Instructional Integration of Computers to Improve Learning: Student Perception.

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Abstract

Two questions were investigated in this study: (a) what is the frequency of faculty integration of computer technology into classroom instruction? (b) To what extent does the frequency of faculty integration of computer technology, students' computer proficiency levels for personal activities, and students' computer proficiency levels for instructional activities predict the students' perceptions of the effect of computer technology use to improve their learning? Based on the evidence from the study, it can be suggested that students need to have direct instruction to use advanced applications. These programs provide skills in advanced computer technology applications that will enable faculty to expect more discipline-specific computer-based projects such as developing a web quest in a web editor.

Purpose of Study

There is a call for evidence regarding the justification of the massive investments into technology resources (Oppenheimer, 1997, 2002), especially as it relates to student learning. Even so, it is difficult to quantify the use of computer technology to support student learning (Oppenheimer, 2002; Roblyer & Knezek, 2003; Strudler, 2003) and justify the lofty spending on new technological resources. It cannot be assumed that once technology tools are available, faculty will necessarily embrace them and integrate them into their classroom instruction. On the contrary, successful use of these tools to enhance student learning goes beyond the common task of just providing more machines in the classroom.

The pressure to reform education through technology integration (Becker, 2001) and the emphasis on developing information literacy skills for students (Rockman, 2004) implies the need for current understanding on computer technology integration practices to support student learning. Therefore, the purpose of this study was to determine the nature of the relationship between faculty integration of computer technology in instruction and student perception of the effect of computer technology use to improve their learning.

Research Methods

The study focused on courses offered in 5 colleges in the selected institution during the fall semester of 2005. To have a more representative sample of the population in the participating university, different courses were selected across the five colleges. A list of all courses offered during the summer at the participating institution was stratified by collegiate level, yielding four strata: course levels 100, 200, 300, and 400.

Random sampling was then used to select two courses from each of the 4 levels across the five colleges. The researchers focused on courses with 20 students and more. Given that there were 5 colleges and 8 courses drawn from each college at each level, a total of 40 courses, and at least 800 participants were expected to be part of the study. The use of this sampling procedure was based on the following criteria:

1. The total number of subjects surveyed should not be unwieldy; a manageable sample size would be easy to collect, analyze and interpret.
1. Equal representation of the five colleges.
2. Equal representation of the 4 possible course levels.
3. Easy accessibility of students enrolled in different majors.

Instrument

The researchers employed a survey methodology to collect and tabulate the data. The researchers reviewed several existing survey instruments and determined that none of them fit the specific need for data collection in this study. Therefore, the researchers developed an instrument based on the analysis of pre-exiting surveys; items from several computer technology survey instruments were modified to fit the present study.

The Computer Technology Integration (CTI) Survey was designed to measure faculty integration of computer technology into classroom instruction and students' perceptions of the effect of computer technology use to improve their learning. Following an initial pilot study which was conducted using a convenience sample of 20 students enrolled in one course at the participating university, the revised version of the survey was administered to a different course in a second pilot study. This course was identified by the researchers and the professor contacted. The results of the second pilot study were tabulated by the researchers to establish preliminary results, check the appropriateness of standard measures, determine potential areas of concern, and to identify questions that would require further clarification. Prior to the administration of the instrument to the participating students, the Cronbach's reliability coefficient was run during the second pilot study to determine the reliability of each scale used in this study.

The Cronbach alpha for all the sections of the pilot study instrument was above the acceptable .70 (McMillan & Schumacher, 1997) implying that over half of the variability was internally consistent or reliable. After data collection, separate Cronbach's reliability coefficients were calculated for the sample respondents (N = 837). A summary of the Cronbach alpha scores for the pilot and the sample respondents is provided in Table 1.

Table 1: Cronbach Alpha Scores for the Survey Sections

Section	# of Items	Pilot alpha	Sample alpha
Personal Proficiency	10	.82	.77
Instructional Proficiency	10	.81	.84
Faculty Integration	12	.71	.78
Student Perceptions	20	.73	.73

A coefficient of .90 indicates a highly reliable instrument but coefficients ranging from .70 to .94 are acceptable for most instruments (McMillan & Schumacher, 1997). The five sections of the CTI surveys reported a Cronbach alpha value ranging from .73 to .83 during the pilot testing of the CTI to a convenience sample of 20 students and were therefore found to be within the acceptable range to be used for the actual study.

The Computer Technology Instrument (CTI) surveys were administered to 854 students enrolled in 40 courses at a participating medium-sized Midwest public university in Indiana. The researcher hand-delivered and administered the surveys to the students and collected them after completion. Of the 854 surveys received, 837 cases (98%) were complete and therefore retained for analysis.

One question was prominent. To what extent does the frequency of faculty integration of computer technology and student computer proficiency level for personal and instructional activities predict student perception of the effect of computer technology use to improve their learning? One null hypothesis derived from this question was tested at the .05 level of significance.

Results

Most participants reported to be very competent in applications such as the Internet and WWW (92.5%); moderately competent in applications such as electronic files attachments (73.1%) and least competent in using web authoring tools, and using Hyperstudio, HyperCard, or other multimedia authoring application (13.9% and 3.9%, respectively) for personal activities. Table 2 summarizes the personal computer skills responses for the 837 students scored across the three scales. The list of computer applications was then rank ordered based on student responses.

Table 2: Student self-rating of personal computer proficiency skills

Computer Tool/Application	1*	2	3
1. Internet and WWW for personal activities.	.4%	7.2%	92.5%
2. Electronic mail (e-mail application).	.7%	9.1%	90.2%
3. Word processing (MS Word).	.5%	11.9%	87.6%
4. Operating system (e.g. Windows, Mac, etc).	.5%	11.3%	86.3%
5. Electronic files attachment for personal activities.	2.7%	24.1%	73.1%
6. Computers for playing computer games, Videos, etc.	6.0%	28.4%	65.6%

7. Internet chat rooms for personal activities.	11.9%	39.2%	48.9%
8. Spreadsheet to record/organize personal activities.	9.6%	50.9%	39.5%
9. Web authoring tools to build personal Web pages.	45.6%	40.5%	13.9%
10. HyperStudio, etc for personal activities.	72.9%	23.2%	3.9%

*Note: Score 1 = not at all competent, 2 = somewhat competent, and 3 = very competent.

Question 1

The participants reported that their faculty often used course management tools (40.9%) and least used web publishing tools (3.8%) for instruction. Table 3 summarizes the results on 837 student response scored across the four scales. The list of applications was rank ordered to indicate the most frequently used computer tool.

Table 3: Student Perceptions of Faculty Integration of Technology into Instruction

Computer Tool/Application	1*	2	3	4
1. Using course management tools	15.7%	19.1%	24.4%	40.9%
2. Web browsers.	14.5%	24.7%	20.2%	40.6%
3. Email for feedback/communication.	10.3%	24.9%	28.9%	36.0%
4. Computer projection device.	15.8%	33.0%	19.0%	32.3%
5. Multimedia presentation tools.	9.0%	31.4%	28.1%	31.5%
6. Productivity tools.	13.4%	30.5%	26.0%	30.1%
7. Teaching in a multimedia classroom.	38.9%	29.2%	16.7%	15.2%
8. Imaging Devices.	46.8%	27.4%	16.6%	9.2%
9. Discipline Devices.	57.2%	26.6%	9.1%	7.0%
10. Content specific Software/ CD-ROM.	37.9%	42.2%	13.5%	6.5%
11. Desktop video conferencing/ chat sessions.	71.1%	19.2%	4.9%	4.8%
12. Web publishing/authoring tools.	56.6%	31.4%	8.1%	3.8%

*Note: Score 1 = Never, 2 = Sometimes/Few times per Semester, 3 = Often/ 1 - 3 times per Month=3; 4 = Very often /1-3 times Per Week.

Question 2

A simultaneous regression analysis was conducted with all three predictor variables. This analysis produced a significant model with the value of $R^2 = 0.039$. In other words, the percentage of the total variance in criterion that was shared with the set of the predictor variables was 3.9%. This was significant at the 0.001 level. Thus we reject the null and conclude that the linear combination of the three predictors in this study have a strong predictive relationship with the criterion.

The standardized partial regression coefficient for faculty total was -.204, $t = -5.663$, and $p = .001$. Therefore, the faculty total was a significant predictor of the student's perceptions of computer use to improve their learning (after controlling for the instructional and personal total). The standardized partial regression coefficient for instruction total was -.013, $t =$

-.237, and p = .812. Therefore, the instructional total was not a significant predictor of the student's perceptions of computer use to improve their learning (after controlling for the faculty total and personal total). The standardized partial regression coefficient for personal total was .084, t = 1.504, and p = .133. Therefore, the personal total was not a significant predictor of the student's perceptions of computer use to improve their learning (after controlling for the faculty total and instructional total). A summary of the results of the tests is provided in Table 4.

Table 4: Summary of Multiple Regression Analyses of Predictors and Criterion

Variable	B	SE B	ÿ	*t*	*p*
Faculty Total	-.190	.034	-.204	-5.663	.001
Instruction total	-.021	.090	-.013	-.237	.812
Personal total	.168	.112	.084	1.504	.133

Discussions

The student responses indicated a high level of computer proficiency in using the productivity software, electronic mail, electronic files, and the Internet and the World Wide Web, for both personal and instructional activities. The student responses indicated a moderate level of computer proficiency in using spreadsheets and Internet chat rooms for both personal and instructional activities. The student responses indicated a low level of computer proficiency in using web authoring tools and using HyperStudio, HyperCard, or other multimedia authoring application for both personal activities and instructional activities.

The major research question is: To what extent does the frequency of faculty integration of computer technology into classroom instruction, students' computer proficiency levels for personal activities, and students' computer proficiency levels for instructional activities, predict student perception of the effect of computer technology use to improve their learning?

The analysis included a null hypothesis that stated that the students' personal computer proficiency, students' instructional computer proficiency, and faculty integration of computer technology do not account for a significant proportion of variance as predictors of the student perception of the effect of computer technology use to improve their learning. A multiple regression analysis revealed that the three predictor variables produced a significant model with the value of $R^2 = 0.039$; $p < .05$. Therefore, a statistically significant relationship was found between the three predictor variables and the criterion –student perception of the effect of computer technology use to improve their learning. Based on the values of $R^2 = 0.039$ obtained from the simultaneous regression model, $R^2 = 0.034$ obtained from the instructional model, and $R^2 = 0.039$ obtained from the personal model, we can infer that instruction did not add significantly to the first model. Therefore, the personal and faculty model were the best fit. The R^2 of 0.039 implies that model accounted for 3.9% of the shared variance between the personal and faculty models.

Implications of the Study

Universities across the nation are experiencing rapid technological innovations, continuous adjustments in the learning environments, and a new generation of students exhibiting diverse computer proficiency skills. Yet in many instances, the rapid advances in instructional technology exceed the level of familiarity with the technology for effective technology use in the classroom (Allen, 2001). Therefore, this study provided baseline data to identify current computer integration practices of the faculty. These data can guide institutions to examine their current technology practices and provide grounds to make sound technology-related decisions that can maximize student learning.

Educators have also made various assumptions about the relationships between computer technology integration, content instruction, and student learning. For instance, faculty may assume that the "cyberkids" of this technological age are highly competent in general computer skills and are likely to be more prepared to learn with technology in contrast to the students of past generations. In practice, this assumption implies less support from faculty –students are left on their own especially in courses that heavily utilize technology. The hope, here, is that this technology savvy generation of students will effectively understand and use the technology and the content information. Evidence from this study provides data to question such thinking. Instead, there is evidence suggesting a need for training in the use of sophisticated software programs. Further, the distinction between personal and course-related use illustrates the need for faculty to create a bridge between personal and instructional use of technology for improved student learning.

The study provided evidence to suggest that a relationship exists between faculty instructional integration of computer technology and student perception of the effect of such integration to improve their learning. However, this relationship is negative. This unexpected finding could be attributed to several factors that include social, contextual and/or personal influences. For instance, due to the digital divide among college students, students might perceive the value of computing for improved learning differently and fail to understand the role of technology in transforming their courses (Beisser, Kurth, & Reinhart, 1997). Instructional practices and contextual factors such as student comfort levels, beliefs, and experiences are also likely to affect the way the students perceive the impact of computer use on their learning. The combined interplay of these factors might have led to this unexpected finding.

Technology has the potential for changing the way teachers teach and students learn (Thompson, Schmidt, & Davis, 2003), but research indicates that educators are less likely to use computers than other professions (Hanushek, 1998). Other reports such as the one by Cuban (2001) indicate that faculty use computers less frequently, and in limited ways that do not support student learning. Even in this respect, faculty play a major role in how successful technology will be in education (Yildirim & Kiraz, 1999). Therefore, if educators want to maximize student learning, they should invest time, money, and technological resources in an area that can make greatest impact on students, the faculty (Fabry & Higgs, 1997).

Conclusion

In conclusion, the inclusion and requirement of a number of computer courses in the general education curricula cannot be overemphasized. The need to train faculty in computer technological applications by providing technological training for faculty to enable them to work more effectively with their students and peers across campus is, now more than ever, paramount. Further, the identification of key faculty who can provide modeling in the best instructional technology integration practices that support student learning is recommended. These key faculty will also guide other faculty through the necessary instructional adjustments for a successful use of technology in the classroom (Johnson & Liu, 2000).

Limitations of the Study

This study was limited in scope by considering those variables included in the items on the questionnaire. Due to the nature of the study, it was not possible to account for all the variables that could interfere with the study results. For instance, the researchers did not consider faculty rank or tenure status. It is possible that such variables could interfere with data outcome and consequently might have influenced the study findings.

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