 8th graders report *rarely* or *never* going beyond what is asked of them by the teacher). These will be important areas of further consideration as technology integration continues. When will students achieve the kind of computational literacy promoted by diSessa (2000) and others?

Computer Use at Home. During the second year of the project, students reported using the laptops at home for more personally related tasks (e.g., e-mail and downloading files). However, this shifted in the third year, with more students reporting **not** using the laptop at home – a trend that has continued in the fourth year, particularly with the 8th grade. Many students once again reported that it was easier to use the system they have at home rather than making the effort required to get their laptops to work at home. This may be a challenge for on-going technology efforts, especially if students continue to be required to take their laptops home. On the other

hand, if students have access to computers at home and prefer to use them, there may be insufficient rationale for encouraging them to use their laptops.

Expertise with Computer Applications. The level of computer expertise reported by the students continues to grow. This trend, which has continued since year two, is exciting, but may have implications in terms of expectations on the part of the students. As the students' level of expertise with applications increases, expectations for how they use the applications will also increase. Clearly, there are areas where students need to develop their skills (e.g., developing Web pages). But in many areas, their level of confidence in using the applications appears to be high (e.g., word processing, e-mail, PowerPoint presentations).

This high level of perceived expertise can also be used to an advantage. Teachers can assign writing and presentation assignments with some degree of assurance that most students can do the work. Teachers shouldn't need precious class time to teach applications any more. The data also seem to indicate that learners are open to learning new things with the laptops. Taking advantage of the learners' motivation provides teachers with an opportunity to move into new areas with laptops.

Next Steps

Similar to the Middle School teachers, the Middle School students demonstrated growth in the last year of using the laptops. Students reported an increase not only in terms of their use of the laptops, but also an increase in their expertise with various computer technologies. This increase in skill and confidence level presents teachers and administrators with an opportunity to continue exploring other ways in which the laptops can be used to enhance the learning experience for the students. Now that the majority of the 7th and 8th students have the basic skills in place, steps can be taken to help move them to the next level so that the laptop can become more of an extension to their thinking and doing.

On a more personal level, many students and some parents have expressed concern about the weight of the computers, especially for the middle grade students. With the advent of easily portable flash memory and network backups, it may be time to reconsider the requirement that students now have to haul their laptops back and forth between home and school.

Several studies suggest educational benefits related to laptop use. Specific benefits noted include increased student motivation (Gardner 1994, Rockman, 1998), a shift toward more student-centered classroom environments (Stevenson, 1998; Rockman, 1998), and better school attendance than students not using laptops (Stevenson, 1998). In his study of a laptop pilot program in Beaufort, South Carolina, Stevenson (1998) also reported that students with laptops demonstrated a "sustained level of academic achievement" during their middle school years, as opposed to students not using laptops who tended to decline during this same period. He also noted that these academic benefits were most significant in at-risk student populations. In their study of laptop use in middle school science classrooms, Fisher and Stolarchuk (1998) found that those laptop classrooms in which skills and the process of inquiry were emphasized had the most positive impact on student learning and attitudes.

*- Yvonne Belanger,
Laptop Computers in the
K-12 Classroom,
2000*

MIDDLE SCHOOL LEARNERS: ATTITUDES TOWARD SCHOOL AND USING COMPUTERS FOR LEARNING

Introduction

This theme examines four aspects of attitudes toward computers and school: (1) attitudes toward school and schoolwork in general, (2) attitudes toward using computers for schoolwork and learning, (3) interest in computers and perceived relevance of computer ability, (4) and the impact laptops have had on their performance.

Data

Two primary sources of data were used to inform this area: focus group interviews with the 7th and 8th graders and an end of the year survey. (See Tables 12 and 13 for summary information for 7th and 8th grade.) The students have a positive attitude toward using the laptops for schoolwork and learning. 63% of the 7th graders and 64% of the 8th graders report that they perceive that the laptops improve the quality of their work as well as improve their attitude toward school. They also *agree* or *strongly agree* that the laptops make schoolwork easier, with 83% of the 7th graders and 82% of the 8th graders reporting this result. During the focus group interviews, students reported specific ways in which the laptops help them with their work, including: accessing Internet resources, writing with ease and convenience (i.e., drafting, editing, revising their papers), and organizing their documents.

The majority of the Middle School students indicated that they prefer using the computer to paper and pen/pencil (81% - 7th grade; 75% - 8th grade *agreed* or *strongly agreed*) and that it makes their work more interesting or fun (72% - 7th grade; 55% - 8th grade *agreed* or *strongly agreed*). And while they see advantages, over half reported that they see *disadvantages* with use (70% - 7th graders; 73% - 8th graders *agreed* or *strongly agreed*), stating they perceive challenges with use of the laptops.

Table 12. 7th graders attitudes toward computers and school

7th Grade Attitudes Toward Computers & School					
Frequency in Percent					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Laptops make schoolwork easier to do.	1.5	0	15.2	39.4	43.9
2. I prefer to use my laptop to do schoolwork instead of using paper and pencil.	0	7.6	12.1	34.8	45.5
3. Using laptops for schoolwork can also have disadvantages.	6.3	6.3	17.5	61.9	7.9
4. Laptops make schoolwork more fun and interesting.	0	1.5	26.2	40	32.3
5. Laptops help me improve the quality of my schoolwork.	4.6	6.2	26.2	32.3	30.8
6. Laptops are helping me make better grades.	7.6	9.1	54.5	15.2	13.6
7. The laptops are too much trouble to carry around.	9.4	29.7	34.4	21.9	4.7
8. I look forward to the continued use of laptops in my classes.	1.6	0	18.8	43.8	35.9
9. I need to learn many new skills to use my laptop for my schoolwork.	14.3	44.4	28.6	7.9	4.8
10. I would be equally prepared to enter college without the laptop program.	12.1	36.4	36.4	12.1	3
11. Having my laptop in class is an advantage when it comes to learning.	3.2	6.3	31.7	42.9	15.9
12. I think my ability with computers will affect the grades I get.	6.2	15.4	38.5	30.8	9.2

Table 13. 8th graders attitudes toward computers and school

8th Grade Attitudes Toward Computers & School					
Frequency in Percent					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Laptops make schoolwork easier to do.	3.0	1.5	13.6	51.5	30.3
2. I prefer to use my laptop to do schoolwork instead of using paper and pencil.	1.5	7.5	25.4	25.4	40.3
3. Using laptops for schoolwork can also have disadvantages.	4.8	6.5	16.1	54.8	17.7
4. Laptops make schoolwork more fun and interesting.	6.0	4.5	34.3	38.8	16.4
5. Laptops help me improve the quality of my schoolwork.	0	9	26.9	38.8	25.4
6. Laptops are helping me make better grades.	9	22.4	53.7	9	6
7. The laptops are too much trouble to carry around.	14.9	25.4	34.3	17.9	7.5
8. I look forward to the continued use of laptops in my classes.	3	3	29.9	43.3	20.9
9. I need to learn many new skills to use my laptop for my schoolwork.	22.7	43.9	22.7	9.1	1.5
10. I would be equally prepared to enter college without the laptop program.	3	24.2	45.5	21.2	6.1
11. Having my laptop in class is an advantage when it comes to learning.	1.5	6.1	37.9	40.9	13.6
12. I think my ability with computers will affect the grades I get.	6.1	25.8	37.9	3	3

Several specific examples of challenges were mentioned during the focus group interviews. First, they mentioned the technical problems (e.g., freezing, crashing, slowing down, network problems). Second, they noted that with laptops, it is often easy to get distracted. A third challenge mentioned by the learners during the focus groups is carrying the heavy laptops, along with all the other materials they must carry.

Despite their concerns about some disadvantages of using laptops, the students' general interest in computers remains strong and perceptions of their own computer skills is quite high. Overall, they appear to be quite confident. 59% of the 7th graders and 67% of the 8th graders do not perceive that they need new skills to use the laptops. Further, a strong majority **do not** want to give up having a laptop at school (86% of the 7th graders and 73% of the 8th graders *agreed* or *strongly agreed*). Further, they are looking forward to the continued use of the laptops (80% of the 7th graders and 64% of the 8th graders *agreed* or *strongly agreed*).

Interpretation

As in previous years of the initiative, students continue to maintain a positive attitude toward the laptop initiative. While there are indications that they are not happy with some specific components of the laptops (e.g., weight of the unit, battery life, losing data), overall the students seem to value having and using the laptop for learning, particularly for communicating. In fact, when asked directly about not having the laptops, the students expressed how difficult it would be. Further, in the focus group interview, the students stated that they believe that using the laptop would increase their opportunities for going to college and getting a job in the future.

A continued challenge that needs attention is the perceived weight of the machines. The students clearly indicated during the focus group interviews that the unit is heavy, and repeatedly stated that the laptop presented challenges in terms of carrying it around along with all the other materials they carry.

Next Steps

Since the students have a positive attitude toward use of the laptop for learning, and even perceive that it helps improve their grades in some courses (e.g., English and history), teachers have a prime opportunity to take advantage of this attitude and use the laptops to help students develop a more positive outlook on schoolwork in general and a greater appreciation for the formal teaching and learning process. The continued challenge will be finding activities and applications that will help the students to continue to stretch their abilities so they do not become bored. Using the latest software and accessing powerful cognitive tools via the Web may help keep the students even more engaged in the learning process (LaJoie, 2000).

Another expression of the teacher-as-coach and student-as-worker is the movement called cooperative learning...In a cooperative classroom the teacher organizes the curriculum, or major parts of it, around tasks and projects that students carry out in small groups. Students function as part of a team. ... applying the principles of cooperative learning in the classroom is tricky business. It's not just a question of the teacher giving an assignment to a group of students and then standing back and watching them go at it. It requires carefully worked-out techniques. Teachers must be careful about the makeup of each group. They must constantly move about the classroom monitoring group progress and offering advice. Students must be instructed in "helping behaviors," such as giving each other explanation, not just answers. Students must be given specific roles, such as checker, summarizer, note taker. The big talker may be cast as the observer, for example, and thus put in a position to realize how much better the group functions when no one dominates.

*- Edward B. Fiske,
Smart Schools, Smart Kids,
1991*

MIDDLE SCHOOL LEARNERS: THE LEARNING ENVIRONMENT

Introduction

This theme examines student perceptions of various activities during a school day as well as preferred teaching and learning methods.

Data

One primary source of data was used for this category: the end of year survey. The data is divided into two main categories: Overall Perceptions of the Learning Environment and Learning Environment Preferences (see Tables 14 and 15 for an overall summary of learning environment data).

Overall Perceptions of the Learning Environment.

The students' overall perceptions of the learning environment once again did not alter much in this final year of the initiative. 73% of the 7th graders and 65% of the 8th graders report learning primarily through teacher instruction and teacher demonstrations. The teacher remains at the center when it comes to the discussions, with 74% of the 7th graders and 68% of the 8th graders reporting that the discussions are teacher-led. This trend is also evident when looking at activities engaged in by the students. 78% of the 7th graders and 75% of the 8th graders reported completing teacher-created activities. The activities appear to be almost equally mixed in terms of being completed on an individual basis or in a group. 50% of the 7th graders reported *often* working individually (39% *sometimes* individually) while 55% reported *often* or *sometimes* working in a group. This split was even more equal in the 8th grade with 39% reporting *often* working individually or in a group and 49% reporting *sometimes* working individually and 55% reporting *sometimes* working in a group.

There was a change from year three to year four in terms of use of media. In year three, 7th graders reported that when discussions are held or activities are completed, media was *sometimes* used in the 7th grade (54%). In the fourth year, the use of media was *sometimes* used 35% of the time (*rarely* 44%). In contrast, during year three, 8th graders reported media was *sometimes* used 58% of the time. However, in year four, 35% reported that it was *sometimes* used, and 40% reported it was *rarely* used.

Table 14. 7th graders learning environment

7th Grade Perceptions of Learning Environment					
Frequency in Percent					
	Never	Rarely	Sometimes	Often	Almost Always
1. Teacher instruction/ demonstrations.	1.5	3	22.7	36.4	36.4
2. Students work from textbooks.	0	12.5	40.6	42.2	4.7
3. Teacher prepared activities.	0	7.8	14.1	46.9	31.3
4. Group work.	0	33.3	47	18.2	1.5
5. Individual projects.	0	4.5	39.4	50	6.1
6. Group projects.	3.1	31.3	51.6	10.9	3.1
7. Teacher-led class discussion.	1.6	6.3	17.2	46.9	26.6
8. Media use (videos, tapes)	4.5	43.9	34.8	13.6	3
9. Student presentations of individual or group projects.	0	21.2	54.5	16.7	7.6
10. Go beyond classroom information at home.	12.1	42.4	28.8	13.6	3
11. Use word processing to edit and improve work	1.5	3	9.1	27.3	59.1

Table 15. 8th graders learning environment

8th Grade Perceptions of Learning Environment					
Frequency in Percent					
	Never	Rarely	Sometimes	Often	Almost Always
1. Teacher instruction/ demonstrations.	1.5	6	26.9	28.4	37.3
2. Students work from textbooks.	0	3	34.3	49.3	13.4
3. Teacher prepared activities.	1.5	1.5	22.4	38.8	35.8
4. Group work.	0	3	55.2	38.8	3
5. Individual projects.	1.5	9	49.3	38.8	1.5
6. Group projects.	0	6.1	56.1	34.8	3
7. Teacher-led class discussion.	0	1.6	30.2	46	22.2
8. Media use (videos, tapes)	4.6	40	35.4	18.5	1.5
9. Student presentations of individual or group projects.	0	6.1	40.9	13.9	9.1
10. Go beyond classroom information at home.	16.4	31.3	38.8	7.5	6
11. Use word processing to edit and improve work	1.5	7.5	7.5	25.4	58.2

Learning Environment Preferences. The learners' preferences for how they learn did not shift considerably from year three to year four. The 7th graders continued to report learning most from group work, individual projects, and teacher-led discussions. The 8th graders reported learning most from teacher-led instruction/demonstration, students working in groups, and using notes they have kept with the laptop to study.

Reports from students regarding how they enjoy learning also stayed consistent during the last year. The 7th graders reported that they enjoy learning from media use, group work, and group projects. The 8th graders reported that they enjoy learning from work in groups and media use. Both groups were aligned with the data reported during the initial surveys where students indicated that they learn most from media use, group work, and team projects,

Interpretation

Overwhelmingly, the Middle School students reported learning most from group work. This also aligns with the activities they reported enjoying most. In terms of enjoyment, students rated group work, media uses, and group projects the highest.

The trend that continues in this final year of the project is that students do not perceive that they learn best in the current classroom environment. In fact, students' perceptions of the environment and preferences for teaching and learning are not in alignment at all. The environment is primarily teacher-centered whereas both students and teachers express a preference for more student-centered learning activities such as group projects. Teachers continue to give indications that things need to change, but based on the data from the students, it would appear they have not yet moved in this direction to any great extent.

Next Steps

The data once again indicates that students are ready for a new approach to teaching and learning, primarily involving the group work and use of media. Given that the teachers continue to talk about a need for change themselves, a movement in the direction of a more learner-centered environment appears to be viable. Carefully facilitated and supported activities may help make this transition easier for everyone. The Apple Classrooms of Tomorrow (ACOT) (Fisher, Dwyer, & Yocam, 1996) project indicated that such a transition takes years, and even then, requires continual efforts to provide support and nurturing.

...some Americans do not see the schools as engines of both information and of intellectual liberation. Indeed, they find the latter – especially when so described – to be intolerable. The schools, they insist, are to teach young people what is true, what is right, and what is wrong. Anything beyond that is anathema. Their argument is seductive but flawed, especially when one gets to schooling beyond the rudiments. There is too much information to purvey, and choices have to be made. And what is right and what is wrong are, however much we may regret it, uncertain in most important matters. Should schools teach a particular kind of certainty? Or should they attempt to teach the craft and habit of deciding for oneself, on the merits?

- Theodore R.Sizer,
*Horace's School:
 Redesigning the American
 High School,*
 1992

UPPER SCHOOL TEACHERS: VIEWS ON TEACHING AND LEARNING

Introduction

This theme incorporates many areas associated with teaching and learning: how teachers structure their courses, teacher satisfaction with student performance, views of teacher and student roles in the process, and perceptions of teachers' satisfaction with the teaching process.

Data

Three primary sources of data were used for this category: observations in the classroom, questionnaires, and focus group interviews.

Observations. Observations revealed that many of the Upper School teachers used the laptops in their classrooms during the 2002-2003 school year. Highest use occurred in three primary subject areas: English, science, and history. The laptops were rarely used in math classes in the Upper School.

Observations also revealed that having access to the laptops in the classroom enabled two primary activities: word processing and information seeking. Students took notes on a regular basis with the laptops. Students were also engaged in information seeking activities using Web-based resources such as search engines and databases.

Questionnaires. All Upper School teachers stated that they enjoy teaching (87% *strongly agree*). All teachers agreed that they organize their courses to accomplish outcomes (57% *strongly agree*, 43% *agree*).

Giving students choice in what they do resulted in mixed reactions, with 44% *agreeing*, 22% being *neutral* and 26% *disagreeing*. This changed somewhat when asked if they prefer to direct most student work, 43% *strongly agreed* or *agreed* and 44% reported being *neutral*.

A majority of the Upper School teachers *agree* with the statement that they were pleased with the standard of work accomplished by their students (78%). On average, the teachers *agree* that they encourage students to help each other with schoolwork, that they prefer students to take responsibility for their own learning, and that students seem to enjoy learning. The data related to general view on teaching and learning is summarized in Table 16.

Table 16. Upper School teachers' general views on teaching and learning

Upper School Teachers' Views on Teaching & Learning					
Frequency in Percent					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I enjoy teaching.	0	0	0	13	87
3. I organize my course primarily to accomplish the outcomes.	0	0	0	43.5	56.5
5. I prefer to give students choice in what they do.	0	26.1	21.7	43.5	8.7
6. I prefer directing most student work.	4.3	8.7	43.5	26.1	17.4
7. I am pleased with the standard of work produced by my students	0	4.3	8.7	78.3	8.7
8. I encourage students to help each other with schoolwork.	0	0	21.7	34.8	43.5
9. I prefer students to take responsibility for their own learning.	0	0	0	36.4	63.6
10. Most of my students seem to enjoy learning.	0	0	4.3	73.9	21.7

Focus Group. As in the Middle School, Upper School teachers reported using the laptops as a daily tool. During the focus group interviews, the teachers reported using the laptops in a variety of ways, including e-mail and resources from the Web. Other applications included grading and subject-specific applications (e.g., electronic textbooks in science, PowerPoint in biology, and audio files in foreign language classes).

The laptops continue to have an impact on the daily activities in most Upper School classes. Teachers reported that the laptops are used everyday for keeping attendance and other administrative tasks. They also indicated that the laptops are increasingly becoming a part of the learning context in some classes, primarily for communication purposes. Several teachers commented on how much easier communication with multiple audiences (students, teachers, administrators, and parents) was now than in pre-laptop days.

In terms of obstacles, the Upper School teachers also mentioned that the laptops occasionally make achieving curriculum goals a challenge. They specifically mentioned challenges with the Internet as a distraction, the laptops freezing, and having mixed operating systems in the classroom. Another obstacle mentioned was the carrying and maintaining of the laptops. As in the Middle School, this is one more item for the students to shift between classes, adding to their overall load.

Interpretation

Overall, the Upper School teachers enjoy teaching and perceive that their students enjoy learning. The teachers' orientation to outcomes and students is also of interest. While the teachers have a goal of meeting outcomes, less than half appear to also be interested in giving students choice. This seems to run counter to the major goal of secondary education, i.e., graduating independent learners. The Upper School teachers may be more focused on meeting outcomes that can be measured by tests such as the SAT and AP exams that will guarantee students' entry into the universities of their choice than on the higher order outcomes such as independent learning skills, problem-solving, or creativity that are needed for success at the university level and in business. Nevertheless, it is obvious that these teachers are also very interested in their students' specific needs, and how well the outcomes are accomplished on an individual basis.

The teachers apparently perceive that their role in the classroom is also of special importance to laptop integration. Whether teachers perceive how much their roles may have to change is doubtful. Many teachers continue to report that a primary role for them was that of lecturer, with whole class instruction dominating. 83% of the teachers indicated that whole class instruction *almost always* or *often* happens. Teacher-led discussions and teacher demonstrations *often* or *almost always* occur. Yet, as has been mentioned before, they indicate that they prefer students to take more responsibility for their learning (100% *strongly agree* or *agree*). This discrepancy will likely create challenges as the integration of technology continues.

Next Steps

There would appear to be some conflict in terms of what teachers would like to see happen with students in the classroom (i.e., taking on more responsibility) and their role in the classroom (i.e., that of lecturer and directing student learning). Research indicates that in order for students to take on responsibility for learning, they need to be given ownership over their learning. While the role of lecturer may not mitigate this move, other roles (e.g., coach, mentor) will help promote and strengthen it. Providing teachers with incentives for adopting new roles, as well as providing guidance in making the transitions, will be important for the successful change. The integration of ubiquitous computing is predicted to shift classrooms from teacher-centered to student-centered (Fisher, Dwyer, & Yocam, 1996), and we have seen indications of this happening in the Middle School. Working to leverage this as much as possible in the Upper School would not only facilitate helping the current Upper School students in their continued growth as independent learners, it would also make the transition easier for the Middle School students.

When comparing elementary, middle, and high school teachers, it was found that elementary school teachers were integrating computers into the classroom more frequently than middle and high school teachers, despite the fact that attitudes were comparable. Elementary school teachers reported using computers primarily for independent learning, student centered learning, individual instruction, and as a communication tool. When the integration of computers in the classroom was compared by subject area, among middle and high school English, math, science and social studies teachers, it appeared that science teachers were using technology more frequently. Most significantly, the science teachers used technology for independent learning, as a communication tool, as a research tool for students, as a productivity tool and as a classroom presentation tool more often than for other reasons. Also, English, math, science and social studies teachers used technology as a communication tool more often than for any other reason.

- Christine Harmes, Kate Kemker, Kimberly S. Kalaydjian, & Ann E. Barron, Working Toward National Technology Standards: Teacher Use of Computers in the Classroom, 2001

UPPER SCHOOL TEACHERS: ATTITUDES TOWARD USING COMPUTERS FOR TEACHING

Introduction

This theme captures information concerning upper school teachers' attitudes toward using computers for teaching as well as specifics on the laptop program.

Data

Two primary sources of data were used to inform the information contained in this category: questionnaires and focus group interviews.

Questionnaires. The majority of the teachers indicated that they are enthusiastic about the laptop program (87% *strongly agree* or *agree*) and expect that their teaching will benefit from laptop use (61% *strongly agree* or *agree*). In terms of the need to learn new skills, 33% of the teachers indicate that they *agree* that they will need new skills. Overall, they are generally confident regarding their computer use (78% *agree*).

Many continued to indicate that computer use has changed their teaching (35% *agree* or *strongly agree*), although 57% reported being *neutral* on this item. Despite this neutrality, 74% *strongly disagreed* or *disagreed* with the statement "I would rather go back to teaching without laptops. Table 17 provides an overview of the data from the surveys.

Table 17. Upper School teachers' views on computer use for teaching

Upper School Teachers' Views on Computer Use for Teaching					
Frequency in Percent					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I feel enthusiastic about the laptop program.	0	0	13	69.6	17.4
2. I expect my teaching to benefit from laptop use.	0	4.3	34.8	43.5	17.4
3. I feel confident about my ability with computers.	0	4.3	13	78.3	4.3
4. I would rather go back to teaching without laptops.	34.8	39.1	26.1	0	0
5. I need to learn many new skills before I can use computers for teaching.	0	23.8	42.9	33.3	0
6. Computer use will essentially change my teaching.	0	8.7	56.5	21.7	13

Focus Group. During the focus group interviews, many of the teachers indicated that the laptop is a daily tool. Overall, for the teachers participating in the focus group (n=8), the use of the laptops was perceived as positive. However, some teachers have expressed concern over the use of the laptops in the classroom, indicating the laptops are a source of distractions. Another reservation expressed related to the students' writing. One teacher expressed concern that the "slang" used by the students in email and instant messaging is leading to grammatical errors in written communication.

The teachers described several other challenges associated with the technology during the focus groups. For example, a significant number of teachers once again mentioned concerns related to the reliability of the hardware and the Internet. Others mentioned that care and maintenance of the laptops was also a challenge. One teacher mentioned that the creation of symbols in math was not well facilitated with the current applications on the laptops. These challenges may indeed be a clear reflection of what we expect from instructional technologies: robust enough to meet overall needs yet flexible enough to meet the unique needs of the individual.

Interpretation

The majority of Upper School teachers continue to maintain positive attitudes toward the laptop initiative and generally appear to be optimistic toward their own abilities with computers. The teachers do, however, have concerns related to the laptops, many of which were vocalized during the focus group interviews. The overall positive outlook toward the laptop program is noteworthy, but it is important that actions be taken to address the concerns raised by the teachers.

Next Steps

In order to maintain the positive attitude pervading the Upper School in relation to the use of laptops, it will be important to provide significant support and guidance to the teachers as they move further toward the seamless integration of the technology in their classrooms. Providing opportunities for discussions and idea sharing within the Upper School and across into the Middle School (as occurred during Faculty Development Day during the fourth year) can assist in this effort.

It might also be beneficial to directly address the concerns expressed by the teachers (in the Upper and Middle School), particularly as they relate to hardware and software issues. While some of the challenges are beyond the control of the technology staff, acknowledging the concerns and providing an open forum for expression of the concerns may help avoid the creation of long-term barriers to success. Mathematics teachers, in particular, at both the Middle and Upper School levels, need support to enable them to create specific mathematical symbols on their laptops. As long as it remains easier to “do math” on the white boards, that is where it will be done.

In order for students to learn with technology, teachers must accept a new model of learning. Traditionally, teachers' primary responsibility and activity have been directly instructing students, where teachers were the purveyors of knowledge and students the recipients. That is, the teacher told the students what they knew and how they interpreted the world according to the textbooks and other resources they have studied. Teachers are hired and rewarded for their context expertise. This assumes that the ways that teachers know the world are correct and should be emulated by the students. Students take notes on what teachers tell them and try to comprehend the world as their teachers do. Successful students develop conceptions more similar to teachers'. Learners will not be able to learn with technology in this kind of learning context. They will not be able to construct their own meaning and manage their own learning if the teacher does it for them.

- David H. Jonassen, Kyle L. Peck, & Brent G. Wilson, Learning with Technology: A Constructivist Perspective, 1999

UPPER SCHOOL TEACHERS: THE TEACHING AND LEARNING ENVIRONMENT

Introduction

This theme captures Upper School teachers' attitudes toward the teaching process and how they create their learning environment. This includes teaching methods, activities, and how laptops are used in the classroom.

Data

Three sources of data were used for this category: observations in the classroom, questionnaires, and focus group interviews.

Observations. Overall, the observations of the teaching and learning environment revealed that while some of the Upper School teachers are making extensive and creative use of the laptops in their classroom, the majority of the teachers are not using the laptops with students. Teacher led activities continue to dominate the classroom, with little use of the laptops by students. When laptops are used, they are used primarily by the teachers for administrative purposes (e.g., online attendance). The majority of the classrooms in the upper school adhere to a traditional classroom structure: teachers lecture and students take notes. This means that when the laptops are used, the students use them for two activities: note taking and information seeking. Some teachers who primarily lecture are relying upon the white board and antiquated wall maps when PowerPoint and Web resources would greatly enhance their presentations.

While laptop use in the Upper School is not widespread, when it is used, it is used in innovative and creative ways. The science department is taking full advantage of the laptop. For example, the chemistry teacher uses the laptop on a regular basis to assist with experiments, including conducting the experiment, collecting the data, doing the analysis, and writing the report of the results. The geology teacher made extensive use of the laptop for a fossilization unit in his class. Students used a cognitive tool (designed, developed and researched by one of the evaluation team members, Dr. Shiang-Kwei Wang) as they explored how fossilization occurs, and under what conditions.

Another science teacher is making exclusive use of an electronic textbook for her class. She also uses the laptop in the classroom to access additional resources and to share notes with the students.

Other departments are also taking advantage of the laptops. Some of the English teachers are using the laptops for writing in class, as well as for bringing in new Web-based resources into the classroom. One of the English teachers has established an online bulletin board to facilitate discussion with her students. One of the foreign language teachers is making extensive use of the laptop for recording audio files. And in the history classes, resources are brought into the classroom on a daily basis to keep everyone current on international and national events.

It is important to note that the activities described in the last two paragraphs are not the norm in the Upper School. However, it is equally important to note that these teachers are models of how technology can be fully integrated into a learning environment.

Questionnaires. Whole class instruction continues to be the primary method used in the upper school classroom (83% *often* or *always*) with teachers leading the discussion in class (72% *often* or *always*). Teacher prepared activities are used more often than student prepared activities (61% *often* or *always*). Students work on activities they have defined less often (44% *sometimes*, 52% *rarely*). Group work is used *often* (39%), but the emphasis remains on individual work (22% *often*, 48% *sometimes*) versus group projects (78% *sometimes* or *rarely*). A summary of the data is presented in Table 18.

Table 18. Upper School teachers' views on teaching & learning environment

Upper School Teachers' Views on Teaching & Learning Environment					
Frequency in Percent					
	Never	Rarely	Sometimes	Often	Almost Always
1. Whole class instruction.	0	8.7	8.7	60.9	21.7
2. Textbook work.	8.7	8.7	43.5	34.8	4.3
3. Students work from laptop.	13	26.1	47.8	13	0
4. Teacher prepared activity.	0	0	39.1	47.8	13
5. Student prepared activity.	0	52.2	43.5	4.3	0
6. Group work.	0	17.4	39.1	39.1	4.3
7. Group projects.	8.7	30.4	47.8	8.7	4.3
8. Individual projects.	4.3	26.1	47.8	21.7	0
9. Teacher led class discussions.	0	0	28.6	61.9	9.5
10. Teacher demonstrations.	8.7	43.5	47.8	0	0

Interpretation

Once again, the fourth year found more teacher prepared activities than student prepared activities or textbook work, and individual projects more frequently emphasized in the learning environment than group work or group projects. This implies that teacher-led activities are generally more common and when student prepared activities occur, they are usually accompanied and organized by teacher

instructions that leave little room for problem-solving or creativity outside predetermined boundaries of expectation.

As indicated in the report for the first and second year with the middle school teachers, this is not unusual when a new technology is introduced into the learning environment. The middle school teachers demonstrated this trend; it is not surprising to see similar activities in the upper school.

In looking at what technologies are being used in the learning environment, it is not surprising that the Upper School teachers are focused on productivity and information seeking tools. This trend, indicated in the literature as a normal progression in technology integration efforts (Hooper & Rieber, 1986), is very similar to what was demonstrated in the Middle School during year three.

Next Steps

As indicated in the year three report, to fully realize the benefits of technology integration, a variety of teaching methods and learning techniques will need to be introduced, implemented and practiced by the Upper School teachers. As mentioned in the section related to the Middle School teachers, it will be important to provide support and guidance to teachers as they learn these new methods and techniques.

It is also important to once again state that any pedagogical changes undertaken in the Upper School will be scrutinized very carefully with respect to their effects on student achievement on measures such as the SAT and AP tests. In addition to raising awareness regarding different strategies, it will continue to be necessary to help the teachers perceive that these strategies are not mutually exclusive and that an integration of a variety of pedagogical techniques is possible without risking high performance on the standardized tests.

Although it has been slow in coming, we are beginning to see the impact of technology on university teaching. Today's "digital generation of students, media-savvy, are demanding new forms of pedagogy. They approach learning as a "plug-and-play" experience; they are unaccustomed and unwilling to learn sequentially – to read the manual – and instead are inclined to plunge in and learn through participation and experimentation. Although this type of learning is far different from the sequential, pyramidal approach of the traditional college curriculum, it may be far more effective for this generation, particularly when provided through a media-rich environment. It challenges faculty to design technology-rich experiences and environments based upon interactive, collaborative learning.

*James J. Duderstadt, Daniel E. Atkins, & Douglas Van Houweling,
Higher Education in the Digital Age,
2002*

UPPER SCHOOL LEARNERS: COMPUTER USE AND EXPERTISE

Introduction

This theme relates to where the learners are using computers, the activities in which they are engaged with computers, and their perceptions of their own expertise with using computers.

Data

Three primary sources of data were used to inform this area: observations in the classroom, questionnaires, and focus group interviews. To help further delineate the data, the information will be presented in three categories: Computer Use at School, Computer Use at Home, and Expertise with Computer Applications

Computer Use at School. The students reported a high use of the laptops, especially at school, with 87% of the 9th graders reporting *almost daily* use and 67% of the 10th graders reporting *almost daily* use. The majority of the students also reported *often* or *sometimes* getting to decide when to use the laptops (72% in 9th grade and 72% in 10th grade).

The students indicated infrequent use of computers other than the laptop at school (69% of the 9th graders and 67% of the 10th graders reported *never* or *once or twice a year* use of another computer). Like the Middle School students, the 9th and 10th grade students expressed ownership of many decisions related to their laptops, including out of class use. 49% of the 9th grade and 54% of the 10th grade students indicated that they *often* or *always* decide when they want to use the laptop for non-academic activities (see Tables 19 and 20 for an overview of the data).

The students reporting of high use runs counter to what we observed in the majority of the Upper School classrooms. While there were notable exceptions, most teachers are not using the laptops with the students on a daily basis. It may be that the students are using the laptops at school, but **outside** of the formal learning environment.

Table 19. Applications used by 9th graders

9th Grade Frequency of Use with Computer Applications					
Frequency in Percent					
	Never	Once or Twice a Year	Monthly	Weekly	Almost Daily
1. Play games	7.5	17.9	14.9	35.8	23.9
2. Do schoolwork	1.5	0	4.5	19.4	74.6
3. Word processing	0	1.7	5.1	28.8	64.4
4. Spreadsheets	10.4	53.7	31.3	4.5	0
5. Presentation	1.5	53.8	41.5	3.1	0
6. Multimedia & Webpages	25.8	59.1	13.6	1.5	0
7. Search for information on Web	1.6	1.6	7.8	54.7	34.4
8. Email	0	1.5	1.5	26.9	70.1
9. Instant messaging	37.9	4.5	13.6	16.7	27.3
10. Tutorials/drill & practice	63.6	19.7	9.1	6.1	1.5
11. Graphics	22.2	38.1	25.4	7.9	6.3

Table 20. Applications used by 10th graders

10th Grade Frequency of Use with Computer Applications					
Frequency in Percent					
	Never	Once or Twice a Year	Monthly	Weekly	Almost Daily
1. Play games	3.8	17.9	25.	24.4	28.2
2. Do schoolwork	1.3	5.1	9	29.5	55.1
3. Word processing	0	5.3	10.5	34.2	50
4. Spreadsheets	24.7	49.4	20.8	2.6	2.6
5. Presentation	3.8	69.2	23.1	1.3	2.6
6. Multimedia & Webpages	45.5	42.9	2.6	3.9	5.2
7. Search for information on Web	0	5.3	22.7	33.3	38.7
8. Email	0	3.8	7.7	21.8	66.7
9. Instant messaging	30.3	13.2	13.2	19.7	23.7
10. Tutorials/drill & practice	62.8	23.1	6.4	6.4	1.3
11. Graphics	37.2	29.5	16.7	12.8	3.8

Computer Use at Home. The vast majority of the students in 9th and 10th grade report that their family has a computer at home, and a majority report to be using it *almost daily* (60% - 9th graders; 54% - 10th graders). Students mentioned the use of the family computer during the focus group interviews. Many commented that the laptop was not as fast as the family computer or that it was too difficult to set up to get onto the Internet, making it easier to use the family computer. As was indicated in the third year report, it appears that in some instances the laptops are used at home when necessary, but students prefer to use the family computer.

Expertise with Computer Applications. The students rated their own ability with computer applications on a five-point scale: ‘I always need help’ (1), ‘I sometimes need help’ (2), ‘I rarely need help’ (3), ‘I never need help’ (4), ‘I can help other people. I am an expert’ (5). Tables 21 and 22 show the average ratings for eleven applications for 9th and 10th graders respectively.

Table 21. 9th graders expertise with applications

9th Grade Expertise with Computer Applications					
Frequency in Percent					
	I always need help.	I sometimes need help	I rarely need help.	I never need help.	I can help other. I am an expert.
1. Games	1.5	16.4	28.8	25.8	27.3
2. Word processing	0	1.5	28.4	35.8	34.3
3. Spreadsheets	4.8	36.5	30.2	12.7	15.9
4. Presentations	0	15.4	40	24.6	20
5. Multimedia & Webpages	14.1	35.9	18.8	17.2	14.1
6. Email	0	1.5	19.4	52.2	26.9
7. Instant messaging	1.6	3.2	15.9	52.4	27
8. Search engines	0	1.5	16.4	43.3	38.8
9. Browser	0	3.1	25	45.3	26.6
10. Tutorials/drill & practice	5.3	33.3	22.8	29.8	8.8
11. Graphics & pictures	4.8	33.9	30.6	19.4	11.3

Table 22. 10th graders expertise with applications

10th Grade Expertise with Computer Applications					
Frequency in Percent					
	I always need help.	I sometimes need help	I rarely need help.	I never need help.	I can help other. I am an expert.
1. Games	2.6	19.2	24.4	28.2	25.6
2. Word processing	1.3	3.9	15.8	51.3	27.6
3. Spreadsheets	5.2	33.8	31.2	19.5	10.4
4. Presentations	2.6	12.8	35.9	37.2	11.5
5. Multimedia & Webpages	17.8	37	24.7	13.7	6.8
6. Email	2.6	1.3	14.3	51.9	29.9
7. Instant messaging	1.4	6.8	16.4	49.3	26
8. Search engines	0	6.4	15.4	48.7	29.5
9. Browser	0	7.8	23.4	45.5	23.4
10. Tutorials/drill & practice	5.5	17.8	39.7	30.1	6.8
11. Graphics & pictures	5.3	34.2	34.2	17.1	9.2

Overall, the top applications reported as "I can help others" included the use of search engines, e-mail, and word processing. Students in the 9th and 10th grade also reported a high level of proficiency with instant messaging.

As in the Middle School, the Upper School students have a high level of expertise with many applications. This provides a good opportunity for integration of the laptops into the classroom in that the skills are in place to do the work. Helping the teachers in the Upper School become more comfortable and proficient with the integration of the laptops might enable the students to take advantage of their skills.

Interpretation and Next Steps

Computer Use at School and Home. Students have considerable experience with using computers, both at school and at home. What is interesting to note is that the experience reported in the questionnaires conflicts with what we observed occurring in the classrooms. Use of the laptops in the Upper School classrooms continues to be primarily by the teacher and for administrative purposes. When the students are using the laptops, it is usually for note taking or information retrieval from the Web. Further exploration of where, how and when the laptops are being used by the students would give more insight into this discrepancy.

It might also be beneficial to explore other ways to leverage use of the laptops at school and use of the family computer at home. The current policy of the school is that the laptop is with the learner at all times and that they are responsible for the unit. We agree that this is a valuable policy, but perhaps it would be worth taking a look to see if a compromise is possible (e.g., students have the laptop in their possession **or** secured in their locker **with a lock**). Students could then move their digital work back and forth from school to home using a USB flash memory key or CD-RW. This would also address other issues associated with the laptop: the weight associated with carrying the laptops, wear and tear on the hardware, and minimal or no use in most of the Upper School classrooms.

Expertise with Computer Applications. As in year three, students are reporting a high level of use and expertise with Internet-based applications and word processing programs. As indicated in the **Computer Use** section, the expertise of the students is not being fully utilized. This should be closely monitored, as it may lead to disenchantment with the laptops over time. Teachers should also be encouraged and supported in their exploration of more innovative pedagogical models that will enable the incorporation of the laptops into the classroom. .

Sixteen-year-old Emily McCartan from Olympia, Wash. is a dreamer. But that doesn't mean she spends large quantities of time lost in idle introspection. Rather, she spends a lot of time contemplating the education system and how it can be improved. "School should equip students with the means to pursue their dreams because dreams are important," McCartan said. "The educational system, by training young generations to be leaders, is the cornerstone of our society's future, and therefore, must be the target of any dreams about social reform." Fortunately for society, McCartan has successfully completed a Generation www.Y (Gen www.Y -- pronounced "Gen Y") class that empowered her to dream and trained her to lead. This is a program where students teach teachers how to incorporate technology into their curriculum and lessons, and become catalysts in education reform.

*- Kim Moyer,
Generation WWW.Y,
Converge Magazine,
2002*

UPPER SCHOOL LEARNERS: ATTITUDES TOWARD SCHOOL AND USING COMPUTERS FOR LEARNING

Introduction

This theme examines four aspects of attitudes toward computers and school for the students: (1) attitudes toward school and schoolwork in general, (2) attitudes toward using computers for schoolwork and learning, (3) interest in computers and perceived relevance of computer ability, (4) and the confidence a student holds about his or her own computer skills.

Data

Two primary sources of data were used to inform this area: focus group interviews and questionnaires. See Tables 23 and 24 for details by grade. The students have a positive attitude toward using the laptops for schoolwork and learning. 57% of the 9th graders and 46% of the 10th graders report that they perceive that the laptops improve the quality of their work. They also *agree* or *strongly agree* that the laptops make schoolwork easier, with 71% of the 9th graders and 55% of the 10th graders reporting this result. During the focus group interviews, students reported specific ways in which the laptops help them with their work, including: take notes; organize documents; communicate with the teacher; write, edit and revise documents; locate resources; and create presentations.

Most of the Upper School students indicated that they prefer using the computer over paper and pen/pencil (49% - 9th grade; 54% - 10th grade *agreed* or *strongly agreed*) although many indicated they were *neutral* (40% - 9th, 23% - 10th). Similar results were reported when asked if they perceived that the laptops make their work more interesting or fun (44% - 9th grade; 47% - 10th grade *agreed* or *strongly agreed*; 47% - 9th and 44% - 10th were *neutral*). And while they see advantages, the majority reported that they see *disadvantages* with use (82% - 9th graders; 72% - 10th graders *agreed* or *strongly agreed*), stating they perceive challenges with use of the laptops. Several specific examples were mentioned during the focus group interviews. First, they mentioned the technical problems as the biggest issue (e.g., freezing, crashing, slowing down, network problems). Second, they noted that with the laptops, it is also easy to get distracted.

Table 23. 9th graders attitude toward computers and school

9th Grade Attitudes Toward Computers & School					
Frequency in Percent					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Laptops make schoolwork easier to do.	0	6.1	22.7	53	18.2
2. I prefer to use my laptop to do schoolwork instead of using paper and pencil.	1.5	9	40.3	31.3	17.9
3. Using computers for schoolwork can also have disadvantages.	0	3	15.2	62.1	19.7
4. Computers make schoolwork more fun and interesting.	3	6.1	47	37.9	6.1
5. Computers help me improve the quality of my schoolwork.	1.5	6.1	34.8	30.3	27.3
6. Computers are helping me make better grades.	4.5	13.6	56.1	18.2	7.6
7. Laptops are too much trouble to carry.	1.5	20	32.3	27.7	18.5
8. I look forward to the continued use of the laptop.	3	1.5	33.3	47	15.2
9. I need to learn many new skills to use computer for my schoolwork.	15.4	33.8	33.8	13.8	3.1
10. I would be equally prepared to enter college without the laptop program.	6.1	25.8	42.4	21.2	4.5
11. Having my laptop in class is an advantage when it comes to learning.	1.6	6.3	38.1	42.9	11.1
12. I think my ability with computers will affect the grades I get.	3	17.9	50.7	23.9	4.5
13. Laptops are more useful at home than in school.	4.7	42.2	42.2	9.4	1.6
14. Instant messaging is a distraction.	12.1	24.2	39.4	19.7	4.5
15. E-mail is a distraction.	9.1	31.8	45.5	10.6	3
16. Laptops don't make learning easier.	6.1	40.9	34.8	15.2	3
17. I would not want to give up having my laptop at school.	4.6	4.6	16.9	38.5	35.4
18. Access to the Internet makes the laptops worthwhile.	4.5	3	14.9	43.3	34.3
19. Laptops should be used more in class.	3	6.1	48.5	25.8	16.7
20. I like the subjects that require the use of my laptop.	7.5	10.4	50.7	17.9	13.4

Table 24. 10th graders attitude toward computers and school

10th Grade Attitudes Toward Computers & School					
Frequency in Percent					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Laptops make schoolwork easier to do.	5.3	14.5	25	36.8	18.4
2. I prefer to use my laptop to do schoolwork instead of using paper and pencil.	10.3	12.8	23.1	35.9	17.9
3. Using computers for schoolwork can also have disadvantages.	2.6	7.7	17.9	43.6	28.2
4. Computers make schoolwork more fun and interesting.	1.3	7.7	43.6	32.1	15.4
5. Computers help me improve the quality of my schoolwork.	2.6	16.7	34.6	33.3	12.8
6. Computers are helping me make better grades.	7.7	26.9	41	20.5	3.8
7. Laptops are too much trouble to carry.	5.2	10.4	31.2	28.6	24.7
8. I look forward to the continued use of the laptop.	2.6	11.8	25	35.5	25
9. I need to learn many new skills to use computer for my schoolwork.	15.4	34.6	34.6	10.3	5.1
10. I would be equally prepared to enter college without the laptop program.	3.8	28.2	43.6	19.2	5.1
11. Having my laptop in class is an advantage when it comes to learning.	2.7	10.7	48	34.7	4
12. I think my ability with computers will affect the grades I get.	2.6	22.1	41.6	27.3	6.5
13. Laptops are more useful at home than in school.	10.4	37.7	40.3	9.1	2.6
14. Instant messaging is a distraction.	7.8	20.8	37.7	26	7.8
15. E-mail is a distraction.	2.6	23.1	38.5	26.9	9
16. Laptops don't make learning easier.	5.1	32.1	42.3	15.4	5.1
17. I would not want to give up having my laptop at school.	6.8	12.2	25.7	37.8	17.6
18. Access to the Internet makes the laptops worthwhile.	1.3	7.7	20.5	39.7	30.8
19. Laptops should be used more in class.	1.3	14.3	50.6	20.8	13
20. I like the subjects that require the use of my laptop.	2.6	11.5	37.2	34.6	14.1

The Upper School students' general interest in laptops runs parallel to that of the Middle School students: interest remains strong and perceptions of their own computer skills is quite high. Overall, they appear to be confident in their use of the laptops. 49% of the 7th graders and 50% of the 10th graders do not perceive that they need new skills to use the laptops. A majority **do not** want to give up having a laptop at school (74% of the 9th graders and 56% of the 10th graders *agreed or strongly agreed*). Further, they are looking forward to the continued use of the laptops (62% of the 9th graders and 61% of the 10th graders *agreed or strongly agreed*).

The Upper School students' strong support of having the laptops was corroborated in the focus group interviews. When asked how they would feel to be without the laptops, the students mentioned it would be disorienting if it were completely taken away. They admitted that it was not so easy at the beginning, but that now everyone is used to it. As stated by one student, "Once you understand the consequences, it is not a challenge anymore."

Interpretation

As in the third year, attitudes appear to be optimistic and students seem to have a positive attitude toward the use of laptops in the learning process. However, it is important to note that there continue to be many neutral responses to the questions related to benefits and challenges with computers (see detailed results in Tables 25 and 26). While this trend was also seen in the initial surveys with the 7th and 8th graders, it would be expected that some of this may have diminished at this point in the use of the laptops as students have more experience and a clearer sense of what the laptop can and cannot do.

One interpretation of the neutrality may be that the students in the Upper School are not seeing as much daily use of the laptop in the classroom now as they did in the Middle School. Not having a model, or compelling evidence of how the laptops can be used to help facilitate learning, they may be more neutral about the impact the laptops can have on their learning, their admission to college, or getting a job in the future. This will be an important area to monitor as technology integration continues.

Next Steps

Since the students have a somewhat positive attitude toward schoolwork and a generally positive attitude toward laptop use, teachers in the Upper School (like those in the Middle School) have the opportunity to take advantage of this attitude and potentially use the laptops to help students develop a more positive outlook on the use of the laptops in the formal teaching and learning process. Of course, this will depend primarily on how the laptops are used in the classroom. If they are used as adjunct components that students and teachers see as apart from the normal processes of schooling, student attitudes toward them will likely become more negative than positive (or remain neutral). Alternatively, if they become essential tools and seamless parts of the learning environment, attitudes are much more likely to be positive. One innovative approach, not yet evidenced on a large scale at the Academy, is the use of students to help teachers and younger students learn to use technology. A great way to learn is to teach someone else!

...Students are used to be “told” what to do (e.g., what to read, what to write, what to study, what to memorize); their involvement in the planning and development of learning activities is minimal.

The instructor assigns, the student does. It is a time honored role. However, a complex society demands members who are better able to act flexibly and to take initiative when facing a problem. Unfortunately, years of being told what to do by others does not foster the initiative or the ability to solve problems and make decisions with any range of flexibility or innovation. ...it isn't easy for students to learn to take the initiative.

They cannot suddenly be “told” to start planning their own learning activities because it is a new role for which they have had little prior experience, practice, or training. If left on their own, students may continue to choose the same learning strategies over and over again, even if they are inappropriate, ineffective, or inefficient. Growth must be a progressive process beginning with small steps.

*- Joanna Dunlap & Scott Grabinger,
Rich Environments for Active Learning in the Higher Education Classroom,
1996*

UPPER SCHOOL LEARNERS: THE LEARNING ENVIRONMENT

Introduction

This theme examines the perceptions of various activities during a school day as well as preferred teaching and learning methods held by students.

Data

One primary source of data was used to inform this area: questionnaires. The data is divided into two main categories: Overall Perceptions of the Learning Environment and Learning Environment Preferences (see Tables 25 and 26 for an overall summary of learning environment data by grade level).

Overall Perceptions of the Learning Environment. The 9th and 10th grade students report a similar perception of the learning environment as that of the 7th and 8th grade students. 62% of the 9th graders and 56% of the 10th graders report learning primarily through teacher instruction (responding with *often* or *almost always*). The teacher is also at the center when it comes to the discussions, with 78% of the 9th graders and 75% of the 10th graders reporting that the discussions are teacher-led.

A similar trend is seen when looking at activities engaged by the students. 57% of the 9th graders and 60% of the 10th graders reported completing teacher-created activities *often* or *almost always*. Many of these activities are completed on an individual basis, with percentages increasing with higher grades (42% - 9th graders; 40% - 10th graders reporting *often* or *almost always*). Students in both grades reported that group work is completed *sometimes* (55% for 9th and 10th graders). When discussions are held or activities are completed, media is *sometimes* used the majority of the time (55% - 9th grade; 62% - 10th grade).

Table 25. 9th graders perceptions of the learning environment

9th Grade Perceptions of Learning Environment					
Frequency in Percent					
	Never	Rarely	Sometimes	Often	Almost Always
1. Teacher instruct/demonstrations.	1.5	13.6	22.7	28.8	33.3
2. Students work from textbooks.	1.5	4.5	34.3	44.8	14.9
3. Teacher prepared activities.	0	6.2	36.9	41.5	15.4
4. Group work.	1.5	26.9	55.2	16.4	0
5. Individual projects.	0	12.5	45.3	39.1	3.1
6. Group projects.	1.5	29.9	53.7	13.4	1.5
7. Teacher-led class discussion.	1.5	1.5	18.5	55.4	23.1
8. Media use (videos, tapes)	3	19.4	55.2	16.4	6
9. Student presentations of individual or group projects.	3.1	27.7	43.1	23.1	3.1
10. Go beyond classroom information at home.	20.9	22.4	34.3	19.4	3
11. Use word processing to edit and improve work.	4.6	3.1	20	20	52.3
12. Use notes that are kept with laptop to study.	16.9	20	16.9	24.6	21.5
13. Students use laptop to do PowerPoint presentations.	1.5	29.2	44.6	20	4.6
14. Teachers use laptop to do PowerPoint presentations.	3	43.3	32.8	16.4	4.5

Table 26. 10th graders perceptions of the learning environment

10th Grade Perceptions of Learning Environment					
Frequency in Percent					
	Never	Rarely	Sometimes	Often	Almost Always
1. Teacher instruct/demonstrations.	2.6	10.4	31.2	27.3	28.6
2. Students work from textbooks.	0	7.8	33.8	41.6	16.9
3. Teacher prepared activities.	0	6.6	32.9	47.4	13.2
4. Group work.	0	13	54.5	29.9	2.6
5. Individual projects.	1.3	15.6	42.9	31.2	9.1
6. Group projects.	2.6	30.3	43.4	19.7	3.9
7. Teacher-led class discussion.	1.3	6.5	16.9	44.2	31.2
8. Media use (videos, tapes)	1.3	21.1	61.8	11.8	3.9
9. Student presentations of individual or group projects.	0	46.8	39	9.1	5.2
10. Go beyond classroom information at home.	10.4	40.3	42.9	3.9	2.6
11. Use word processing to edit and improve work.	0	5.4	16.2	28.4	50
12. Use notes that are kept with laptop to study.	5.3	11.8	18.4	34.2	30.3
13. Students use laptop to do PowerPoint presentations.	1.3	24.7	48.1	18.2	7.8
14. Teachers use laptop to do PowerPoint presentations.	10.5	31.6	35.5	18.4	3.9

Learning Environment Preferences. In terms of learning environment preferences, trends with 9th and 10th grade students are similar to what they reported in the third year with one notable exception. While the 9th and 10th graders once again reported learning most from the teacher and teacher led discussions, they also reported a learning preference for working in groups.

Reports regarding how they enjoy learning in the fourth year were also aligned with the third year report. The 9th and 10th graders once again reported that they enjoy learning from media use, group projects, and group work.

Interpretation

As with the third year, students overwhelmingly reported learning most from teacher demonstration and class discussion. Group work also rated high. On the low end, students reported learning least from individual projects and student presentations.

What they reported learning the most from did not align with the activities they reported enjoying most. In terms of enjoyment, students rated group related activities and mediated instruction the highest. On the low end were learning from textbooks and individual projects.

Next Steps

Given the students' positive attitude toward teacher-directed instruction, they may find moving to a more student-centered approach challenging. As was cautioned in the last three years, careful implementation will be critical in making this transition so that students are also comfortable with the change.

The length of time it takes to make pedagogical changes as well as shifts in epistemological beliefs related to learning is not insignificant. It is therefore recommended that consideration of how more student-centered approaches may be implemented at the elementary level be considered. Providing students with opportunities to practice directing and making decisions in the classroom environment, with or without technology in the mix, can help empower them as learners.

Another area that offers promise in promoting change in the classroom environment relates directly to media. The students' interest in mediated instruction (non-human) is of particular interest and may prove to be the factor that makes the transition into a technology-integrated learning environment easier. The effects of ubiquitous Internet access in the Upper School will be especially important to track.

As often is the case with trends in technology development, there is both good and bad news. The proliferation of computers in schools is really good news. However, national survey data indicate generally low levels of student use, particularly applications that require high-level cognitive skills. ...the ways in which computers are being used in schools do little to promote cognitive development among the students. The most common use of computers among students in the fourth and eighth grades was to play games, and the most common use among students in the eleventh grade was word processing. It is clear that these applications...do not encompass using computers as cognitive tools. Although we have come a long way in expanding the use of computers in schools, these data show just how much further we must go before realizing the potential for facilitating cognitive development.

- Ellen B. Mandinach & Hugh F. Cline,
It Won't Happen Soon: Practical, Curricular, and Methodological Problems in Implementing Technology-Based Constructivist Approaches in Classrooms,
 2000

OVERALL CONCLUSIONS & NEXT STEPS

Some specific indicators for “Next Steps” may be generated based on overall trends within groups. Key points are highlighted below by group.

As in the third year, our overall conclusions can be characterized as *guardedly optimistic*. Although we continue to find generally positive attitudes toward the entire laptop initiative among both students and teachers, we also continue to see only modest changes in teaching and learning activities on an overall level and have been able to detect few effects in terms of achievement and performance (with the notable exception of *Information Age Skills*). We believe that the prevailing positive attitudes can provide a strong foundation for more obvious shifts in teaching and learning practices, but that is a decision that will need to be made actively, with steps taken to help move the learning environment in a new direction. We do think the move toward more learner-centered teaching and learning environments has promise, and may eventually have an impact on diverse areas of achievement and performance. But such a move will not be without costs and risks. If it is to become the focus on significant effort in the next few years, it should be done with the full participation of the entire Athens Academy community, including teachers, administrators, technology staff members, media specialists, students, and parents.

TEACHERS

Middle School

1. Continue to want students to take responsibility, but are not empowering them to do so
2. Increased communication, especially amongst themselves
3. Primarily using the tool for productivity and management-related activities
4. Needs: more time and new ideas
5. Expressing a need to change what they are doing
6. When faced with the thought of no longer having a laptop, the overwhelming response is that they cannot imagine not having it

Upper School

1. Want students to take responsibility, but like the middle school teachers, are not empowering the students to do so
2. Alignment with US teachers/US students in terms of view of learning environment as primarily teacher-centered
3. Primarily using the tool for productivity and management-related activities
4. Recognizing that they could be doing things differently
5. Want/need ideas for how to use in the classroom – beyond how-to's
6. Like the middle school, when faced with the thought of no longer having a laptop, the overwhelming response is that they cannot imagine not having it

LEARNERS

Middle School

1. Indicate that they feel like they learn more from group work, group activities and media
2. Doing more with Internet/Web – primarily e-mail, finding resources. Also more with PowerPoint
3. Indicate that they want things to be different
4. Indicate that distractions of email, Web, etc. are a challenge
5. Unhappy with the requirement to transport laptops home and back
6. Like the teachers, when faced with the thought of no longer having a laptop, the overwhelming response is that they cannot imagine not having it

Upper School

1. Higher baseline of skills than when 7th/8th started
2. Indicate that they feel like they learn more from teacher demonstration/instruction, class discussion and media
3. Indicate that distractions of email, Internet, etc. are a challenge
4. Also unhappy with the requirement to transport laptops home and back
5. Like the teachers, when faced with the thought of no longer having a laptop, the overwhelming response is that they cannot imagine not having it

POSITIVE TRENDS

There are also overall positive trends and challenges indicated in the fourth year data across groups. Access to laptops and a wireless network in the school has led to:

- Increased communication – especially teacher to teacher, administrators to teachers
- Increased use of and more convenient access to resources
- Organization of documents and resources (teachers and students)
- Enhanced computer and information literacy skills
- The tool becoming a part of the environment. Increasingly, it is a tool used on a daily basis.

CHALLENGES INDICATED

There are some areas that appear to be creating challenges for teachers and students that need to be addressed. These include:

- Logistics: the weight of the units, use of power cables in the classroom, and limited desk space continue to be issues for some teachers and many students.
- Technical challenges of wear and tear (and abuse in some instances) of the units are creating challenges for teachers and students, as well as administrators, staff, and parents.
- Resistance to shifting and/or incorporating other pedagogical models that would better facilitate the use of the laptops. For many, rather than conscious resistance, there is more a sense of being overwhelmed by the effort to make such fundamental changes.
- The invisibility of the laptops, particularly in the Upper School. Currently, the laptops are not invisible; that is, everyone is still very much aware of their presence in the classroom. They continue to remain outside the curriculum vs. integrated into it (i.e., there still is a *Time for Laptops*).

OVERALL RESEARCH QUESTIONS

Based on the collective data analysis and trends indicated in the data, we offer the following responses to the overall research questions.

Enhancing the Teaching and Learning Environment

1. Are there differences in roles/responsibilities that can be attributed to the ubiquitous computing environment?

There do not appear to be fundamental differences in roles/responsibilities with respect to teaching and learning practices. However, most students and teachers are expressing the desire for changes.

2. Are there differences in the processes of learning that can be attributed to the ubiquitous computing environment?

It does appear that there are modest differences in the processes of learning that can be attributed to the laptops. The increased access to the Internet/Web has enabled an increase in use of external resources in the classroom. There has also been an increase in presentations, both by teachers and students.

3. What are the affective implications of the ubiquitous computing environment?

While we do not have a lot of data that supports evidence of change in this area, we did find evidence of a continued leveling of the playing field. Students indicated that they are confident in their use of the technology – and this confidence cuts across the population.

Another indicator of an impact of the laptops on the affective aspects of the community is the strength of the aversive response to the possibility of not having the laptops. It was unanimously conveyed to the evaluation team that no one wants the laptops to go away. While they may not be making as effective or efficient use of the laptops as they might be, neither the teachers nor students want to go back to a time without laptops and ubiquitous computing.

Enhancing Achievement and Performance

1. How much is learned in English, History/Geography, Math, and Science that can be attributed to the ubiquitous computing environment?

At the end of the fourth year, there was little or no evidence of quantitative differences in achievement and performance that could be directly attributed to the laptops.

Enhancing Key Qualifications for the Information Age

1. Are there differences in cognitive skills that can be attributed to the ubiquitous computing environment?

There is some evidence that changes in cognitive skills (e.g., problem solving, critical thinking) were occurring as of the end of the fourth year, particularly in the Middle School.

2. Are there differences in media literacy skills that can be attributed to the ubiquitous computing environment?

Yes, there is some demonstration of this in both the Middle and Upper Schools. Students and teachers are thinking differently about how to use information sources for learning.

NEXT STEPS

Some specific indicators for Next Steps have been generated based on the overall findings in the study. The recommendations listed below were stated in the year three report and continue to be relevant in this final year of the evaluation.

- **Training and workshops** related to the laptops should be personalized to the curriculum in a just-in-time orientation.
- Work on **integration** vs. use. Laptops should be a part of what is taught and not take over classroom activities.
- **Time** is needed by teachers to help them with developing strategies to effectively integrate the technology into their classrooms as well as for other laptop-related activities: time to find resources, time to help the students with the technology, time to grade all the work, time to sit and discuss technology integration with students/parents.
- To date, more traditional, teacher-led activities and discussions have dominated the classrooms. However, students and teachers at various levels indicate a desire and/or need to change the structure in the classroom. Finding a way to assist teachers in identifying strategies and techniques to move toward a more learner-initiated/teacher-facilitated structure will help enable **change in the pedagogical practices** in the classroom. Building on the notable successes in Middle School social studies and Upper School science would be a great starting point.

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APPENDIX A: **Teacher Questionnaires**

APPENDIX B: **Teacher Interview Protocols**

APPENDIX C: **Student Surveys**

APPENDIX D: **Student Interview Protocol**

APPENDIX E: Usage Logs

APPENDIX F: **Observation Protocol**

APPENDIX G Year Four Timeline