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A Comparison of Teacher and Student Attitudes Concerning Use and Effectiveness of Web-based Course Management Software

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ABSTRACT

The purpose of this study was to assess the perceived effectiveness of the CourseInfo instructional technology package implemented at a regional Midwestern university. An online survey was administered, with 971 students and 44 faculty responding. Results indicate attitudes of both faculty and students were positive – both believed that the web, and specifically Blackboard's CourseInfo, were beneficial educational tools. They felt confident in their ability to utilize both CourseInfo and the Web and considered themselves computer literate. Faculty, significantly more than students, believed both teacher-student and student-student communication was facilitated. Students, much more than faculty felt that CourseInfo had improved student learning.

Keywords

Course management software, CourseInfo, WebCT, Online learning environment

Introduction

Many educational institutions are making significant investments in Web-based course management software such as WebCT and Blackboard (and its subset, known until recently as CourseInfo). Such packages allow for a standard Web interface—for both faculty and students—across a networked environment. When installed by a system administrator, software templates within these packages make available a variety of interactive features that would otherwise require fairly sophisticated programming to install. The market for such software is highly lucrative, with thousands of colleges and an ever-growing number of high schools considering the purchase of such programs to be the first step towards Internet-classroom integration. The educational technology research company MDR stated in its 2002-2003 College Technology Review: "Contributing to the increasing use of electronic communication on campus, course management systems are present in virtually all (94%) of colleges." Among schools reporting a single course management system, Blackboard recorded the largest market share at 46% of colleges, followed by WebTV at 35% and eCollege at 4% of schools. (MDR, 2002-2003, p. 3). Blackboard announced its revenues of $25.5 million in *Collegiate Presswire* (2003) and pointed out this constitutes an 11,046% revenue growth from 1998 to 2002. *Business Wire*, July 14, 2004, summarized the results of a WebCT survey conducted by Boston-based Atlantic Research & Consulting in April, 2004 as follows: "Thirty-seven percent of the survey's 416 respondents say they have implemented e-learning institution-wide, up from 25 percent in 2002… Student participation in e-learning is growing at a 31 percent clip, and faculty members are catching up to the demand with a 44 percent aggregate growth rate in e-learning participation, according to the survey. The survey results indicate e-learning is no longer a peripheral part of education at colleges and universities around the world" (WebCT User Survey, 2004).

Considering the vast amount of money, time, and energy being invested in Web-based teaching programs across the country, a greater understanding of their perceived effectiveness is needed. To this end, both sets of users – teacher and student – at a four-year regional Midwestern university were surveyed.

Literature Review

While appropriate warnings against the uncritical introduction of elaborate instructional technologies into the curriculum have been voiced (Daniel, 1997; Ehrmann, 1991), there is widespread acceptance of the proposition that new technologies generally—and the Web specifically—will continue to exert major influence on the ways that knowledge is retrieved, stored and shared in educational settings (Brazell, 1998; Chickering & Ehrmann, 1997; Dugan, 1997; Ehrmann, 1991; Katz, 1999; Rowley, Lujan, & Dolence, 1998).

To date, much of the empirical research in this field has focused on the effectiveness of the strictly traditional classroom versus the strictly virtual classroom. Tom Russell (1999) has compiled a comparative research annotated bibliography that explores 355 research reports, summaries, and papers on technology for distance education. Updates are referenced on his website as well: http://www.nosignificantdifference.org/. (Additional studies in this area include Carr, 2000; Irons, et al., 2002; Jones, 1999; Koorey, 2003; Schutte, 1997; Spooner, 1999; White, 1999.). While data from studies examining virtual environments are important to schools when deciding whether or not to add distance education courses to their curriculum, they are less helpful when analyzing the Web's most likely role in the future of mainstream education—the integration of Web components into a standard classroom.

Several studies have explored the effect of course management software systems on student performance and attitudes. In Rivera, McAlister and Rice's 2002 study, one section of an introductory management information systems course was offered almost exclusively via the web, another was taught in the traditional classroom setting and a third was a hybrid of traditional supported by the course management system WebCT. Class enrollment averaged 45 per section. No differences in student performance (as measured by exam scores) were found. Students were generally satisfied with the traditional and hybrid classes; less so with the online course. A similar study was conducted by Lim (2002) who also compared three different instructional formats. One was a traditional classroom with eight students, one was Web-based with six students, and five students participated in the satellite based section (distance learning with video and communication systems). No significant differences in learning were identified. Wernet, Olliges and Delicath (2000) reported on a survey of 39 social work students' satisfaction with, and perceptions of, WebCT in social work education. All students found course materials on the course Web site helpful. In a study where WebCT was used as a primary means of delivery in a Community Information class with an enrollment of 46, student surveys reported high student satisfaction and good student performance (Kendall, 2001). Sherman (1998) introduced Web assignments into an advanced course in social psychology using activities that entailed collaboration and knowledge sharing. Web components of the course engendered an overall positive response from the 10 students in this class. Murphy and Lidner (2001) surveyed 111 students enrolled in one Texas A & M undergraduate course on technological change which used WebCT through the semester. They asked students five questions about their perceptions of the use of WebCT. Overall, students agreed that WebCT had "contributed to their success in the course" (72%), had a positive perception of the use of WebCT in the course (89%), and most reported that they had accessed their grades via WebCT (76 %). Figueroa and Huie (2001) anecdotally reported students in computer information system courses "liked using Blackboard as a record of their grades, course outlines, and other pertinent course information" (no survey, no "*n*" reported.)

Fewer studies have assessed teachers' attitudes towards the effectiveness of course management software. Witt (2003) surveyed 36 instructors using supplemental Web sites for a classroom course (24 responded), asking open-ended questions designed basically to assess "Are course Web sites worth the trouble?" Most instructors indicated that their goals for the Web sites have been entirely or largely achieved, and most consider the sites to be essential to successful course design. A number of the respondents felt that course Web sites promoted "more and better communication." In a study by Crooks, Yang and Duemer (2003), 127 faculty answered eight survey items designed to measure views about the effectiveness, reliability, and usability of Web-based resources for instruction purposes. The questions referred to Web-based resources in general rather than Web-based course management software tools. There were no differences found in the six demographics tested: current position, gender, years in academia, public vs. private institution, institution's student population, and university classification (doctorate, masters, etc.) Daugherty and Funke (1998) conducted a study of faculty and student perceptions towards Web-assisted learning at Georgia College and State University. They surveyed 76 faculty members recruited from listserves devoted to combining education and technology and required 36 undergraduate students enrolled in a health science course to complete several Web-based assignments during the semester. The surveys consisted entirely of open-ended questions regarding the problems, advantages, and general issues of Web-assisted education. Overall, both students and professors were upbeat about the effects of the Internet on the learning process. Fifty-five percent of the students stated that communication was effective during the Internet portion of the course. In fact, many students claimed that teacher-student communication

improved due to Internet interaction. Both faculty (38%) and students (58%) believed that the biggest advantage of Web-based education was that it taught students the computer skills necessary to be competitive in the modern workforce.

The problem with these studies is their limited scope. None has large sample sizes, and a few have such small samples that no generalizations can be made. Every study of students cited above only used one class, or at best several sections of one class. Of the three studies that surveyed faculty, two only used open-ended questions, the third did not ask about course management software, and none of the three directly compared faculty and student opinions.

The study at hand adds to previous research by surveying both students and teachers within all academic divisions at one university. It reports on attitudes of over 1,000 respondents. A Likert-scale questionnaire was used in order to facilitate comparisons of student-teacher perceptions. The large sample size, variety of users, and use of the same questionnaire for faculty and students are particular strengths of this study.

Research question and methodology

The primary objective of this project was the measurement of faculty and student opinions regarding CourseInfo's effectiveness. The general research question is: "What is the perceived utility of CourseInfo by involved faculty and students, and how do those perceptions compare?"

Based on prior research, we expect both faculty and students who use CourseInfo to have a positive attitude about CourseInfo's capabilities and educational effects. We have no a priori reason to expect student and teacher attitudes to differ significantly and we found no prior research addressing this question. Therefore, we hypothesize no differences in perceptions between these two groups.

A Web-based survey was used for data collection. The survey used the software package "Web Survey Assistant," available online (http://www.surveyassistant.com). This survey, in two versions, was formatted for the Web and posted on the principal author's university Website. The two versions—one for faculty and one for students—consisted of a set of identical questions; however, each incorporated a few questions unique to their respective target respondents (Appendix A). A link to these surveys, with brief cover letter and permission request, was e-mailed to all professors using CourseInfo. Instructors were requested to forward by e-mail the link to the student version to all of their students enrolled in CourseInfo-assisted classes. The target populations were thus easily identified and easily reached.

The institution where the survey was administered is a four-year regional comprehensive Midwest public institution with a declared liberal arts mission. ACT scores of entering freshman average 27; nine percent of the student population is minority. Virtually 100% of the student body consists the traditional 18-22 year-old. The student body size is approximately 6,000 undergraduate students, with a male-to-female ratio of 40%-to-60%. Over 93% of faculty are full-time, numbering 360. Eighty-five percent of full-time faculty hold terminal degrees in their discipline.

The questions given to both students and faculty focused on the usefulness of the program itself, its integration into the classroom environment, and its effects on the student/instructor's learning experience. Basic demographic questions regarding gender, academic division/discipline and, in the case of students, year in school, were also included. The survey resided on the Web for two weeks; most data were collected the final week of classes. In order to attract student responses, a random drawing for $50 was announced. Entry in the drawing was optional, but did require that interested respondents to leave their name and e-mail address. Faculty were offered $5 for taking the survey.

Results

Forty-four faculty and 971 students responded to the Web-based electronic survey. All student respondents were undergraduate students. Student respondents across grade level were roughly proportionate to actual enrollment numbers. Responses by academic division were more disparate: Majors in the academic division of Business and Accountancy represented nearly 25% of all student responses, followed by Language and Literature, 17%; Human Potential and Performance, 16%; Social Science, 15%; Science, 14%; with various other divisions adding to 13%. Thirty-four percent of the student respondents were male; 66% were female, reflecting a slightly

higher female response than university percentage (60% female). Responses were generally evenly split among grade levels (30% freshmen, 21% sophomores, 25% juniors, 24% seniors). Faculty responses also came from throughout the university, with faculty from 9 of the 11 divisions responding. The majority of faculty were from Language and Literature (45%), followed by Science (20%) and Human Potential and Performance (14%).

Respondents answered nine Likert-scale questions which asked about attitudes toward the World Wide Web and CourseInfo specifically. Responses were scaled from +3 (strongly agree) to -3 (strongly disagree). A problem with the survey form was the accidental omission of the "disagree" category, forcing respondents who disagreed to choose between the milder "tend to disagree" or the more forceful "strongly disagree" category. However, there was very little disagreement with the survey questions (and the polarity of the response set was always consistent). So to compensate, every "tend to disagree" (-1) response was recoded as a "disagree" (-2) response, realizing that if the response to the question *still* differed significantly from zero in the positive direction, this difference was meaningful. In other words, the coding adjustment overcompensated for potential data error.

Even with this scaling, responses on every faculty survey question and every student survey question but one were significantly positive at the $p < .01$ level. That is, respondents of this survey felt positively about their computer skills and about CourseInfo's enhancement of communication and its educational value (see Table 1: Mean Scaled Survey Responses of Faculty and Students). Specifically, both faculty and students felt they were computer literate and confident in their ability to utilize both the World Wide Web and CourseInfo. Both groups of respondents, on average, considered themselves active CourseInfo users, believed both the Web and CourseInfo were "beneficial educational tools' and that CourseInfo "improved student learning". They also felt CourseInfo facilitated teacher-student communication and students liked it when professors communicated via email. Teachers agreed that CourInfo facilitated student-to-student communication while students did not agree.

To test for significant differences between student and faculty means, a multivariate model was run using SPSS. The nine questions were entered as dependent variables, the student-teacher variable was the independent variable, with gender and division entered as covariates. Test results are shown in Table 2 (Table 2: Tests of Between-Subject Effects). Significant differences between teacher and student attitudes were detected at the $p < .05$ level on three of the nine ranking questions tested. Two of these dealt with student/faculty perception regarding CourseInfo's ability to facilitate electronic communication. Faculty (mean .68) were significantly more likely than students (.03) to agree with the statement "CourseInfo substantially facilitates student-to-student communication" ($p < .02$). This is the one question where the student response was not significantly different from zero. In other words, while faculty believed the course management software was enhancing student-to-student communication, this was not the case according to students. Similarly, teachers felt more affirmative in response to the question "CourseInfo substantially facilitates teacher/student communication" (faculty mean 1.84, student mean 1.08.)

Table 1. Mean Scaled Survey Responses of Faculty and Students

	Mean	*Std Deviation*	*n Agree****
I consider myself computer Literate			
Student	2.11*	1.05	971
Faculty	*2.30**	*.95*	*44*
I am confident in my ability to utilize the WWW			
Student	2.27*	.93	971
Faculty	*2.55**	*.59*	*44*
Web is beneficial educational tool			
Student	2.35*	.91	971
Faculty	*2.20**	*.73*	*44*
I am an active CourseInfo user			
Student	1.52*	1.45	971
Faculty	*1.84**	*1.24*	*44*
I am confident in my ability to use CInfo			
Student	2.19*	.98	971
Faculty	*1.98**	*1.21*	*44*
CInfo is beneficial educational tool			
Student	1.72*	1.36	971
Faculty	*2.07**	*.82*	*44*
CInfo facilitates teacher-student communication			
Student	1.34*	1.36	971
Faculty	*1.84**	*1.08*	*44*

CInfo facilitates student-to-student communication			
Student	.03	1.75	971
Faculty	*.68**	*1.20*	*44*
CInfo has improved student learning			
Student	1.93*	1.20	971
Faculty	*1.27**	*.90*	*44*
I like it when professors communicate via e-mail			
Student	2.66*	1.23	971
Faculty	*N/A*	*N/A*	*N/A*

(Where 3=Strongly Agree, -3=Strongly Disagree)

* Mean response significantly differs from zero (p <.01, one-sample t-test), i.e., respondents *agree* with these statements.

Table 2. Tests of Between-Subject Effects

	User Type (Teacher vs. Student)		*Gender* ± *(Male vs. Female)*		*Academic Division (11 Areas of Study)*	
Dependent Variable	F	Sig.	F	Sig.	F	Sig.
I consider myself computer literate	0.847	0.358	16.702	**0.000***	0.103	0.748
I am confident in my ability to utilize the WWW	2.658	0.103	28.840	**0.000***	0.119	0.730
Web is a beneficial educational tool	1.200	0.274	1.923	0.166	5.076	**0.024***
I am an active CourseInfo user	2.480	0.116	0.593	0.441	7.551	**0.006***
I am confident in my ability to use CourseInfo	1.843	0.175	0.003	0.954	1.383	0.240
CInfo is a beneficial educational tool	3.048	0.081	0.112	0.738	2.719	0.099
CInfo facilitates teacher/student communication	6.433	**0.011***	1.342	0.247	4.536	**0.033***
CInfo facilitates student/teacher communication	5.990	**0.015***	0.253	0.615	3.235	0.072
CInfo has improved student learning	13.553	**0.000***	1.254	0.263	0.005	0.943

(* significant at the p <.05 level)

(± See Table 4)

Another interesting difference between student and teacher perceptions was in their response to the question "All things considered, CourseInfo has improved student learning". Both sets of respondents agreed with this statement; specifically, 80% of faculty and 93% of students marked 'strongly agree', 'agree', or 'tend to agree'. The more marked contrast exists in the level of agreement. Seventy-seven percent of students either 'strongly agreed' or 'agreed' with this statement, while only 39% of faculty answered so positively (see Table 3: Responses to "CourseInfo Has Improved Student Learning").

Table 3. Responses to "CourseInfo Improved Student Learning"

	Students		*Faculty*	
Strongly Agree	358	37%	4	9%
Agree	388	40%	13	30%
Tend to Agree	154	16%	18	41%
Not Sure	26	2%	9	20%
Tend to Disagree	0	0%	0	0%
Disagree	37	4%	0	0%
Strongly Disagree	8	1%	0	0%
Total	971	100%	44	100%

There were two questions where there were significant differences between genders: "I consider myself computer literate" and "I am confident in my ability to navigate the WWW". Further analyses were performed on responses to these two questions. We compared male teachers and male students on both questions; no significant difference. The test was rerun comparing female teachers and female students; again, no significance. We examined only teachers – male vs. female – and again no significance on either question. The significance differences on both questions occurred between male students and female students (p <.001 on both questions). See Table 4: Questions Where Gender Was Significant.

Table 4. Questions Where Gender Was Significant

	Teachers			*Students*		
	n	*mean*	*std. dev.*	*n*	*mean*	*std. dev.*
Males	21	2.52	0.68	332	2.29*	1.05
Females	23	2.09	1.12	639	2.02*	1.04

"I consider myself basically computer literate"

	Teachers			*Students*		
	n	*mean*	*std. dev.*	*n*	*mean*	*std. dev.*
Males	21	2.62	0.50	332	2.49*	0.75
Females	23	2.48	0.67	639	2.16*	1.00

"I am confident in my ability to utilize the WWW"

(* Difference between male and female students significant at $p < .001$)

It is very interesting to note the direction of the means. Male students were clearly more self-confident about their computer ability than female students. The same tendency, although not statistically significant ($p = .13$ and .43 on the questions, respectively) can be observed in faculty responses. The large student *n* made their difference of 2.29 vs. 2.02 (male-female, respectively) on the "computer literate" question statistically significant while the numerically larger faculty differences of 2.52 *vs.* 2.09 were not statistically significant.

The other intervening variable deserved further examination as well. On three questions, responses differed by academic division. These questions were: "The WEB is a beneficial educational tool", "I am an active CourseInfo user" and "CourseInfo facilitates teacher/student communication". Tables 5a-5c show means, sample size and standard deviation by division. The tables are in descending order by degree of agreement with the question. Teachers and students were combined as the number of teachers by division was so small (44 teachers in 10 divisions, or an average of less than 5 teachers per division).

Table 5a. "CourseInfo Substantially Facilitates Teacher/Student Communication"

Responses by Division (Where 3=Strongly Agree, -3=Strongly Disagree)

Division	Mean	N	Std. Dev.
Education	1.73	15	0.96
Business & Accountancy	1.55	238	1.16
Undeclared	1.54	54	1.09
Math & Computer Science	1.53	53	1.32
Human Potential & Performance	1.33	160	1.25
Science	1.25	145	1.56
Language & Literature	1.23	176	1.47
Social Science	1.23	146	1.38
Fine Arts	1.14	22	1.25
Justice	1.00	6	1.55
Total or Average	1.36	1015	1.35

Table 5b. "I Consider Myself an Active CourseInfo User"

Responses by Division (Where 3=Strongly Agree, -3=Strongly Disagree)

Division	Mean	N	Std. Dev.
Business & Accountancy	1.91	238	1.04
Math & Computer Science	1.70	53	1.31
Social Science	1.57	146	1.53
Fine Arts	1.55	22	0.91
Undeclared	1.46	54	1.34
Science	1.46	145	1.70
Human Potential & Performance	1.45	160	1.38
Education	1.33	15	1.63
Language & Literature	1.16	176	1.62
Justice	-0.17	6	2.04
Total or Average	1.53	1015	1.45

Table 5c. "The World Wide Web Is a Beneficial Educational Tool for Students"
Responses by Division (Where 3=Strongly Agree, -3=Strongly Disagree)

Division	Mean	N	Std. Dev.
Business & Accountancy	2.53	238	0.73
Math & Computer Science	2.45	53	1.10
Undeclared	2.43	54	0.88
Language & Literature	2.41	176	0.87
Justice	2.33	6	0.52
Science	2.27	145	0.91
Education	2.27	15	0.46
Human Potential & Performance	2.21	160	0.92
Social Science	2.20	146	1.06
Fine Arts	1.86	22	0.94
Total or Average	2.35	1015	0.90

It can be seen from Tables 5a-5c that each division's mean response was positive on these three questions with the exception of the six students in justice who did not consider themselves active CourseInfo users. Degree of agreement differed, however. Consistently, the most positive responses came from the Business & Accountancy division. Other than that, there was very little consistency among divisions.

One additional t-test was run. Respondents were split between "active users" and "non-active users" of CourseInfo, based on their response to the question "I am an active CourseInfo user". The "users" were those who answered "Strongly agree", "Agree", or "Tend to Agree"; the non-users were all others. Comparing survey results revealed a statistically significant difference ($p < .01$) on every one of the remaining eight questions. As one would expect, user responses were more positive than nonusers. Cause-and-effect cannot be determined. That is, the positive response from users may be due to self-selection, where students and faculty who like the course-management software use it, or it may be that those students required to use the technology grew to appreciate its benefits.

To compare student and faculty opinions on which CourseInfo features they found most useful, respondents were asked to rank the top three (only) features of the CourseInfo program. The features listed were: ability to link to external web-based resources, ability to link to internal course documents, calendar, digital drop box, formulaic student Web page construction, online grade sheet, student survey/quiz, student/student communication, and teacher/student communication. An "other" box was also provided. Students and faculty both ranked "links to internal course documents" and "teacher-to-student email" as 1 and 2, respectively. They agreed that the three features next in importance were "online grade sheets", "links to external web resources" and "student-to-student email", though their rank order differed. The rankings are presented in Table 6 (Table 6: Ranking of CourseInfo Features on Importance). The rankings of the "other" features were as follows:

Student: Calendar (6), Drop Box (7), Quiz (8), Other (9), Web Construction (10)
Faculty: Calendar (8), Drop Box (5 [tie]), Quiz (7), Calendar (8), Other (9) Web Construction (9 [tie]).

Table 6. Ranking of CourseInfo Features on Importance

	Links to Internal Course Documents	*E-mail (Teacher-to-Student*	*Online Grade Sheet*	*Links to External Web Resources*	*E-mail (Student-to-Student)*
Student Rank	1	2	3	4	5
Faculty Rank	1	2	5	3	4

A few questions of a descriptive nature were unique to the faculty version of the questionnaire. When asked the most important factor in choosing what CourseInfo features were used in their courses, 22 faculty (or 50%) indicated "general usefulness," and 34% marked "relevance/contribution to course content." The remaining 16% of responses were about equally split between "knowledge of how to use the feature" and "time required to set up/maintain the feature."

Conclusion

There was overwhelming agreement between both faculty and student respondents that the Web is a beneficial educational tool, and very substantial agreement that CourseInfo specifically is a beneficial educational tool which improves student learning. Overall, both students and faculty respondents considered themselves computer literate, were confident in their ability to utilize the World Wide Web, and considered themselves active and competent CourseInfo users. The overall positive responses from our large survey of faculty and students certainly gives the indication that web management software is perceived as beneficial.

One significant difference between faculty and student opinions was that faculty agreed CourseInfo "facilitated student-to-student communication," while students did not agree. This is understandable given that students often use personal email accounts (Hotmail, Yahoo, etc.). Also, at this particular university they had access to an email account they could throughout their student career. In contrast, the CourseInfo email accounts were associated with a particular course and would run out at the end of each semester. Faculty also agreed more strongly that CourseInfo "facilitated faculty/student communication." The indication here is that faculty made use of CourseInfo's email feature. Given that one of the benefits of course management software is the ease of sending email to the entire class, faculty appreciation of this feature makes sense. Students agreed that CourseInfo facilitated faculty/student communication. They just did not agree as strongly with that statement as faculty. A logical conclusion would be that they did not need the mass email feature. To students, shooting off an email from their personal account was probably just as easy as sending one from their CourseInfo account. The last significant difference between students and faculty was that students, more than faculty, agreed CourseInfo had improved student learning. At first glance, this result appears surprising. Upon more reflection, it is consistent with the experience of many faculty who find their students incautiously optimistic about their performance and their grade. Or perhaps students were referring to the benefit of learning the web tools, while faculty were thinking of course content.

Faculty and student ratings of CourseInfo features were similar. Both students and faculty rated "links to course documents" and "teacher-to-student e-mail communication" first and second respectively. Among the top five features only the importance of the online grade sheet differed by more than one position in the rankings, with students ranking the feature 3rd and faculty ranking it 5th. Faculty might want to consider the importance of fast and accessible feedback on student performance not only as it relates to CourseInfo classes, but generally.

When respondents were separated into those who agreed with "I am an active CourseInfo user" and those who were neutral/disagreed, marked differences appeared. Those who agreed answered every one of the other eight survey questions more positively than those who did not agree. Cause and effect cannot be determined; however, there is certainly a correlation between use and positive opinion toward the course management software.

Limitations and key assumptions

There are several limitations in the scope and accuracy of the data collected. First, the sample was not random—the population consisted of students and faculty using CourseInfo. Further, participation among members of that population was voluntary, introducing a self-selection bias. As a result, it is highly likely that both the student and faculty samples were biased in the direction of computer literacy. Additionally, because the responsibility of informing the student sample of the survey's existence fell to the professors who maintained CourseInfo pages, instructors who were more enthusiastic about the software may have more actively encouraged their students to take the survey. The $50 random drawing may also have posed a threat to student respondents' sense of anonymity. Although entry into the drawing was voluntary and participant contact information was disassociated from other data, the responses of participants who were particularly sensitive to the anonymity issue may have been affected by the inclusion of their name and e-mail address.

This study also did not collect the opinions of teachers and students who do not use CourseInfo, including the reasons why they may not. For example, the more computer-literate instructors may find it easier and more efficient to create and maintain a VAX server page than a CourseInfo site.

This study focused upon perceptions rather than actual effectiveness. It does not attempt to provide an assessment of the *actual* benefits or effectiveness of the CourseInfo program. One cannot assume that simply because a particular feature is most frequently used or highly regarded by students or faculty members that it is, in fact, the most relevant, important, or useful feature on the system. Popularity does not always equate to utility.

Suggestions for future research

Although not a formal aspect of the original set of research questions, some interesting gender differences were noted in the data analysis. Twenty percent more males than females (54% vs. 34%) strongly agreed with the statement "I consider myself basically computer literate." Considering the large sample size, this is a very noteworthy difference in self-perception. Similarly, 61% of the males, compared with 42% of the females, strongly agreed with the statement regarding self-confidence of World Wide Web utilization. Although these differences largely disappear when the two categories of strongest agreement are combined, the difference between sexes at the strongest level of agreement is still surprising. This is made even more striking when compared with the distribution of responses by gender to statements concerning activity on CourseInfo and ability to utilize CourseInfo: there the differences disappear. This difference in self-perceived general ability (computer literacy, Web utilization) vs. self-perceived specific abilities of program activity and utilization is worthy of further examination.

Habits in each academic discipline can be different regarding the usage and perception of e-learning facilities. As can be seen from this study, user attitudes differed by division on several questions. Future research is needed to examine more specifically how web management software is being used in different disciplines and how this usage affects attitudes and perceptions.

Finally, aspects of CourseInfo that did not feature prominently in this study could be more thoroughly examined. A 1999 study by Romine on the use of "discussion boards" to foster student interaction with practicing professionals is one promising avenue of exploration. Other communication features, such as facilitation of group communication, could also be pursued. As the incorporation of external Web links into CourseInfo, and the course, was a particularly popular use of the software a closer examination of the types of Web pages linked and the manner of their elaboration is called for. Greater study of less frequently used but still potentially worthwhile features like the "digital dropbox," online grade sheet, and student quiz could also be explored.

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Appendix A

FACULTY AND STUDENT SURVEY QUESTIONS PERTAINING TO THIS STUDY

A. Questions on both faculty and student survey instruments

Both questionnaires asked gender, academic division, academic discipline, and the following Likert-scale questions (Strongly Agree, Agree, Tend to Agree, Not Sure, Tend to Disagree, Strongly Disagree):

- I consider myself basically computer literate.
- I am confident in my ability to utilize the World Wide Web (e.g., search, navigate, bookmark)
- The World Wide Web is a beneficial educational tool for students.
- I consider myself an active CourseInfo user.
- I am confident in my ability to utilize CourseInfo.
- CourseInfo is a beneficial educational tool for students.
- CourseInfo substantially facilitates teacher/student communication.
- CourseInfo substantially facilitates student-to-student communication.
- All things considered, CourseInfo has improved student learning

Both questionnaires also asked:

- With respect to achievement of course learning objectives, please RANK the following features of CourseInfo in order of importance to you by typing a number in the appropriate box [**top THREE only, with '1' being most important**]
  Ability to link to external Web-based resources
  Ability to link to internal course documents
  Calendar
  Digital Drop Box
  Formulaic student Web page construction
  On-line grade sheet
  Student survey/quiz
  Student/student communication
  Teacher/student communication
  Other

B. Additional question on faculty questionnaire:

- What is the most important factor in choosing what features you use on CourseInfo?
  Knowledge of how to use the feature
  Time required to setup/maintain the feature
  General usefulness of the feature for you
  Relevance/contribution to course content
  Other

C. Additional questions on student questionnaire:

- Year in school (Freshman, Sophomore, Junior, Senior)

And the additional Likert-scale question:

- I like it when professors communicate with the class via email.