

STUDENT PREFERENCES AND OPINIONS ON ACADEMIC INTERNET INTEGRATION – A FIVE-YEAR STUDY

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ABSTRACT

From 1999-2003 a five-year higher education study on student attitudes towards course-related Internet usage was conducted at a Midwestern public university. The study focused upon Internet integration into traditional courses using tools such as syllabi posting, links to online readings, and class emails, rather than web-delivered, asynchronous courses. Using a large cross-disciplinary, repeated sampling of undergraduate students the study was able to track trends and identify student preferences. Through the identification of preferences, the future costs associated with the adoption of Internet technologies into mainstream higher education can decrease, and the rate of adoption success can increase. Baselines of demographic and usage statistics were collected annually to observe changes before and after a laptop standardization program was institutionalized in Year 3 of the study.

Key Words: Diffusion of Innovation, User Attitudes, User Behaviors, Education IS, Technology Trends

I. BACKGROUND AND RESEARCH ISSUES

Starting with the advent of user-friendly browsers and email clients on college campuses in the mid 1990s, the Internet matured from a novelty item to an expected tool. Comprehensive course management systems such as WebCT and Blackboard offered an easier entry for less technical faculty. Lower costs for high-speed connections and wireless campuses in the early 2000s made Internet integration more practical for frequent use as supplemental to traditional higher education courses.

A review of the literature reveals that studies on technology use and effectiveness in higher education have been growing in number, but have constraints. Nationwide or multi-institutional projects such as National Survey of Student Engagement [Kuh, 2004], Pew Internet and American Life Project [Jones, 2002], and The Campus Computing Project [Green, 2004] show high levels of online access by students and corresponding university infrastructure expansion. Other research and literature examine the assessment of web-based learning [Carr, 2000; Sonwalkar, 2002; Koohang and Durante, 2003] or design guides for online courses [Chizmar and Walbert, 1999; Ingram and Hathorn, 2003]. When considering adoption of Internet technology, most concentrate on the faculty side or preferences [Hansen and Salter, 2001]. Some studies have researched student attitudes/preferences, but target online courses [Lundgren, Garrett and Lundgren, 1999-2000; Brown and Liedholm, 2004] rather than online use in lecture based courses. The goal of a Pan, Sivo, and Brophy [2003] study was to investigate the relationship between actual student use of WebCT and students' perceptions of the ease of use, perceptions of usefulness, attitudes toward WebCT, subjective norms, and computer self-efficacy in a web-enhanced general psychology course. Sanders and Morrison [2001] quantified student attitudes on preferred features and overall perceived value of the web

enhancement to a specific biology course. They recommended a study that investigated more features, more courses, and more institutions. Selim [2003] examined student acceptance of course websites across subjects and found evidence to suggest that student perceived usefulness and ease of use influenced actual use. Dasgupta, Granger, and McGarry [2002] studied the relationship between perceived ease of use of e-collaboration tools and perceived usefulness, perceived usefulness and actual use, actual use and improved performance.

The present study focuses specifically on the use of a wide variety of Internet features in traditional courses across disciplines and time. It identifies and follows the actual patterns of student use of various Internet tools and it tracks their preferences in those tools. Findings from this study offer suggestions to instructors to best incorporate the Internet. There is potential value if students continuously prefer and use certain learning tools to maximize their amount learned at their least cost. This cross-sectional view of student use and preferences toward, Internet tools over a five-year period tests the following hypotheses of potential value to instructors and administrators in higher education:

- There is a significant difference over time in personal web use.
- There is a significant difference over time in prior experience (the reported number of prior courses with Internet integration).
- There are Internet features that are consistently desired by students in an academic setting.
- There are correlations among preferences toward specific Internet tools.
- Neither increased personal nor class uses are predictors for desired features.

- There is correlation between the three attitudinal questions measuring students' attitudes that Internet use (i) has learning benefits in a specific class, (ii) has learning benefits across courses, and (iii) is beneficial both in and outside of their educational environments.
- There are significant differences among the three attitudinal questions over time.
- There are predictors for the attitudinal question on Internet use helpfulness to a specific class.

II. SURVEY METHOD

A survey instrument (See Appendix I) was drafted, in consultation with statisticians, to be administered over multiple years and was tested by a small group of students for clarity. Further feedback after Year 1 prompted a slight wording change; where appropriate some data has not been included in five-year composite results. In addition, during Year 4 the student governance body requested the addition of ten questions relating to the standardized laptop initiative at the university.

The desired sampling was 10% of the university student population, thus the actual sample size increased each year in accordance with that population (see Table 1).

Table 1. Sample Size and Response Rates

Year	Sample Size (N)	# Responses	Response rate
1 - 1999	729 (6725)	539	74%
2- 2000	742 (6696)	415	56%
3 - 2001	765 (6906)	278	36%
4 - 2002	799 (7288)	361	45%
5 - 2003	852 (7747)	414	49%

Instead of using a purely random sample, it was preferred to have a sampling that might better reflect the demographics of the university population.

The consistency and control over time was apt to increase acceptance of study results. This notion was borne out at several university forums wherein questions regarding validity of representation and applicability to all university factions were raised and allayed. In an earlier faculty survey, 105 (out of 320) faculty indicated a willingness to participate in a detailed Internet usage study. Classes taught by 17 of those faculty volunteers were chosen for the sample (using the criteria that the ending sample be representative of disciplines, student status, and class sizes). As a result, thirteen upper division and seventeen lower division classes were selected. In all subsequent years, those same classes (or equivalent, if not offered) were surveyed regardless of the faculty member. While the original faculty volunteers were interested in the study on Internet use, they were not necessarily advocates or users. To further control for potential faculty bias, the survey was conducted at the beginning of the winter semester with the exception of Year 4, which was delayed until mid-semester to accommodate the addition of laptop questions from the student governance body. This approach is similar to the "Recurrent Institutional Cycle Design" described by Campbell and Stanley [1963] which is a good fit where institutions have a cyclic schedule and the survey can be continually presented to a new group of respondents. The approach differs from their quasi-experimental design in that it does not include a second survey on each year's group. As this study did not include a treatment or change variable presented to the survey sample, pre-post and longitudinal study methods were not chosen. The goal of this study was to identify whether changes occurred over five years in Internet usage and attitudes using a consistent sampling of the student population that was convenient to identify each year.

In Years 1 and 2 a dual survey collection process was used. One-half of the students were given a computer scanned paper survey while the other half were asked to complete an online survey. The questions were identical. The paper survey was distributed and immediately collected by a researcher or a

student aide during class time, typically at the beginning of class. Students were instructed not to complete a survey if they had done so in another class and the sample size was accordingly reduced. The Web address for the online survey was sent during the first week of the winter semester via an email announcement from a researcher to students in each selected class, copying the instructor so students knew it was a legitimate request. As both a control mechanism to prevent excessive duplicate entries and as a motivation, students typed their email address on the web page survey. The instrument promised confidentiality and composite reporting. One week after the initial email announcement, a reminder email was sent. If a student received multiple notices because they were enrolled in two or more of the surveyed classes, they were instructed to reply to the email stating they had already received one, rather than submit a second survey. These replies were used to avoid multiple responses from students. Since a statistical analysis of the results indicated no significant differences between the two sets of collected data, Years 3-5 were conducted only via the online method. As an incentive, a gift certificate for the university bookstore was offered to those who submitted a completed survey. A random drawing selected the winner.

III. DETAILED RESULTS AND DISCUSSION

Demographics

The survey asked several demographic questions with the following results:

- In Year 1, 76% had computers at their local residence compared to 100% in Year 5. The mandatory laptop program that commenced in Year 3 ensures all full-time students have a computer while part-time students may opt in.
- In Year 1, 62% had an Internet connection at their local residence compared to 84% in Year 5. A point of observation here is that, in Year

3, 93% reported Internet access at home. Anecdotal evidence suggests that increases by students in exclusive use of cell phone service at the expense of landlines have reduced Internet access at home. If this is a significant trend that is not offset by use of community high speed or wireless access, then faculty and administration expectations of off-campus access should be modified.

- The average age varied little over the five-year study, ranging from 22.2 - 23.2 with an overall average of 22.7 and a standard deviation of .46.

Table 2. Distribution of Age Categories

Age	1999	2000	2001	2002	2003
<19	8%	10%	9%	10%	16%
19	15%	13%	18%	19%	18%
20	20%	21%	19%	20%	19%
21	17%	17%	16%	15%	15%
22	11%	11%	11%	11%	10%
23-24	10%	11%	8%	10%	9%
>24	20%	17%	19%	15%	13%

- Academic status and disciplines were fairly well distributed. The survey responses were reasonably representative of a diverse student body and, more importantly, they were consistent over time. (See Tables 3 and 4) Graduate students were not a targeted audience; however, some post-graduate students returning for additional undergraduate studies were caught in the sample. It was not expected that the number of graduate responses would match the university graduate population of 11-12%.

Table 3. Distribution by Class Status

	1999	2000	2001	2002	2003
freshmen	14%	18%	14%	18%	24%
sophomore	24%	21%	28%	22%	24%
junior	28%	30%	25%	27%	24%
senior	28%	25%	29%	30%	26%
graduate	6%	5%	4%	3%	2%

Table 4. Distribution by Academic Discipline

	1999	2000	2001	2002	2003
Arts	10%	11%	15%	11%	9%
Business	29%	32%	26%	26%	33%
Education	13%	12%	12%	14%	10%
Sciences	31%	25%	23%	28%	31%
Behavioral Sciences	13%	14%	18%	13%	9%
Undecided	5%	6%	6%	8%	8%

Internet Use

Figure 1 shows that the Internet was used at least daily by over 53% of the student responders in Year 1. By Year 5, that number rose to 90% and only one person reported no use. The numbers remain higher and stable from Year 3 (the introduction of the laptop initiative) onward and might be reaching the saturation point.

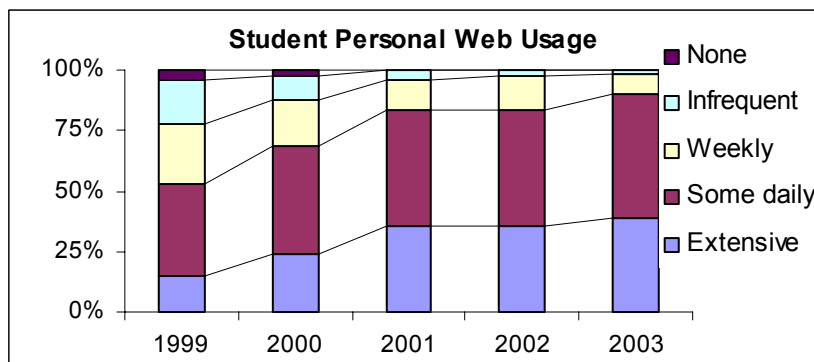


Figure 1. Student Web Use

Personal web use may generalize into more acceptance of academic web use in that skills gained by downloading games/music, sending attachments and email, and surfing for entertainment and commerce can be effectively applied to an academic use, and later to a job use. The Pew Internet and American Life Project of 2002 considered non-educational factors. 2,054

students from 27 academic institutions participated in a survey intending to identify significant trends in Internet use among college students. Based on this study, 47% of students entering college do so with Internet experience. While in college another 49% gain Internet experience. As for amount of usage, the Pew project found “three-quarters (74%) of college students use the Internet four or more hours per week, while about one-fifth (19%) uses it 12 or more hours per week.” [Jones, 2002] Additionally, the report states that non-academic Internet activities gains skills that can transfer to the workplace. “Today’s college student will be well prepared to work in a wired world. Virtually all of them will have experience with email and the Web, and most will be familiar with a wide variety of software packages. Many will also be well versed in peer-to-peer file sharing and online collaboration.” [Jones, 2002]

Prior Experience

Students were asked, “Have any of your university courses (here or elsewhere) included the use of the Internet as part of the course?” If so, they were asked to report how many prior courses. Figure 2 shows that in Year 1 27% responded that they had not had this experience. By Year 5, all but 5% reported at least one course of prior experience. The responses indicate that the number of courses having an Internet component changed significantly over the five years. The p-value of the chi-square test is less than .001. There was a flip to more experience with 27% reporting five or more prior courses in Year 5. Given overall Internet expansion, this may appear obvious. However, this result must be put into perspective for this study’s sampling method. The survey sample always used the same classes, i.e. same algebra class or chemistry lecture, rather than the same students or a random group. Thus, it is more likely that students in these sampled classes were at relatively equivalent points in their academic standing, i.e. second semester freshmen, than if a purely random sample had been used. Therefore, if each year’s population had a similar number

of prior courses, and of those, there was an increase in the number with an Internet component, this may indicate that a sustained faculty Internet adoption has occurred – students are entering the same set of classes with more prior academic Internet experience.

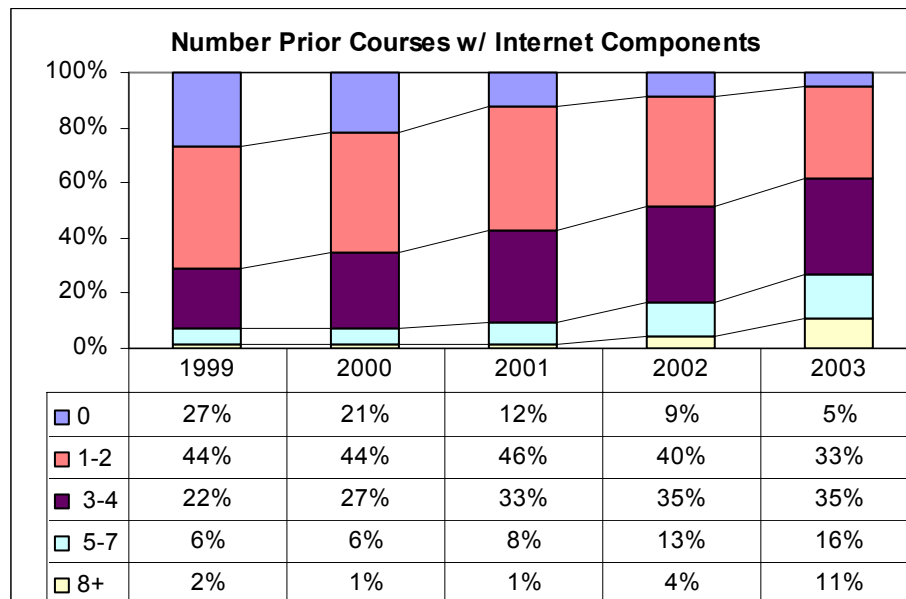


Figure 2. Prior Experience

Data in Table 5 from the Campus Computing Project similarly reflects an increase in Internet tool usage during the timeframe of the study. [K. Green, 2000, 2003]

Table 5. Internet Tool Usage from Campus Computing Project

Component	1999	2003
course email	54%	71.8%
Internet URL resources	38.9%	52.9%
course website	28.1%	37.4%
CMS [Course Management Software]/ LMS [Learning Management Software]	14.7% (2000)	33.6%

Feature Usage

All student responders were asked to review of list of Internet features that could be used by an instructor within their courses. For each feature, the choices were “would use a lot,” “would use,” and “wouldn’t use.” Only data from the last four years were used for comparison purposes due to a slight rewording of the possible answers from the Year 1 survey. The results were considered in two ways: what are the most highly desired student Internet features (choice 1), and what features are students potentially willing to use (choices 1 and 2). The distinction is important for faculty adopting Internet integration because they have limited time to prepare these resources and their initial success will sustain the effort. When an instructor spends hours developing a rich set of resources to accompany their course that few students use, it is discouraging and likely to be discontinued.

Remarkably consistent responses, shown in Table 6, exist for the top ranked features across four years, a laptop initiative, and increased Internet fluency. Not only do the same desired features appear year after year, they ranked in almost identical order each year. Using Spearman’s rho, the correlation among the ranks over the four years was significant at the .01 level (two-tailed). At a significance level of .05 there is little evidence suggesting that these desired features are independent. Additionally, there appears to be positive correlation between personal web use and each of the desired features as well as between the number of prior courses and each according to Spearman’s Rank coefficients.

Students most want to use the Internet to make their job of being a student more efficient and effective. None of the top ranked features involves use of the Internet for subject knowledge gain such as doing research, reading online articles, or using course supplements. When choosing features on the list to use

a lot, composite correlation analysis indicates personal web use may carry more weight than exposure to the Internet in prior courses.

Table 6. Highly Desired Features (would use a lot)

	2000 rank	2001 rank	2002 rank	2003 rank	Spearman's Rank coefficients with # prior courses Prob > t = 0.000	Spearman's Rank coefficients with personal web use Prob > t = 0.000
view grades	1	1	1	1	.2014	.2651
practice tests	2	2	2	2	.0959	.1665
get lectures	3	3	3	3	.1759	.1822
get syllabus	4	5	5	4	.1417	.2299
email from prof	5	4	4	5	.2255	.3077
get assigns	6	6	6	6	.2306	.3109
submit assigns	7	7	7	7	.1074	.2336
take tests	8	8	8	8	.1259	.2524
get software	9	9	10	10	.0579	.1035
online office hours	11	14	9	9	.0613	.1500

Secondly, the results were grouped into “potential use” (combining “would use a lot” and “would use”) vs. “non use” to determine whether students were apt to use a feature if an instructor offered or recommended it. There is little motivation for instructors to introduce a feature that students indicate they will not use. The results in Figure 3 mimic those of the highly desirable features, but expand to show a willingness to use course supplements and do research. (Intermediate years are not included in order better show usage trends by reducing clutter on the chart.)

All features except interactive web assignments and web readings changed significantly over the years. The most growth in acceptance (over 25%) were in taking tests online, submitting assignments electronically, and taking a web-only course. (While the study population and focus was on traditional courses, a question regarding attitude towards a web-only course was asked to cover the far end of the Internet use spectrum.) These could indicate a shift in perceived security and stability of the Internet. Referring to Table 7, with p-values

of 0.000, the number of prior courses did not appear to impact the growth areas of submitting assignments, taking tests, and opting to take a web course. Personal web usage has a mild effect on these growth areas.

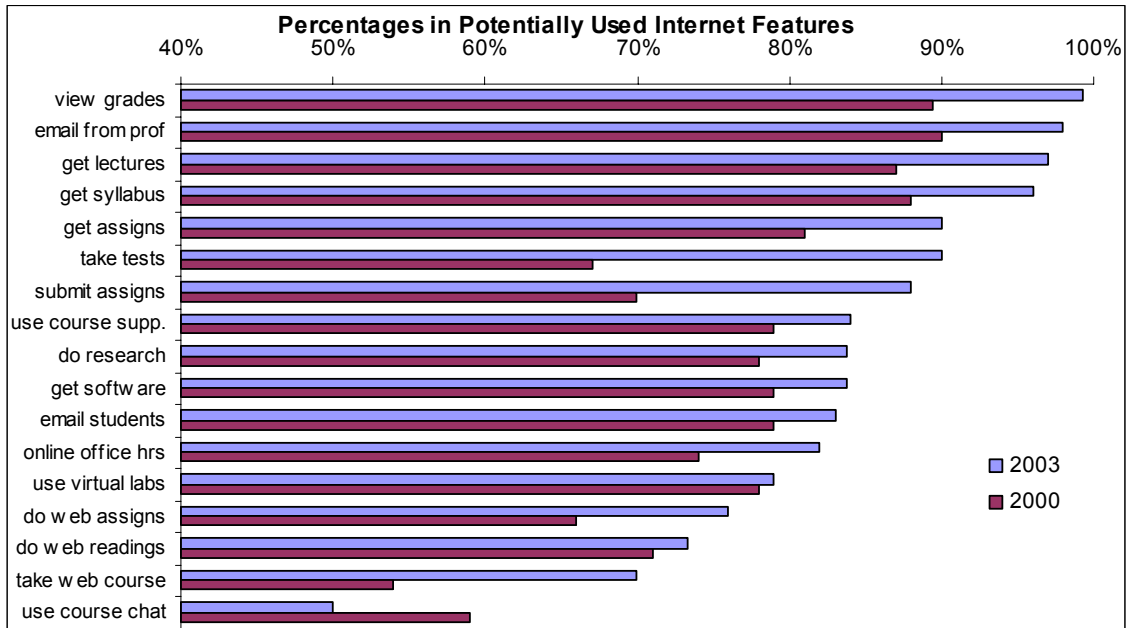


Figure 3. Percentages in Potential Feature Usage from Year 2 versus Year 5

Table 7. Growth Areas

	Spearman's Rank coefficients with # prior courses Prob > t = 0.000	Spearman's Rank coefficients with personal web use Prob > t = 0.000
submit assigns	.1074	.2336
take tests	.1259	.2524
taking a web course	.0996	.1832

Taking a web-only course and using course chat were consistently low in the highly desired features list. The only feature that decreased over time is the use of a course chat feature. These findings are roughly consistent with earlier studies conducted on a singular web-enhanced course [Sanders and Morrison-Shettlar, 2001], which covered fewer but similar features. The data from this study lends some support to the findings by Dasgupta, Granger, and McGarry [2002]

on actual use of e-collaboration tools; chat, bulletin boards, student-student email are not highly desirable features compared to other options.

In looking for correlations between the potentially used features, Table 8 lists the pairs of related features. Most pairs correspond to the top 10 list of highly desired features, i.e. if a student will download assignments, they are also likely to download syllabi and lectures, and submit assignments electronically. By using this table, instructors can deliberately select features most likely to encourage a domino effect of student use, stopping at points where costs incurred to instructors rise too high.

Table 8. Correlation between potential features

Feature	Feature	Spearman's Rank Correlation > .5 Prob > t = 0.000
Getting assignments	Getting syllabus	.567
Doing web readings	Doing research	.543
Getting assignments	Submitting assignments	.541
Submitting assignments	Taking tests online	.527
Submitting assignments	Doing web assignments	.512
Getting assignments	Getting lectures	.511
Doing web readings	Using online supplements	.498
Doing web assignments	Taking web-only course	.494
Doing web readings	Taking tests online	.486
Doing web readings	Doing web assignments	.485
Getting lectures	Viewing grades	.466
Getting lectures	Getting syllabus	.460

These results confirm that students may need encouragement to use some features that are not high on their priority list, but could be beneficial to their learning process.

Perceived Usefulness

Students who have had experience using the Internet in a course were asked to indicate the usefulness of that Internet integration in three ways, which were treated as attitude variables.

- Was Internet integration into a course useful to that specific course?

- Was use in one course generalized to other classes, i.e. were skills obtained in one course transferred to others.
- Was use in one course generalized to their overall computing literacy and personal use?

Those who felt negatively or did not use the Internet components of the class were in the clear minority of an average of less than 5%. Figure 4 depicts this consistency across the years of study. In a statistical analysis, the mixed results with usage specific and year variables indicate some downward shift from “improves student performance” to “neutral impact” and an upward shift from “negatively impacts student performance” to “neutral impact.” In other words, there is a slight shift to the center from both ends of the perceived value scale. It is difficult to determine if these shifts are significant and will be left for future research.

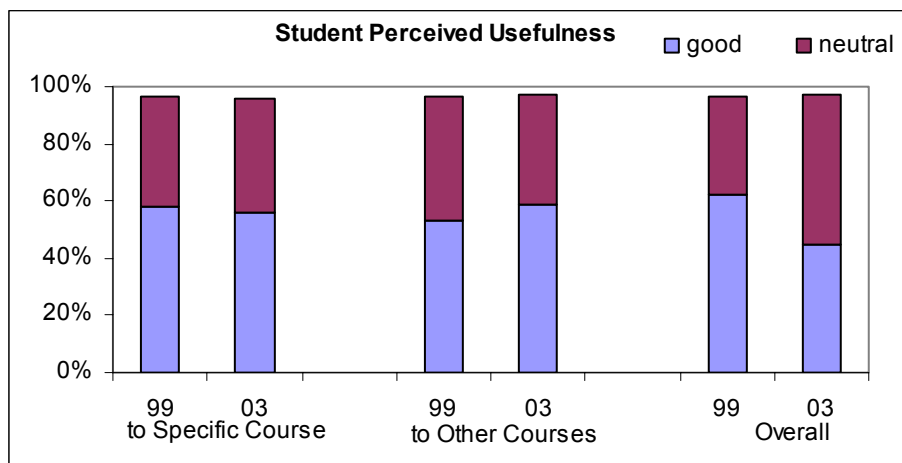


Figure 4. Perceived Usefulness Yr 1 v. Yr 5

This positive student attitude appears consistent with a study on a web-enhanced biology course [Sanders and Morrison-Shetlar, 2001] and nationally in a Pew Study which found 79% of respondents agreed the Internet had a positive impact on their academic experience [Jones, 2002]. A study by Selim [2003] to validate the applicability of Davis' Technology Acceptance Model (TAM) on

course websites in higher education concluded that website usefulness had the greatest impact on website acceptance (as measured by actual use). The same study found website ease of use increased the perception of usefulness, thus indirectly increasing acceptance. Dasgupta, Granger, and McGarry [2002] studied the applicability of the TAM to e-collaboration and found that perceived ease of use had a positive effect on perceived usefulness, but perceived usefulness had a negative impact on actual use. They suggested a possible reason for the discrepancy between TAM and their findings was due to the choice of e-tools studied.

With p-values of 0.000, there is agreement among the three attitudinal questions reflected by Spearman's rank correlation coefficients of .602, .438, .521 for usage specific-usage other, usage specific-usage overall, and usage other-usage overall, respectively. The correlations shown in Table 9 indicate there is little evidence that personal web usage and the three attitudinal variables are independent. There is slightly higher positive correlation between number of prior courses and usage specific, usage other.

Table 9. Attitudinal Questions Correlations

	Spearman's Rank coefficients with course usage(specific) Prob > t = 0.000	Spearman's Rank coefficients with course usage(other) Prob > t = 0.000	Spearman's Rank coefficients with usage overall Prob > t = 0.000
personal web usage	.183	.130	.077
# prior courses	.216	.187	.155

While students consistently perceive there is academic value in Internet integration within a course, the prior course exposure and personal web usage are mild predictors. If academic value were a dominating factor (students connect learning success with course experiences and Internet use), it would seem that increased exposure should strongly correlate to increased perception value. Another possibility is that perceived value started high because Internet use is

not associated solely with learning. A high and stable perceived value may be a halo effect from entertainment, leisure, and employment usage.

A further evaluation, shown in Table 10, was done using a generalized linear model, testing usefulness for a specific course against year, age, status, computer ownership, and home Internet connection at the .05 confidence level. In Year 1 and 4, home connection had p values of .025 and .064, respectively. It does not appear that usefulness is dependent upon status, computer ownership, home connection, year of study, personal web use, or number of prior courses. Age is the only independent variable, having a p value of .005, with a statistically significant, though minor, role in predicting the dependent variable, attitudinal answer on usefulness of the Internet tools to a specific course. The constant variable indicates there are other undetermined factors at play.

Table 10. Results of Generalized Linear Model for Usefulness to a Specific Course

Specific course usefulness	Coefficient	Std. Error	Z	P> z
Year	-.016114	.0171035	-.94	0.345
Age	.007227	.0027012	2.67	0.007
Status	-.0032466	.0121263	-0.27	0.789
Computer ownership	-.0417633	.0518366	-0.81	0.420
Home connection	.0804382	.0459291	1.75	0.080
Constant	2.313408	.0878432	26.34	0.000

When ages were grouped into the four categories in Figure 5, this significance changes with the mean usefulness ending only slightly higher for the highest age group. Repeating the generalized linear model in Table 10 using four discrete age categories instead of actual age, the P>|z| value goes from .0007 to .596. When more age groups were used (nine instead of four), the P>|z| value was .800. Sanders and Morrison-Shetlar [2001] detected a similar phenomenon and concluded that age could not be considered a factor, but cautioned about the small number of respondents in their age groups. With the larger sample of this current study, it seems that a relationship does exist between age and attitude, but only when age is reported continuously, not discretely. Thus, while it may be

premature to dismiss age as a predictor, the inconsistency makes it difficult to claim that age matters.

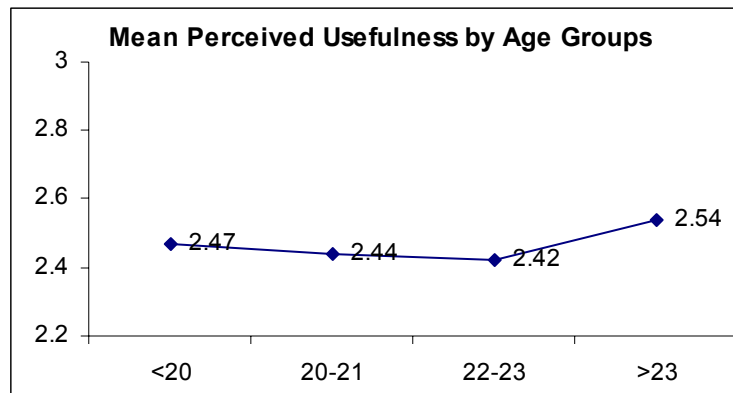


Figure 5. Age v. Perceived Usefulness to Specific Course

These findings suggest that there may be no significant predictors for perceived Internet usefulness and actual Internet use specifically in educational environments.

Drawbacks

In the comment section of the survey, students were provided an area to describe drawbacks to Internet use within courses. Table 11 depicts the high percentage of students adding written comments each year (indicating that a large number of students had additional opinions to offer beyond the quantitative survey questions).

Table 11. Number of Written Comments

Numbers of comments (%)	Number of participating students
420 (78%)	539
331 (80%)	415
224 (81%)	278
270 (75%)	361
284 (69%)	414

These comments were read, categories created, and re-read for manual coding into one or more categories. Seven categories emerged:

- impersonal nature
- lack of access
- technical problems
- lack of knowledge on use
- misuse
- forced laptop initiative
- other

From the graph in Figure 6, it appears that the impersonal nature of the Internet is a clear issue. However, the number in the “impersonal” category is misleading because the majority of those comments related to drawbacks of taking a web-only courses rather than integrating the Internet within a traditional class setting. Neither the survey nor the sample population was based upon web-only courses, so it was unclear as to why the written comments gravitated to that delivery. Perhaps it is corroboration that the far-end spectrum question of “web-only” Internet use averaged only 25% of the highly desired responses and students felt highly negative about it. The significant drop in lack of access comments after Year 1 reflect the laptop initiative, giving every student ubiquitous Internet access on campus, leaving negative comments from those without Internet connection at home. Awareness of technical problems and a lack of computer knowledge on both the part of the faculty and students increased as usage increased. This may imply students did not realize how little they knew until after they had to use it. Negative comments about being forced to participate in a laptop program with its costs, freedom of choice, and required use of the Internet stayed about 5%, except for the year prior to the laptop. “Other” negative comments generally dealt with a preference for paper or the inconvenience and time cost associated with online resources.

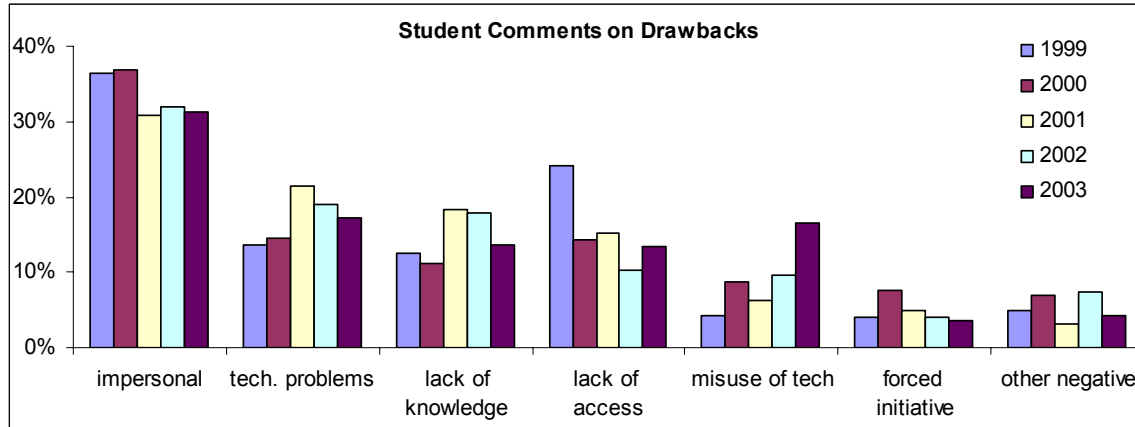


Figure 6. Drawbacks

The most significant change was the increase in comments regarding misuse of technology from 4 to 17%. These include abuse out of the classroom (easier plagiarism and piracy), misuse of laptops in the classroom (surfing, chat, email), and bad habits on the part of instructors (too many last minute changes, out of date content, or overuse of links causing information overload). Given the sharp increase that seems to follow the increases in course and personal usage, this may be a warning flag to administrators that guidelines for proper use must be put into place early so as not to erode the benefits of Internet integration.

IV. STUDY LIMITATIONS

Several limitations should be addressed when considering or applying the results of this study. First, gender was not captured on the survey. Second, it had been hoped that the responding participants would be representative of the university and thus significantly applicable in training instructors for this institution. Comparing the study and university data indicates that the survey responses do not statistically mirror the university overall for each category. However, it is believed that the results are valid for this institution and others since all demographics collected are generally diverse and consistent. Third, though Internet tools advanced over the five-year period, the researchers felt it

important to maintain a consistent instrument. Thus, there may be other features beyond the original eighteen that should now be included. Even though the comments were extensive, further qualitative research, employing student focus groups, may add insight for interpretation of the quantitative data.

V. IMPACT OF THE LAPTOP INITIATIVE

The laptop initiative and its comprehensive network connections may have impacted the study results from both the demand (student) and supply (instructor) sides. Students, as consumers, have few costs associated with increased use of their laptop and the Internet and were self-reported users: 74% of students use their laptops 1-6 hours per day and 90% are online at least daily. By Year 5, the laptops were pervasive. Using a readily available laptop while on campus to obtain course materials or information was so relatively easy that it removed the barrier of inconvenience. Beyond the survey data, anecdotal evidence and promotional photos support the laptops as constant companions.

Faculty, as providers, had higher costs for adoption than students. By Year 1, faculty were aware of the upcoming laptop initiative and offerings of instructional technology workshops. It was a slow process for faculty to change their methods of teaching and communication with students, primarily due to a high cost in time and resources. Figure 2 shows a steady increase from Year 1 to Year 5 in number of courses making use of the Internet – particularly in Year 4, one year after the laptop introduction. While there was a mandate for student participation in the laptop program, there was no mandate from administration for faculty use of technology in their courses. It was not expected that a sharp increase in faculty use would occur. This discrepancy spawned vocalized controversy – if students had to participate, why didn't faculty? This sentiment prompted ten additional laptop questions to the survey instrument at the request of the student government body. These laptop opinion questions had more

positive results than expected, indicating there was a silent majority of satisfied students. By Year 5, 69% of students responded that laptop use in their coursework was just right (up from 48% in Year 4), 20% feeling it was too little (down from 35% in Year 4). On their own accord, faculty appear to be moving in the direction of academic laptop use, much of it via Internet integration. (It is impossible to state whether the survey results would have been the same without the laptop initiative.) The student preferences appear so consistent that it seems their attitudes would not have changed, but the number of courses and hours online may have been less. The same patterns of growth could have occurred without the laptop, but at a more accelerated rate, particularly for faculty transition.

VI. SUMMARY

This five-year study embarked with multiple hypotheses relating to student attitudes and behaviors associated with Internet integration into traditional courses. The results of this study identified the following findings.

- High majorities of students are regularly online for personal use and the usage has increased over time. While critics assert the majority of student Internet uses are for entertainment, from the survey it seems students are able to apply skills from personal web use to academic web choices that may enable them to more efficiently handle their course load. If this is the case, entertainment usage should not be immediately discounted – any use could have a long-term positive value. This is supported by a Pew study [Jones, 2002].
- Student personal web use appears to lend itself (more than prior course experience) to student use of Internet features integrated by instructors.

- Students at approximately equivalent points in their academic standing are entering the same set of classes with more prior academic Internet experience, which may indicate a sustained faculty adoption of Internet technologies.
- There is a distinction between student *desired* Internet features and those they are *willing* to use if given incentive. Students most want to use the Internet to make their job of being a student more efficient and effective. To get the most student satisfaction with the expended effort, the faculty should adopt features relating to efficiency of the students' job as the learner: posting grades, lectures, syllabi, assignments, practice tests, and software. These Internet features continuously and consistently were reported as the most valued from the outset of the study. Other efficiency-related features of collecting assignments electronically, administering online tests, offering some electronic office hours, and communicating to students via email are considered helpful. Students responding to the survey did not highly desire the chat feature, supporting the finding by Dasgupta, Granger, and McGarry [2002] on actual use of e-collaboration tools.
- Instructors may view the Internet as a means of knowledge enrichment, spending time locating, assessing, and listing outside materials that few students voluntarily use. Features geared towards an enriched content or interactive learning experience have a higher cost to the faculty member in time and technology skills. This does not mean faculty should discard course content enhancements such as links to current readings and online resources. Results indicate students will use these features if expected, but may not if they are optional. This is supported by a Pan, Sivo, and Brophy finding that actual WebCT use was predicted by student attitude toward WebCT use (negative-positive) and subjective norms (external pressures).

They state that “since subjective norms can directly impact frequency of using WebCT, the instructor or TAs need to announce to the class that using the Web-related instruction is a requirement in the course (vertical influence). [Pan, Sivo, and Brophy, 2003]

- Students consistently felt that Internet integration was beneficial, or at least neutral, to the specific course, to other courses, and to their overall education. They felt the same prior to and after increased course and personal web use. There are no significant differences for the three attitudinal questions over time and the three questions regarding perceived usefulness were highly correlated. Perceived usefulness has been shown to predict technology acceptance for course websites. [Selim, 2003]
- It does not appear that attitudes towards usefulness are dependent upon status, computer ownership, home connection, or year of the study. Age, when used as a continuous variable, was found to have a positive relationship to perceived usefulness of the Web to a specific course. When ages were grouped discretely, age was not a factor. This extends the discussion of age presented by Sanders and Morrison-Shetlar [2001].
- Internet access to course-related materials can occur in class, on campus networks, at student off-campus residences. Exclusive use of cell phone service, not offset by community high speed or wireless services, may reduce off-campus Internet access - a factor faculty and administration need to consider when increasing integration.
- A significant increase in student comments regarding the misuse of technology may be a warning flag to administrators that guidelines for both students and faculty should be put into place early so as not to erode the benefits of Internet integration.

Over the five years of study, many Internet advancements became available. Course management software such as WebCT, improved reliability and quality of websites, faster Internet speeds, and better database search features. The tangible and intangible costs to faculty to adopt Internet components have reduced with better tools. Student Internet preferences within a traditional course are constantly focused on course efficiency tools. Faculty will need to use incentives for student use of content-based features.

VII. REFERENCES

Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the paper on the Web, can gain direct access to these linked references. Readers are warned, however, that

1. these links existed as of the date of publication but are not guaranteed to be working thereafter.
2. the contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
3. the author(s) of the Web pages, not JIER, is (are) responsible for the accuracy of their content.
4. the author(s) of this article, not JIER, is (are) responsible for the accuracy of the URL and version information.

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Appendix I. Survey of Student Internet Usage within a Course

SURVEY QUESTIONS: Fill in the boxes (■) to answer each question below.

Class status: Freshman Sophomore Junior Senior Graduate

Year of Birth: 19__ Do you have an IBM Thinkpad from the university laptop program? Yes No

General field of Study: Arts Business Education Sciences Behav. Sciences Undecided

Internet connection at home: Yes No

Frequency of personal Web use (Web surfing, non-academic email, chat, etc):

Extensive Some daily Weekly Infrequent None

Have any of your university courses (here or elsewhere) included the use of the Internet as part of the course (include regular email between students and faculty)? Yes No

If No, skip to question #4

If Yes, in approximately how many courses? 1-2 3-4 5-7 8+

1. Using the Internet as part of a course:

- helps me better learn a course's subject and/or improves my grade (by being a better researcher, knowing what was going on, having materials done on time, clarifying assignments, etc.) than if there were no Internet component
- really doesn't have an influence, good or bad, on my learning or performance in a course (either you already had the skills or don't typically choose to use them)
- has a negative impact on my learning or performance and courses are better without an Internet component
- I don't use the Internet components of a course

2. Using the Internet as part of a course:

- helps me improve my performance in **OTHER COURSES** by giving me an important skill that I could generalize to other classes
- really doesn't have an influence on any **OTHER COURSES** taken or plan to take (either you already had the skills or don't typically choose to use them)
- has a negative impact on my opinion of the Internet as a useful tool in **ANY COURSE** I took or plan to take
- I don't use the Internet component of the course

3. Using the Internet as part of a course:

- makes me more confident than I was before in my **OVERALL** computing literacy and ability to use the Internet for personal, business, or other uses beyond the courses I take
- really doesn't have an influence on my **OVERALL** computing literacy and ability to use the Internet (either you already had the skills or don't typically choose to use them)

- has a negative impact on my opinion of the Internet as a useful in my **OVERALL** computing literacy and ability to use the Internet for personal, business, or other uses beyond the courses I take
- I don't use the Internet component of a course

4. Here is a list of 18 Internet features that an instructor *could* use or recommend in a course. After each indicate YOUR opinion.

Potential Internet Features	Would use a lot	Would use	Wouldn't use
Email announcements from instructor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electronic office hours (your instructor is online and will respond to email immediately)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Email between other students relating to class matters	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Online chat rooms for student team discussions or class member discussions in general	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Online syllabus (descriptions, policies, schedule, readings)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Assignments and handouts distributed online	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lecture summaries or PowerPoint slide files posted online	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grades posted online	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Assignments collected as email attachments, graded and returned as email attachments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interactive online assignments that link you to specific Web sites then ask you questions about their content	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Online practice tests with immediate answers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Online tests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Course delivered over the Web without classroom	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Links to instructor suggested Web sites to obtain additional or more current information on a topic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Assigned reading of online journals or newspapers for classroom discussion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Require Web sources as part of a research paper or project	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Software needed for a class is given to you by a Web link	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Virtual labs that simulate experiments or give animated graphics to explain a concept	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. In your opinion, what is the biggest drawback from the student's viewpoint of using the Internet in course delivery and classroom instruction (for any type of course or major)?

[In Years 4 and 5 the following section was added to investigate attitudes and use of laptops]

TLC initiative section. Please answer the following questions to help assess this program.

1. I fully understand the TLC program and exactly what it encompasses
 - Strongly agree
 - Agree
 - Disagree

- Strongly disagree
 - No opinion
2. I am satisfied with the types of services provided by Help Desk.
- Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
 - No opinion
3. I believe the Help Desk services are provided in timely and efficient manners
- Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
 - No opinion
4. I am satisfied with the number and locations of network connections provided on campus.
- Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
 - No opinion
5. I am satisfied with the software installed or available for my laptop
- Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
 - No opinion
6. Check the laptop features, beyond the standard NMU Thinkpad, that you would like to have added to your next laptop at an extra charge. The extra charge would be paid when you were given your laptop and the amount would be determined by actual cost from IBM. (Check as many as apply. Checking none means you do not wish to have additional features at an added cost.)
- second 20 GB hard drive (increases file storage) for approx. \$250-300
 - next higher level of RAM memory (faster speed and more processing power) for \$50-75
 - second battery (doubles the time you can run off battery power) for approx. \$125-150
 - memory key (a device the size of a highlighter pen that lets you store and transfer small files between computers - think of it as a floppy disk on a stick) for approx. \$50-80
 - numeric keypad (separate device having number keys) at approx. \$40-60
 - other _____
7. Taking into account that I must re-install all non-NMU software and copy all files, I want a newer laptop
- Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
 - No opinion
8. On average, I use my laptop (for any purpose at all):
- over 9 hours per day
 - 7-9 hours per day
 - 4-6 hours per day
 - 1-3 hours per day
 - 0 hours per day

9. On average, the amount of my laptop use that relates to my courses (both in and out of class) is:
- too little
 - just right
 - too much
 - no opinion
10. The laptop program (equipment, software, Internet access, campus connections, technical support, repair services, and insurance) is academically and professionally valuable.
- Strongly agree
 - Agree
 - Disagree
 - Strongly disagree
 - No opinion

You may add any additional comments on the TLC program here.

Authors' Biographies

Sandra Poindexter is a full professor of computer information systems at NMU. She has served as Chair of the Teaching and Learning Advisory Council to the NMU Senate, has been a member of the Curriculum for the 21st Century Task Force at NMU, and researches teaching innovations, which are incorporated into her courses.

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