Using Personal Technology for Education

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Abstract: As Internet tools are developed and improved, opportunities to utilize these developments are abundant for the education community. The technology is widely available. Why not expand the usage into the distance learning environment? Our survey of students shows what they think of mobile classrooms. Colorado college students offer their opinions on the value of ten mobile uses, the same ten mobile use factors that were cited as being in-use at Duke University. The outcome indicates strong support for the use of personal devices in the mobile classroom.

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Innovators and researchers, today, may overlook the value of new technological advances and new gadgets as potential tools for changing or for enhancing opportunities for higher education. For instance, in their review of new technology gadgets, Fullerton and Schmidt (2005) suggest in the title of their article that new technology is interesting for "work, home, and play." Yet, many of the gadgets they describe are, potentially, as useful to educators and to students as they are to anybody else (Clyde, 2005). Fullerton and Schmidt (2005) did not mention the option of educational use in their explanation of each of the tools in their research article. Educators may be the ones who can identify and who can make an awareness of the value of both new technology and new gadgets for providing new learning opportunities (Roach, 2005). Educators have already begun to find new ways to bring audio, video, and interactive learning to their students (McFarland, 2006; Princeton university offers 'vodcasting', 2005; Roach, 2005).

Educators are paying attention to the new gadgets used by children and used by college students of all ages (Campbell, 2005; Clyde, 2005; Schmeiser, 2002; Shaw, 2006). Child and adult use of innovations and gadgets for work, home, and play could provide a technology-savvy student body that does not require extra technology training for using the technologies for educational purposes (Clyde, 2005). The educators may need to keep abreast of all the new gadgets and innovations so that educators can improve education efforts by taking advantage of the gadgets and other innovative possibilities that could be used in the classroom. The term *in the classroom* is used rather loosely, here, because the availability of the gadgets and the innovations creates the opportunity for not only the traditional classroom learning or the Internet-based classroom learning, but the *mobile classroom* which can be accessed by students *on the go* or the *mobile learning laboratory* where students can use personal devices, some connected to the Internet, and some not.

The mobile classroom, the mobile-connected classroom, and the mobile learning laboratory, in terms of transforming the traditional classroom or the Internet-based classroom with mobile device access to education, are fairly new concepts. Still, savvy educators have not let the idea of the mobile classroom slip past them. For instance, at the recent EDUCAUSE conference, 2005, (Riggs & Cohen, 2006, ¶ 4-7) Ohio State University President, Karen Holbrook, spoke of her organization's recognition of the need to "re-conceptualize environments of learning, discovery, and transaction" allowing for maximum educational use of new gadgets and new innovations while keeping the core values associated with respected institutions of higher education.

Ohio State University maintains a knowledge base that stores a variety of different kinds of digital knowledge and digital artifacts that are available around the world. Availability of a digital library has allowed the library to become dynamic. Those who use the dynamic library are able to use new innovations to access and to use the digital content in the library and knowledge base. Librarians can become the interface to help library users learn new ways to take advantage of the digital content available in libraries. Materials and content, first, must be stored in a digital format before anybody can make use of them in a digital library for mobile classroom use (Riggs & Cohen, 2006).

Educators have already begun testing the new mobile classroom possibilities. For instance, Duke University has begun distributing Apple iPods with Belkin voice recorders to freshman students (Riggs & Cohen, 2006). The iPods are being used 'for portable access to course materials; recording of lectures, discussions, writing workshops; field notes; interviews and student performance (spoken, sung) for review, practice, or assessment; hands-on lab activities, hard drive for multimedia files; and "podcasting"/audio blogging' (Riggs & Cohen, 2006, ¶ 8-10) allowing students to meet many academic goals. Moving along the learning curve from data to information to knowledge will require educational support systems like Universities and other schools to develop new competences in knowledge management skills (Riggs & Cohen, 2006).

Concerns for intellectual property rights, security, and privacy each play parts in the process of moving forward to allow widespread access while providing for safe and secure use of the digital materials. New ideas and new rules about sharing and collaboration will come into play (Ortiz, 2006; Riggs & Cohen, 2006; Schmeiser, 2002).

Educators are talking about how to use the new innovations and gadgets to enhance learning. What do students think about these new possibilities?

Methodology

A sample of 58 Colorado college students from private and public schools, both community college and universities, ranging from undergraduate to Master and Doctorate students were surveyed to find out what they think about the potential value of using mobile classrooms. Students were asked, "Would the following assist you in being more successful in learning as part of your college education?" The ten factors identified by Riggs and Cohen (2006) were listed for student responses. The factors included, in order, (a) portable access to course materials, (b) portable access to record lectures in a digital format, (c) portable access to discussions, (d) portable access for writing workshops, (e) portable field notes, (f) portable interviews, (g) portable hands-on lab activities, (h) portable student performance (spoken, sung) for review, practice, or assessment, (i) portable hard drive for multimedia files, and (j) portable "podcasting" or audio blogging. A five-point Likert scale described in Table 1 was used to gather the survey responses. We ranked the response items on a scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). For each of the ten factors, students selected a rank corresponding to the textual description that best identified their opinion of a factor.

We tabulated student responses. Then, we applied a double, or two-part, Chi-square calculation. Demographic data was compiled to help categorize the students in the study by categorization items including (a) the type of classroom they used in the past, (b) the current academic level, (c) gender, (d) age, (e) income, (f) U.S. citizenship, and (g) technology-savvy.

Two sets of hypotheses were tested. For Test 1, the null and alternative hypotheses were used to determine if students had any opinion about the factors of the study.

> **Chi-square Test 1 Null Hypothesis (H_o)**: There is no statistically significant difference between the number of "neutral" and "non-neutral" responses from students as to whether students perceive that mobile classroom factors could help them be more successful as part of their college education.
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> **Chi-square Test 1 Alternative Hypothesis (H_1)**: There is a statistically significant difference between the number of "neutral" and "non-neutral" responses from students as to whether students perceive that mobile classroom factors could help them be more successful as part of their college education.

The number of expected non-neutral responses (the value that is one-half of fifty-eight which is twenty-nine) f_e, were tested against the observed non-neutral (the sum of strongly disagree, disagree, agree, and strongly agree) responses, f_o, for each factor a through j to determine whether the students had a significant opinion about the factors they were being asked to consider. In other words, Test 1 was performed to see if students had an opinion, at all, about the use of mobile classrooms. The Yate's chi-square statistic was calculated for each of the ten factors to see if the student respondents had any significant interest in the factors of a mobile classroom. Both, the $p < .05$ and the $p < .01$ tests were conducted with one degree of freedom and with N=58.

For Test 2, the hypotheses to be tested were used to determine if students had a significant opinion about the factors of the study.

Chi-square Test 2 Null Hypothesis (H_o): There is no statistically significant difference between the number of positive and negative responses from students as to whether students perceive that any or all of the mobile classroom factors could help them be more successful as part of their college education.

Chi-square Test 2 Alternative Hypothesis (H_1): There is a statistically significant difference between the number of positive and negative responses from students as to whether students perceive that any or all of the mobile classroom factors could help them be more successful as part of their college education.

The expected responses, f_e, for each factor were calculated by subtracting the number of neutral responses for each factor from the total number of responses for each factor and, then, dividing by two. The total number of responses for each factor was fifty-eight responses. Once the expected responses for each of the factors were calculated, the observed values (sum of agree and strongly agree responses), f_o, were logged for each of the ten factors a through j. The Yate's chi-square test was performed to determine if one or more of the mobile classroom factors were significantly important to current college students. In other words, Test 2 was used to determine how important each factor was to those students who did not hold a neutral opinion about the use of a mobile classroom. Both, the $p < .05$ and the $p < .01$ tests were conducted for one degree of freedom using the Yates chi-square test.

Results of the Survey

Fifty-eight students responded to the survey. All fifty-eight students selected an answer on the Likert-scale for each of the ten factors, a through j, listed in the Methodology section of the paper. The students were instructed that the demographic questions were optional. Most of the students, fifty-three of them, answered at least some of the demographic questions, a through g, listed in the Methodology section of the paper.

For Test 1, the Yates chi-square was used to test respondents' neutrality for each factor. All ten factors were found to be very significant to the students. If any of the ten factors had been found to be insignificant, the factor would have been considered to be unimportant to students. Unimportant factors would not have been included in the factors to be tested for Test 2. The summary of results for Test 1 was displayed in Table 2. It was easy to see that each of the Chi-square results exceeds the $p < .05$ critical value of 3.841. It was clear that the $p < .01$ critical value of 6.635 was exceeded in the results of each of the ten factors, as well. The Test 1 null hypothesis was rejected for each of the ten factors, a through j. Rejection of the null hypothesis for Test 1 meant that student responses indicated that students did have an opinion about the factors posed in the survey.

For Test 2, the Yates chi-square was used to test for respondent interest in using each of the ten factors. All ten factors were found to be very significant to the students. The summary of results for Test 2 was displayed in Table 3. It was easy to see that each of the Chi-square results exceeds the $p < .05$ critical value of 3.841. It was clear that the $p < .01$ critical value of 6.635 was exceeded in the results of each of the ten factors, as well. The Test 2 null hypothesis was rejected for each of the ten factors, a through j. Rejection of the null hypothesis for Test 2 means that student responses indicate that a significant number of students would like to use all of the mobile classroom factors listed in the study to help them be more successful as part of their college education.

The demographics data gathered in the survey offered information about characteristics of the students who were surveyed. The demographics data included (a) the type of college classroom students experienced in the past, (b) the current academic level, (c) gender, (d) age, (e) income, (f) U.S. citizenship, and (g) technology-savvy.

The age information we gathered showed that the respondents' ages were between eighteen and fifty-seven years of age with forty-six of the total fifty-eight students reporting their ages. The mean age was twenty-eight years of age. The mode age was twenty-two years of age. Six student respondents reported their age as twenty-two years of age. The median age was twenty-six years of age. All of the students over the age of thirty, a total of twelve students, reported that they were technology-savvy. For students under age twenty-five, a total of twenty students, thirteen of the students reported that they were technology-savvy. For students age twenty-five to thirty, a total of fifteen students, nine students reported that they were technology-savvy.

The grade-level information offered that two respondents were doctoral students; twenty-three were master students; twenty-eight were undergraduate students with seven freshmen, ten sophomores, five juniors, and six seniors. Five students did not report their level of education.

Gender totals were calculated. Twenty-eight students were male. Twenty-four students were female. Six students did not report their gender.

Thirty-seven students reported that they were technology-savvy. Ten said that they were not technology-savvy. Three said that they did not know if they were technology-savvy. Eight did not report whether they were technology-savvy.

Student income levels were gathered in ranges using the U. S. dollar as the base. Two students reported that they had no income. Eleven students reported income less than thirty thousand dollars. Sixteen students reported income between thirty thousand and forty-nine thousand dollars. Five students reported income between fifty thousand and sixty-nine thousand dollars. Eight students reported income between seventy thousand and eighty-nine thousand dollars. Three students reported income between ninety thousand and one hundred ten thousand dollars. Five students reported income greater than one hundred ten thousand dollars. Eight students did not report their income levels.

Students reported whether they were U. S. citizens. Forty-seven students reported that they were U. S. citizens. Six students reported that they were not U. S. citizens. Five students did not report citizenship.

Students reported the formats of college courses they had taken. Students were permitted to select as many items as applied to them. Students selected from college course experience categories including in-class, hybrid, and online formats. Forty-four students reported that they had taken in-class courses. Twenty-three students reported that they had taken online courses. Twenty-six students reported that they had taken hybrid courses. Eight students did not report the course formats in which they had participated.

Implications and Applications

All levels of college students ranging in ages from eighteen and fifty-seven years of age are interested in using new technologies, innovations, and gadgets as part of their college learning experiences. There is no indication that younger learners are more technology-savvy than older learners since all of the students over the age of thirty reported that they were technology-savvy while more than half of the students under the age of thirty reported that they were technology-savvy. Since so many students are already technology-savvy, it may be possible to introduce new, innovative learning techniques into education with a minimal need for technical training for at least half of the students. It may be necessary for educators to provide alternative, low-tech learning options or to provide extensive technology training for those who are not technology-savvy. As personal technology options grow, educators may need to research options and may need to learn to provide new educational materials and new personal technology-based assignments (Riggs & Cohen, 2006;). In addition, since many students are not technology-savvy, educators may need to research options that may be available to enhance learning for students who do not participate in technology-based learning alongside their technology-savvy peers. It may be necessary to provide both a technology-based assignment and a low-tech assignment to assist those who lack technological capabilities.

Personal devices can be expensive. Not all students can afford to buy them for themselves. Some schools have been experimenting with providing the personal devices to the students. The Duke University effort to provide personal devices like iPods to all new incoming Freshmen students is in a process of development and change. Duke University and other schools have paid to provide the personal devices so that all students can use them for their coursework regardless of students' personal incomes. Although new ideas for personal device use are still growing, Duke and some of the schools are cutting back on which students receive the personal devices for free and, instead, are aiming at identifying where and when the personal devices are the most useful (Roach, 2005).

The applications for this recommendation are numerous, especially for those in educational settings. The technology generation has grown up with all forms of computing devices (Campbell, 2005). Students are, often, far more intrigued by online gaming, music downloading, video clipping to cell phones, and text messaging than they are by reading a book (Ortiz, 2006; McFarland, 2006; Roach, 2005). Learning by audio text could be a great way to help technology-savvy students learn course materials. This solution, while not perfect on its own since many still like old-fashioned reading, could provide a way to disseminate crucial information to non-readers. If the goal of educators is to truly challenge and to enlighten students, the educators should use whatever methods make our students successful (Roach, 2005), Shaw, 2006). What it will take for instructors to personalize instruction for students using the latest technology is a great topic for further research.

Students could use all kinds of recorded information and archived digital media to learn in visual, auditory, tactile, and kinesthetic ways (Fullerton & Schmidt, 2005; Shaw, 2006). Students could record their own presentations, assignments, exam solutions, practice sessions, instructor lectures, and much more using every kind of learning mode. Personal device opportunities for student-to-student collaboration, student-to-instructor collaboration, or class to expert-in-the-field collaboration could come alive in multimedia anywhere the student, educator, or expert happens to be located at the time (McFarland, 2006; Roach, 2005).

We have seen foreign students in our classrooms that often have minor difficulties speaking English, struggle, considerably, with printed materials in English. These students could have the capability of hearing the text materials in a native language, or vice versa, and making visual associations, to enhance their learning experience.

We have seen visually-impaired students struggle to keep up. An audio text could provide another alternative for acquiring the written information. The file downloads could be completed from a PC in the student's home, a library, or a dormitory, anywhere Internet access is available. One visually-impaired student told us that audio text has the potential to become a companion for visually-impaired textbooks, or could replace the textbooks, altogether.

Finally, the mobile classroom is a great option for the working adult whose daily commute provides the perfect setting for listening to a digital book. Many busy adult students in our classes have told us that they feel overwhelmed trying to complete all their assignments, occasionally dropping out of class, especially when time for homework is limited. Education can take a back seat to work and family needs. An audio text could provide the working student with a way to review textual information without the boss or the children distracting from school time. We already use audio books for fun in our cars and on airplanes. Student-available audio texts could be used in an automobile, or just as easily, could be used on public transportation, during work breaks, during exercise, and during lunch time (Roach 2005, Shaw 2006).

There will be numerous challenges to overcome in the arena of intellectual property rights, improper use of personal equipment, etiquette for using the personal devices, legal concerns with sharing, and more (Campbell, 2005; McFarland, 2006; Ortiz, 2006; Roach, 2005) . Educators and students have the opportunity to make the use of personal technology devices, technology software, and communications meet the needs and desires of the realm of education.

Conclusion

More research and more real-time experiences could provide better understanding of how personal devices can be used to enhance education. MP3 players, flash drives and many other personal devices are already beginning to be used to meet an educational gap between educators and students (Princeton university offers 'vodcasting,' 2005; Roach, 2005). As hardware and software capabilities improve, and as multiple devices are enlisted to meet communication needs, educators will need to learn how to specify individual or personal educational wants and needs when providing specifications to developers and to manufacturers. The survey shows that students want to use their new technology gadgets as part of the learning process. Personal devices, mobile classrooms and other supporting material are on the wave of the future of education—not too far off.

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Table 1. Explanation of the Five-point Likert-scale used in the Study

Rank	Textual Description of the Rank
1	Strongly Disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree

Table 2. Summary of the Yate's Chi-square Results for Test 1: Neutral Test

Factor	Expected Responses (f_e)[a]	Observed Non-neutral Responses (f_o)[b]	Chi-square Statistic[c]
a	29	50	28.982* **
b	29	49	26.224* **
c	29	46	18.775* **
d	29	40	7.603* **
e	29	44	14.500* **
f	29	41	9.120* **
g	29	47	21.120* **
h	29	44	14.500* **
i	29	49	26.224* **
j	29	41	9.120* **

[a] 58/2=29. [b] Sum of the factor responses of Strongly Disagree + Disagree + Agree + Strongly Agree. [c] Yates Chi-square statistic.
*$X^2(1, N=58) = 3.841$, $p < .05$. **$X^2(1, N=58) = 6.635$, $p < .01$.

Table 3. Summary of the Yate's Chi-square Results for Test 2: Criticality of the Ten Factors

Factor	Neutral Responses [a]	Expected Responses (f_e) [b]	Number of Observed Positive Responses (f_o) [c]	Chi-square Statistic [d]
a	8	25.0	46	33.620* **
b	9	24.5	43	26.448* **
c	12	23.0	41	26.630* **
d	18	20.0	33	15.625* **
e	14	22.0	41	31.113* **
f	17	20.5	32	11.804* **
g	11	23.5	40	21.787* **
h	14	22.0	46	16.568* **
i	9	24.5	36	36.000* **
j	17	20.5	44	16.487* **

[a] Count of the neutral responses for each factor. [b] ((58 – the number of neutral responses) / 2). [c] Sum of Agree + Strongly Agree responses for each factor. [d] Yates Chi-square statistic.
*X^2(1, N=(58-the number of neutral responses for the factor) = 3.841, p < .05.
**X^2(1, N=58-the number of neutral responses for the factor) = 6.635, p < .01.