Evaluating a Ubiquitous Computing Program – Wendy Marson, M.S.
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Introduction

In the new millennium, the number of laptop, or “ubiquitous computing,” initiatives across the United States and worldwide has increased significantly. Currently, there are over 275 colleges and universities with programs that provide some or all students with laptop computers (or that require students to purchase a laptop computer) (Brown, 2010). Although colleges, universities, and school districts differ in terms of the implementation of their ubiquitous computing programs and how technology is used, all of them have had to invest a significant amount of resources to implement and maintain these programs.

Like other institutions who have implemented ubiquitous computing programs, Stout has struggled with evaluating its e-Scholar program. (e-Scholar being the term used to describe our ubiquitous computing program). A primary goal in implementing e-Scholar was to improve student learning outcomes, as reported by many other early adopters of ubiquitous computing, (Cuban, 2001; Zemsky & Massy, 2004; Zucker, 2004). Both Higher Ed and K-12 institutions assumed that implementing laptop programs would result in improved student achievement (Texas Center for Educational Research, 2006; U.S. Department of Education, 2003; Zucker, 2004), higher standardized test scores (Texas Center for Educational Research, 2009; Weglinsky, 1998; Zucker, 2004), the development of 21st century skills that are needed outside of school (Silvernail et al., 2008, Texas Center for Educational Research, 2009, Zucker and Hug, 2008), and higher grades or GPAs (Efaw, Hampton, Martinez & Smith, 2004; Griffith, Gu & Brown, 1999). These goals have not changed. Zucker and Light (2009) state, “With the continuing decline in costs of technology, programs are proliferating worldwide to put networked laptop computers into the hands of millions of students on a routine basis. The reasons policy-makers support these programs are based on economic arguments, equity concerns, and widespread interest in education reform.”

We believe that there are several reasons for the mixed evidence. For example, any evaluation should begin with a focus on satisfaction, support, training needs and usage. Only when these areas have been thoroughly investigated, and issues addressed, should an institution move on to investigating the impact on learning. Further, much of the previous research focuses exclusively on the impact of the laptop computers on learning. However, there are many other aspects of ubiquitous computing programs that influence learning outcomes but are not often examined, including wireless access, computer laboratories, and access to software programs.

We recommend that any evaluation of ubiquitous computing programs begin with a focus on satisfaction, support, training needs and usage when a program is early in its life cycle.
Once the program becomes firmly established, we recommend that the focus be shifted to focus on outcome measures such as student learning. This is the natural evolution of the process/program life cycle.

This presentation describes both a methodical approach to assessing process issues common to any start-up program involving technology, including support/service, student satisfaction, training in using the software, and how students are using the technology, then moves into the assessment of learning itself.

Methods

In January, 2003, a long-term plan was developed to assess learning, critical thinking and active learning in graduate and undergraduate education. Simultaneously, a short-term plan was also developed to assess satisfaction, support, training, and usage.

The outcomes assessment piece, often missing in programs of this type, was grounded in the university’s vision and value statement and included the goals of the program and the assessment goals and their identification. Outcomes assessment goals included:

- Understanding of best practices,
- assessment of learning in areas of process, concept, attitude and critical analysis,
- improvement of instruction,
- identification of desirable traits in students,
- enhancement of active learning, and
- identifying the acquisition of concepts, processes and attitudes through active learning.

The short-term assessment plan included four surveys which will be summarized along with their results. Each component of the process was built upon the one preceding it. When enough data was gathered in a particular area, and any identified issues were addressed, a new survey was created so the body of knowledge about the program could continue to increase.

To address the long-term plan of assessing learning, critical thinking and active learning, two new surveys were created that would work in tandem, with the spring survey identifying both the components of the digital learning environment used to enhance learning and the areas where learning was most and least enhanced, and the fall survey asking specifically how those identified components of the digital learning environment were used to enhance those identified learning areas.
Component #1 – Skills inventory (Microsoft Office Proficiency Self-Report)

*Timeframe: Summer 02 – Fall 04.*

The first Freshman cohort to receive laptops (FA02) were administered this instrument the summer of their entry to UW-Stout. The survey asked if they could perform specific learning objectives within MS Office (Word, Excel, PowerPoint and Outlook). This instrument was utilized to work in tandem with the Student Questionnaire Survey (SQS). The Skills Inventory would identify possible problem areas in training, which ideally would be confirmed by the SQS a few months later. This instrument would also provide an opportunity to identify students who may be at-risk due to their lack of skills, and provide an opportunity to contact them with help resources.

Survey evolution

This instrument was administered in 2002, 2003 and 2004 to incoming Freshman e-Scholars during summer registration. It was dropped from the assessment plan after the FA04 administration.

Summary of results

Students in the second laptop cohort (FA03) reported slightly higher abilities than the FA02 cohort. Highest self-reported skill level was for Word, followed by e-mail, Excel and PowerPoint. The FA04 cohort showed statistically significant increases in knowledge of Word, Excel and PowerPoint compared to the FA02 cohort.

Actions taken as a result of this survey:

- Exploration and implementation of student training pilots based on MS Proficiency Assessments
- Students identified as “at-Risk” after completing MS Proficiency Assessments contacted individually to provide mentoring
- Training resources developed for web delivery [http://www.uwstout.edu/training/](http://www.uwstout.edu/training/)
- Tech Tips sent to specific student populations for training outreach (Word, copyright, back-up, etc), literally providing training at their fingertips.
- Developed/printed digital and hardcopy manual “Computing @ UW-Stout” as a resource for students

Component #2 – (Training and) Expectation Survey

*Timeframe: FA02 – FA06*

This survey was begun in FA 02, and initially consisted of three questions. The first question asked if the participant had attended the library/blackboard training session and the second and third questions asked participants to briefly explain what being an e-
Scholar meant to them and how they could expect to use their laptop in their daily life as a new student.

Survey evolution
After 2004, the training question was dropped, and the survey was known after that as the Expectation Survey. The survey was dropped from the assessment plan following the 2006 report.

Summary of Results
“Being an e-Scholar means having the ability to connect with an entire college campus and being able to utilize its resources”

Being an e-Scholar, according to students, could mean a number of different things. The most frequent responses across five years were; 1) staying connected to instructors and classmates, to family at home, to friends on and off-campus; 2) using/accessing learning technology – having 24/7 access to the internet, to resources, to information, to communication; and 3) learning – using a laptop computer to aid in learning, having a level playing field because everyone has a laptop. Even though UW-Stout as a laptop campus is in its sixth year, many students were confused about what being an e-Scholar means. It was described by students as: a program, a portal, a course management system and a person. These types of responses comprised about 9% of all responses in 2006. A new theme that emerged in 2006 was use by participants of the word “access” and how their laptops would allow them access to everything offered by UW-Stout’s Digital Learning Environment. An example of this was, “I am able to access a different method to learning because of the help of the internet”.

How students expected to use their laptops remained steady across time, with schoolwork/homework listed as the #1 choice across all five years of data collection. Email/communication was a strong second. “I can communicate with anyone on campus at the push of a button as well as reach valuable research information.” Personal use/entertainment was also frequent use mentioned by students. “Truthfully, I will mostly use it for the internet. I have a lot of different messaging and fantasy football things. I will use it to talk to my teachers and friends.”

Actions taken as a result of this survey:
- Developed a document for students explaining UW-Stout’s student expectations for how the laptops will be used, endorsed by Senates.
- Provided information to the UW-Stout faculty on student expectations, so they could use the information in designing their courses.

Component #3 – Student Questionnaire Survey (SQS)
Timeframe: FA02 – FA03
The purpose of this process instrument was to gather student issues and concerns regarding several aspects of the laptop program. Initially in FA02, students were asked four open-ended questions –

- Have they had problems with their laptop?
- Have they had training issues with their laptop?
- How they have used their laptop inside the classroom?
- How they have used their laptop outside the classroom?

Follow-up focus groups were held in both FA02 and FA03 to “drill down” into comments made on the survey.

Survey evolution
The SQS was repeated in SP03, with few changes in results. The instrument was modified for FA03 administration, becoming three likert-type scale questions related to satisfaction with the e-Scholar program, three questions related to service/support of the laptop itself, two questions related to training/knowledge, and one qualitative question asking for further comment. The earlier qualitative questions related to laptop use in and out of the classroom were spun off into a new survey, the One-Minute Laptop Survey. The training and knowledge questions replaced similar questions previously asked on the MS Office Proficiency Self-Report (component #1). This entire instrument was discontinued after the FA03 administration.

Summary of Results
This survey tended to identify concerns with the program, which is not unusual given the early stage of the program at the time of administration. Having the concerns identified by users allowed those responsible to create action plans, implement changes to improve the program, and monitor progress on subsequent surveys.

One concern was “no use in class/little use in class” of laptops being reported by 21% of student respondents (SP03). In subsequent surveys, particularly the one-minute survey, this percentage declined drastically. Additionally, actions were taken specifically to address this issue, including: the development and eventual publishing of instructional practices related to learning, teaching and laptops/technology, enhanced focus and direction on the improvement of teaching and learning, enhanced focus and commitment on learning assessment related to laptops, and development of a best practices learning database.

One-third of respondents reported wireless/connectivity problems and network speed problems. These types of comments have also decreased across time. Knowledge issues also emerged in the areas of security practices, laptop features, and laptop care. However, overall satisfaction with the e-Scholar program increased in FA03 compared to SP03.
Actions taken as a result of this survey:

- Various faculty development sessions offered by the Teaching and Learning Center.
- Technical issues were forwarded to the IT help desk and addressed individually.

Component #4 – The One-Minute Laptop Survey

*Timeframe: FA03 – FA06.*

This was first administered in FA03, using the two qualitative questions about laptop use in and out of class from the earlier SQS survey, creating a new survey. It was called the One-Minute survey because it was only a two-question survey, and it was hoped that students would take “a minute” to complete it. Since it was a survey for laptop students only, the first year of its administration, it went only to Freshmen and Sophomores, the second year to Freshmen, Sophomores and Juniors, and so on. The One-Minute survey was designed to work in tandem with the Expectation Survey (component #2), comparing how students expected to use their laptops compared with how they actually used them, and additionally, to look at how reported laptop use changed across years in school as each new cohort was added. For example, how did seniors use their laptops compared to Freshmen?

Survey Evolution

The survey consisted of only two questions:

- How do you use your laptop in class?
- How do you use your laptop outside of class?

A third question, a likert-type scale questions asking about overall satisfaction with the e-Scholar program, was added in FA06. This survey instrument was dropped from the assessment plan following the FA06 administration, but a new survey that is focused on student learning is in development for fall administration.

Summary of results

“Most of my classes at this point require the laptop every day.”

“All of my classes use Learn@uwstout.edu, so I use it to look at my assignments, grades and use the drop box.”

Students reported using their laptops in-class most often for taking notes, also for schoolwork, in-class assignments/labs/quizzes, email/keeping in touch, research tool/access web, and internet/research. Reported recreational use of laptops in-class increased from #12 in frequency of comments (2005) to #7 in 2006. Outside of class, until 2005 the most often reported use of laptops was for schoolwork. In 2006, the most frequently reported uses were e-mail and recreational use, followed by schoolwork. Negative comments about the laptop program decreased from a high of 17% in 2004 to 6.5% in 2006, and more comments were made about frequency of laptop use in the
classroom. When comparing the results of this survey with the results of the Expectation survey, reported use of laptops continued to exceed expected use of laptops for e-mail/keeping in touch, schoolwork, recreational use, and taking notes.

Actions taken as a result of this survey:
- Various faculty development sessions have been offered by the Teaching and Learning Center. As a result, the percentage of students reporting that instructors who do not use the laptops in class has declined.

Long-term Surveys and Results

Component #5: Spring DLE Survey

The Spring Digital Learning Environment Survey (DLE) was first administered in SP2007. Participants were asked, depending on the version of the survey they received, either how their instructors’ use of the DLE at UW-Stout impacted their learning (survey A) or how their own use of the DLE impacted their learning (survey B).

Instructor use of the Digital Learning Environment (DLE) is perceived by survey participants to have the highest impact on learning when they use the DLE to:
- Post course materials and content online
- Organize course content and information online
- Provide feedback
- Extend the classroom outside of class time
- The questions in this section with lower means were:
  - To enhance my writing skills
  - I have higher expectations of my academic performance as a result of my instructors’ use of the DLE.
  - My instructors’ use of the DLE enhances my critical thinking skills

Use of the DLE by participants is perceived by survey participants to have the highest impact on learning when it is used to:
- Gain factual information for courses
- Assist in finding resources to solve problems
- Extend the classroom outside of class time
- Collaborate with other students
- Complete in-class assignments
- Assist with developing skills related to major
• The questions with lower means in this section were:
  • The DLE impacts/enhances my critical thinking skills
  • I have higher expectations for my academic performance as a result of using the DLE.

One of the lowest rated questions was on the impact of the DLE on critical thinking. This question also had the largest number of non-responses and “did not experience” responses on both versions of the survey.

The responses to this survey were used to create the questions asked in the Fall DLE survey, first administered in FA08.

**Component #6: Fall DLE Survey**

Respondents were asked to identify the importance of various DLE components – both those used by the student and by the instructor. The components were rated on a scale of 1-4, (where 1=not at all important and 4=very important) and the means ranged from 2.28 to 3.58.

**Highest rated DLE components**

These two components were reported as being the most important from both versions:
• Email
• Electronically posted rubrics, assignments and readings.

Other items that were among the highest rated were: out of class homework using the laptop (student) and electronically posted course syllabus/course expectations (instructor).

**Lowest rated DLE components**

Respondents provided the lowest ratings on the following instructor components of the DLE:
• Collaborative digital space/storage
• Specialized lab software

Respondents provided the lowest ratings on the following student components of the DLE:
• Discussion boards
• In-class exercises on laptops

**Opportunities for improvement in use of the DLE**

Respondents were asked to select DLE components they or their instructor could have used better for selected tasks, and to describe how the components could have been better used to enhance learning.
<table>
<thead>
<tr>
<th>Task</th>
<th>Most important DLE components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Enhance synthesizing skills</td>
<td>None/discussion boards/in-class PowerPoints</td>
</tr>
<tr>
<td>2. Assist with making judgments</td>
<td>None/discussion boards/in-class PowerPoints</td>
</tr>
<tr>
<td>3. Enhance writing skills</td>
<td>None/discussion boards/in-class exercises on laptop</td>
</tr>
<tr>
<td>4. Enhance critical thinking skills</td>
<td>Discussion boards/web research – class related/none</td>
</tr>
<tr>
<td>5. Raise expectations for academic performance</td>
<td>Course grade availability/none of the DLE components listed/Electronically posted course syllabus &amp; expectations.</td>
</tr>
</tbody>
</table>

**Summary of Quantitative data:**

1. The highest mean value across three years of survey administrations was achieved this year on overall satisfaction with the DLE, with a mean of 3.18. Over 98% of participants report some level of satisfaction with the DLE, with over 86% satisfied/very satisfied.

2. Means have continued to increase on questions related to how well participants feel the DLE has prepared them so far for the workplace. Utilization of technology had the highest mean (4.21), with over 80% reporting high/very high preparation. All means for this set of questions have increased from 2008 and 2007. In 2008, several means were lower than 2007, but all means are now at a higher level in 2009 than either 2008 or 2007.

3. Instructor use of the DLE is perceived by survey participants to have the highest impact on learning when they use the DLE to:
   - Post course materials and content online
   - Organize course content and information online
   These were also reported in 2008 and 2007 survey administrations as having high impact. Across 13 questions common to all three survey administrations, there were two questions (Instructor uses the DLE for in-class assignments, instructor uses the DLE to provide a variety of methods for learning) which had statistically higher means in 2009 than in 2008 or 2007.

4. In assessing how well the DLE has prepared participants so far for the workplace, participants reported they were the most prepared for:
   - Utilization of technology
   - Consistency in meeting deadlines
   - Organizing information

5. Few differences were seen in mean responses by gender, cohort, and by survey version in comparison to previous administrations.
Next steps

The next steps in assessing an ever-evolving digital landscape are currently being formulated, and the framework for the next phase of assessment will be implemented in the 2010-2011 Academic year. Preliminary plans include:

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<tbody>
<tr>
<td>1</td>
<td>Asking students and faculty/staff to describe the learning environment of the future – and how technology fits into this</td>
</tr>
<tr>
<td>2</td>
<td>Asking faculty/staff to describe how technology could be better utilized in the future to teach more efficiently and effectively</td>
</tr>
<tr>
<td>3</td>
<td>Identifying a small number of the main findings from the assessment to date to study in more depth</td>
</tr>
</tbody>
</table>

For more information on the surveys presented here:
http://www.uwstout.edu/static/bpa/ir/index.html

Or contact Wendy Marson at the University of Wisconsin-Stout
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REFERENCES


Paper presented at the National Learning Infrastructure Initiative Annual Conference, New Orleans, LA.


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Baldrige National Quality Program

Education Criteria for Performance Excellence

leadership ethics
“The rollout of the e-Scholar program at the beginning of the fall semester forever transformed UW-Stout.”

UW-Stout Annual Report, 2002-03
The short-term plan surveys:

1. Skills inventory

2. Training and Expectation

3. Student Questionnaire

4. One-Minute Laptop
Timeline:

Skills inventory
Training and Expectation
Student Questionnaire
One-Minute Laptop

<table>
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<td>Student Questionnaire</td>
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<td>One-Minute Laptop</td>
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<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Component #1: Skills inventory
1. Can do
2. Can’t do
3. No clue
Component #2:

Training and Expectation Survey
1. Staying connected
2. 24/7 Access
3. Learning
Component #3: Student Questionnaire Survey (SQS)
No/little use of laptops in class by instructors

Problems Identified:
Component #4:
The One-Minute Laptop Survey
Increase of reported in-class recreational use of laptop

Decrease in negative comments about the laptop program

Increase in number of instructors using laptops
What did we learn?
The long-term plan surveys:

1. Spring Digital Learning Environment (DLE) Survey
2. Fall DLE Survey
Timeline:

Spring DLE
- 2007: X
- 2008: X
- 2009: X
- 2010: X
- 2011: X

Fall DLE
- 2007: X
- 2008: X
- 2009: X
- 2010: X
- 2011: X
Component #5

Spring DLE Survey
Students:

Gain factual information for courses
Assist in finding resources for problem-solving
Component #6

Fall DLE Survey
Highest Rated DLE components overall:

Email
Electronically posted rubrics, assignments and readings
Lowest Rated DLE components (instructor):

Collaborative digital space
Specialized Lab software
Lowest Rated DLE components (student):

Discussion boards
In-class exercises on laptops
Opportunities for improvement:
However:

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<td>Not at all</td>
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What did we learn?
Next Steps
Questions?