The Impact of Students' Perceived Computer Experience on Behavior and Performance in an Introductory Information Systems Course

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ABSTRACT

In this study the impact of perceived computer experience on the behavior and performance of students in an introductory information systems (IS) course with both lab and lecture components was examined. Perceived computer experience was predicted to affect behavior and performance in the course because of its relationship to positive internal attitudes towards computers and because students' perceptions of their computer experience are related to their actual level of knowledge about computers. The results of the study showed that higher levels of perceived computer experience positively affected lecture and lab homework and exam performance. In addition, higher levels of positive class behaviors (attendance and extra-credit participation) positively affected both lecture and lab exam performance. Gender and lab/lecture section were included as control variables and both had an impact on behavior and performance. Women participated more in extra-credit opportunities. Lecture and lab sections varied significantly with regard to attendance, extra-credit participation, lab homework, and lab and lecture exam performance. These results are discussed in the context of previous research on factors affecting introductory information systems course performance and prior research on the effects of prior computer experience on learning.

Keywords: Perceived computer experience, Introductory IS course, Student behavior, Student performance

1. INTRODUCTION

The introductory information systems (IS) course is a key component both of business school curricula and of the curriculum for IS majors. It is extraordinarily important that it is successfully taught, both because it is often the only opportunity for many business students to acquire the fundamentals of IS use and because it is a major recruiting gateway to the IS major. Yet there are many difficulties with this course in particular. Its content varies greatly across schools, it is often staffed by adjunct professors, it must accommodate very large numbers of students, and its method of delivery is continuously evolving. One of the difficulties most often cited by faculty who conduct research regarding this course is the variability in students' computer experience, both real and perceived, which makes it very difficult to know how to design a course that is appealing and useful to all their students (Case et al. 2004; Dettori et al. 2005; Dyer et al. 2004; VanLengen & Haney 2005).

It is likely that any professor who has taught the introductory IS course has heard the following pronouncement from a student: "I'm not going to do well in this class because everyone else knows a lot more about computers than I do." Its opposite is also fairly frequently expressed: "I'm going to ace this course because I know tons about computers." It is clear that students often evaluate their own chances for success in the introductory IS course on the basis of their perceived previous experience with computers. Although some universities have decided to permit students to opt out of their introductory IS courses on the basis of computer literacy testing results (Gillard 2000; Low et al. 2001; Pierce et al. 2001; Stephens & Shotick 2002; Wallace & Clariana 2005), many other schools still require all students, no matter their prior computer experience, to take the same introductory course (Baugh 2003; Dwyer & Knapp 2004; Kruck & Lending 2003; McDonald & Viscelli 2005). This creates the need to determine how students with varied computing backgrounds respond to and perform in the introductory course.

The setting of this study was the introductory IS course in the College of Business at a private, medium-sized Midwestern university. The course was a required sophomore-level course for the College of Business and typically had an enrollment of 250 to 350 students per semester. It was a three credit course, consisting of both lab and lecture components. The two components represented, respectively, the IS 2002.PO (Personal Productivity with IS Technology) course and the IS 2002.1 (Fundamentals of Information Systems) course from the IS 2002 Model Curriculum.

2. LITERATURE REVIEW

2.1 Perceived computer experience.

The phrase "perceived computer experience" is used in this paper because the intent is to measure the impact of participants' perceptions of their computer experience on their behavior and performance in an introductory IS course. A large literature exists that suggests students' perceptions of their computer experience influence their behavior in the course because they rely on these beliefs when making decisions about their actions (Levine & Donitsa-Schmidt 1997; Levine & Donitsa-Schmidt 1998; Low et al. 2002; Smith et al. 1999; Smith et al. 2000). Furthermore, several studies have shown that students' perceptions are strongly, but not perfectly, correlated with their actual computer experience (Case et al. 2004; Compton et al. 2002; Dyer et al. 2004; Jones & Pearson 1996; Levine & Donitsa-Schmidt 1998; Pierce et al. 2001).

Definitions of perceived computer experience have been varied and have ranged from participants' reports of their mastery of certain computer skills or applications (Cassidy & Eachus 2002; Havelka 2003; Hindi et al. 2002; Low et al. 2002; Wiedenbeck 2005), to the number of years or hours they have spent on the computer (Case et al. 2004; Havelka 2003; Low et al. 2002; Shiue 2003), to computer presence in their homes or at work (Cassidy & Eachus 2002; Houle 1996; Lee et al. 1994; Levine & Donitsa-Schmidt 1998; Shashaani 1997), to the number of computer courses they have previously taken (Case et al. 2004; Havelka 2003; Shiue 2003; Wiedenbeck 2005).

Because the construct of perceived computer experience has been defined so variously, the measures used to assess its impact and presence have likewise been many and varied. A number of studies have used multi-item instruments to measure perceived computer experience (Case et al. 2004; Garland & Noyes 2004; Hasan 2003; Havelka 2003; Potosky 2002; Wiedenbeck 2005). However, some have used a single item that asks study participants simply to rate their prior computer experience without precisely defining the term (Ballance & Ballance 1993; Cassidy & Eachus 2002; Geissler & Horridge 1993; Hall & Cooper 1991). In this study the latter approach was used because an overall measure of the students' perceptions of their computer experience was desired. It has been demonstrated that this single item correlates very highly with the combined results of multi-item instruments (Hoxmeier et al. 2000; Postosky & Bobko 1998). In addition, when participants' overall assessment of their computer experience has been included as a component in multi-item measures, it has had strong correlations with other variables of interest, such as computer self-efficacy and computer anxiety (Garland & Noyes 2004).

Now that the definition and operationalization of perceived computer experience have been discussed, the next section will introduce the predictions made in this paper concerning the relationship of perceived computer experience to students' behavior and performance in an introductory IS course.

2.2 Perceived computer experience and behavior.

This study proposed that students' perceived computer experience would influence their class behaviors. Specifically, the study investigated the impact of perceived computer experience on attendance and extra-credit participation.

Most of the existing literature on perceived computer experience has studied its impact on internal states, such as attitudes, self-efficacy, and commitment to learning. This focus results from the belief, based on Bandura's social cognitive theory of self-efficacy (1997) and Fishbein and Ajzen's theory of reasoned action (1975), that these internal states ultimately affect observable behavior, such as the willingness to adopt new technology or to accept technology in the workplace. None of the reviewed studies took the next step and examined the impact of perceived computer experience on behavior in the introductory IS course.

It has been shown that class attendance positively affects course performance (Barrington & Johnson 2005; Clump et al 2003; Shimoff & Catania 2001; Silvestri 2003). It has also been shown that diligent work on course assignments and extra-credit opportunities increase both computer self-efficacy and knowledge, leading to higher course performance (Karsten & Roth 1998; Kruck & Lending 2003). It is important to understand the impact of perceived prior computer experience on the class behaviors described above. Because there were no direct predecessors of the current research in this regard, this paper's hypotheses regarding class behavior were based on the relationship between internal constructs with which perceived computer experience is correlated, specifically computer self-efficacy and commitment to learning, and behavior.

Many previous studies have demonstrated that perceived computer experience is positively related to computer self-efficacy (Cassidy & Eachus 2002; Hasan 2003; Havelka 2003; Shiue 2003). Computer self-efficacy is based on the broader concept of self-efficacy, or an individual's belief that he or she has the capability to perform a specific task (Bandura 1997). Previous studies across a broad array of settings have shown that computer self-efficacy is positively correlated with an individual's willingness to choose and participate in computer-related activities, expectations of success in such activities, and persistence when faced with computer-related difficulties (Compeau & Higgins 1995). In educational settings computer self-efficacy is positively correlated with registration in computer courses (Hill et al. 1987), decisions to use computers (Compeau & Higgins 1995), and performance in software training (Gist et al. 1989; Martocchio & Webster 1992) and programming courses (Potosky 2002). More broadly, individual self-efficacy has been positively associated with conscientious learning in a variety of courses (Colquitt et al. 2000). Based on these results it would seem that a student entering the introductory IS class with higher levels of perceived computer experience and its attendant higher levels of computer self-efficacy beliefs would be more interested and more willing to make an effort to succeed in the class.

However, other studies have shown that students' self-efficacy beliefs can also have negative consequences. There is both anecdotal and empirical evidence that students' computer self-efficacy beliefs can be inaccurate (Baugh 2003; Larres et al. 2003; Smith 2004) and that high pre-course computer self-efficacy beliefs can lead to over-confidence (Low et al. 2002), with resulting lessened effort and lower performance. Low et al. (2002) reported that an initial analysis of the impact of perceived expertise on performance in an introductory IS course showed that students with high perceptions of computer skills did not obtain high assessment results in the course but they provide no quantitative information about these analyses. In a study of the factors affecting the success of non-majors in learning to program, Wiedenbeck (2005) found that pre-course self-efficacy was negatively related to course performance and attributed this effect to possible overconfidence on the part of inexperienced students. Smith (2004) speculated that heightened pre-course self-efficacy beliefs may cause students to expend little effort toward acquiring new software skills, basing her argument on Bandura's (1982) statement that "those who perceive themselves to be supremely self-efficacious in [an] undertaking feel little need to invest much preparatory effort in it."

Similarly conflicting results have been obtained by studies examining students' commitment to learning about computers. Commitment to learning in the context of information technology courses has been defined as a commitment to developing knowledge of and skill in the use of the computer (Geissler & Horridge 1993). Commitment to learning has been found to increase such behaviors as the investment of time and effort (Corcoran & Clark 1984). Geissler and Horridge (1993) found that university students with prior computer experience were significantly more committed to learning more about them. However, Levine & Donitsa-Schmidt (1997) found that prior computer experience and confidence in using computers were negatively correlated with commitment to learning in a high school setting.

The results above suggest that perceived computer experience will affect students' behavior in an introductory IS course by influencing students' feelings of computer self-efficacy and commitment to learning. However, given the disagreements in the literature reviewed above, the direction of the impact is not certain. For this reason, the direction of the impact was not specified in the following hypotheses.

H1: Perceived computer experience will significantly affect lecture attendance.

H2: Perceived computer experience will significantly affect lab extra-credit participation.

2.3 Perceived computer experience and its relationship to performance.

This study proposed that perceived computer experience would affect not only class behaviors but performance as well. The impact of perceived computer experience on two facets of performance, homework and exam, was examined.

Studies that have examined the impact of perceived computer experience directly on class performance (Case et al. 2004; Kruck & Lending 2003; Wallace & Clariana 2000; Wiedenbeck 2005) have produced mixed results. Lee et al. (1994) tried to predict computer literacy course performance by including both achievement indicators (SAT scores and high school rank) and prior computer experience indicators (computer use in high school (yes/no); knowledge of a programming language (yes/no); and number of computer courses taken prior to the computer literacy course.) They found that students who knew a programming language performed better in the class than those who did not, even though the course included no programming. They also found that students who had used computers at work performed better in the class than those who had used computers either at home, at school, or not at all.

In a more recent attempt to develop a model to predict academic performance in an introductory IS course, Kruck & Lending (2003) found no significant relationship between their measures of perceived computer experience and students' final semester grades in the course. However, perceived computer experience was measured by two yes/no variables (previous exposure to the same material and previous exposure to programming classes) that may not have fully captured students' perceptions of their prior computer experience or had the range to capture differences in those perceptions.

Studies whose primary focus was on other factors, such as gender or course delivery, also provide some insights into the effects of perceived computer experience on class performance. Shashaani (1997) reported that the female students in her study reported far lower levels of prior experience with computers than did the male students. However, she noted that the female students ultimately performed much better in the course than did their male counterparts. These results indicate that women may underestimate their prior computer experience or that they are able to make up for lower levels of prior experience with positive class behaviors. In an examination of different types of course delivery, Wallace & Clariana (2000) found that students with higher levels of perceived computer experience performed significantly better than other students in an online instruction environment but not in a regular classroom setting. These results suggest that the benefits of perceived computer experience may be particularly evident in online courses or other courses with large technology components.

Although the studies reviewed in the previous paragraphs provide mixed empirical support for the positive impact of perceived computer experience on course performance, theory developed and tested in many studies strongly suggests that perceived computer experience should have a positive influence on introductory IS course performance. Perceived computer experience has been shown to correlate positively with actual computer experience (Harris 1993; Levine & Donitsa-Schmidt 1998; Pierce et al. 2001). Previous use of computers should provide both increased knowledge about computers and increased levels of computer self-efficacy (Cassidy & Eachus 2002; Havelka 2003; Karsten & Roth 1998; Wiedenbeck 2005), both of which are correlated positively with course performance (Lee et al. 1994; Martocchio & Judge 1997; Wiedenbeck 2005). In addition, previous use of computers can be an indicator of level of interest in and motivation to learn more about computers, as has been demonstrated in the commitment to learning literature (Geissler & Horridge

1993; Hoxmeier et al. 2000; Levine & Donitsa-Schmidt 1997). For these reasons, in this study it was predicted that higher levels of perceived computer experience would have a significant and positive impact on performance in the introductory IS course.

H3: Perceived computer experience will positively affect lab homework performance.

H4: Perceived computer experience will positively affect lecture homework performance.

H5: Perceived computer experience will positively affect lecture exam performance (measured as an average across three lecture exams)

H6: Perceived computer experience will positively affect lab exam performance (measured as an average across two lab exams).

2.4 Control variables: Lab or lecture section, gender, and class behavior.

Several other variables were included as controls in the analyses because they have been shown to account for significant portions of variance in models designed to predict class performance.

First, a variable was included that identified which lab or lecture section a particular student attended. This variable was included because different types of students may choose or be required to enroll in sections at different times of the day or week. For example, in the university setting of this study, student athletes were limited to certain class times because of athletic practice demands. ROTC members were also precluded from enrolling in sections at certain times of the day due to training schedule constraints. In addition, two professors in the study taught the lab portion of the course, and the section variable helped to control for variance explained by the professors' teaching differences.

Second, a variable was included that identified the gender of each student because previous studies had revealed that there may be differences in male and female students' computer experience and self-efficacy. A number of studies indicated that female students may have lower levels of computer self-efficacy (Busch 1995; Cassidy & Eachus 2002; Houle 1996; Shashaani 1997) and higher anxiety regarding computers (Dyke & Smither 1994). However, other studies had shown that female students can overcome these initial disadvantages through a strong commitment to learning, eventually outperforming their male counterparts in computer-related courses (Shashaani 1997). The current study sought to control for these effects and discover whether they played a role in the results.

Finally, class behavior variables (attendance and extra-credit participation) were included in the models designed to predict homework and exam performance because previous research had shown that positive class behaviors assist the acquisition of knowledge (Barrington & Johnson 2005; Clump et al 2003; Shimoff & Catania 2001; Silvestri 2003) and help increase levels of computer self-efficacy and positive attitudes about computers (Karsten & Roth 1998; Potosky 2002; Vincent et al. 2002). The current study was designed to discover whether perceived computer experience would affect homework and exam performance even when behaviors such as attendance and extra-credit participation were included in the analyses.

2.5 Summary.

The models investigated in the study are depicted in Figures 1 and 2. The study adds to the existing literature about students' performance in the introductory IT course by focusing on the impact of perceived computer experience on class behaviors and then examining the combined impact of perceived computer experience and these behaviors on homework and exam performance. The methods used to facilitate this examination are described in detail in the following section.

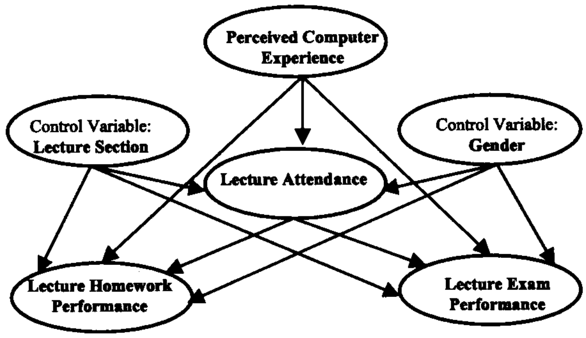


Figure 1. Model for Lecture Behaviors and Performance

3. METHOD

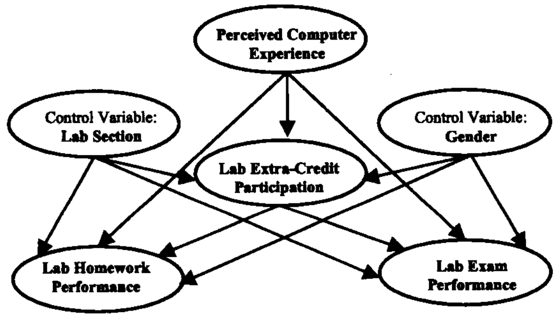


Figure 2. Model for Lab Behaviors and Performance

3.1 Participant characteristics.

Participants in the study were students enrolled in the introductory information systems course in the College of Business at a private, medium-sized Midwestern University during the fall semester of 2005. Most students in the class were sophomores (84%) but there were some students from other years as well (16%). The number of students enrolled in the course was 244 but some students chose not to provide information for the study. Of the 225 students who were enrolled in the course and participated in the study, 123 were male, and 102 were female. Majors represented were finance (42%), accounting (19%), marketing (20%), management (9%), and management information systems (1%) with 9% of the students still undecided about their major. All students were in their late teens or early twenties.

3.2 Course Content and Structure.

The introductory information systems course was made up of lab and lecture components. The lab component (personal productivity with technology) was worth two-thirds of the overall course grade and focused on mastery of Microsoft

Excel, Microsoft Access, and Macromedia's Dreamweaver. The lab was taught by two instructors and students were divided into nine sections ranging in size from 10 to 31 students. Each section met twice weekly for 50 minutes. Students were required to complete seven lab homeworks as well as two lab exams, and were given the opportunity to hand in five chapter tutorial results for extra-credit.

The lecture component (fundamentals of information systems) was worth one-third of the overall course grade and focused on the exploration of basic information systems concepts such as hardware, software, networks, databases, and decision support systems. The lecture was taught by one instructor and students were divided into four sections ranging in size from 20 to 88 students. Each section met once weekly for an hour and fifteen minutes. Students were required to complete five lecture homeworks and three lecture exams.

3.3 Independent Variables.

3.3.1 Perceived Computer Experience: On their first day in the lecture portion of the course students were asked to provide their prospective or declared major and their level of computer experience. Students provided information regarding their computer experience by answering the question, "How much computer experience do you have?" on a Likert-type scale from 1 (very little) to 5 (extensive). Average perceived computer experience was 2.88 with a standard deviation of .88. The average perceived computer experience for male students was 3.09 with a standard deviation of .97. The average perceived computer experience for female students was 2.64 with a standard deviation of .67.

3.3.2 Lecture Attendance: Attendance was taken in every lecture class session. For the purpose of the analyses attendance was summed across all class sessions, producing a total attendance number for each student. There were a total of 9 lecture class sessions throughout the semester (not including class sessions in which the 3 lecture exams were given), so the total attendance number for each student could range from 0 to 9. Average total attendance was 7 with a standard deviation of 2. Lab attendance statistics were available from one of the lab professors but not the other, so lab attendance was not included in the lab behavior or performance analyses.

3.3.3 Lab Extra-Credit Participation: In the lab portion of the course students were given five opportunities for extra-credit. Students completed tutorials in their textbooks in preparation for their next lab class. They were asked to bring the completed tutorial work with them on disk to each lab class session. These tutorial results were checked on an unannounced basis 5 times throughout the semester. Each correctly completed tutorial was worth 3 extra-credit points, for a total of 15 extra-credit points possible. The extra-credit participation percent variable was calculated by summing each student's extra-credit points earned and then dividing by the 15 points possible. The average extra-credit participation percent was 50% with a standard deviation of 37%.

3.4 Dependent variables.

Attendance and extra-credit participation were also used as dependent variables in some equations because one of the goals of the study was to explore the impact of perceived computer experience on these intermediate behaviors as well as on homework and exam performance. Attendance and extra-credit participation were operationalized identically in either case.

3.4.1 Lecture and Lab Homework Performance: The five lecture homeworks were designed to develop both declarative knowledge and critical thinking skills. For example, the homework on computing hardware listed the hardware requirements of Microsoft Excel and asked students to provide definitions of the specified hardware components and answer questions regarding the reasons why Excel would require the capabilities of the specified hardware. Students were given at least a week to complete each homework. During these weeks a variety of resources were available to help students successfully complete their homework. These consisted of a two-hour long help session on the homework, the professor's office hours, access to the professor via email, and the ability to work in groups. These opportunities for help were designed to make it possible for all students to perform well on the homeworks. The lecture homework percent variable was calculated by summing each student's scores on the five lecture homeworks (each worth 10 points) and then dividing by 50. The average lecture homework percent was 77% with a standard deviation of 14%.

The eight lab homeworks consisted of computer-based exercises that reinforced the software skills taught in the textbook tutorials and in the lab class sessions. Again, students were given at least a week to complete each homework. A two-hour long help session was conducted for all lab homeworks and the lab professors were available to help students both during their office hours and by email. In addition, lab homeworks were constructed to provide immediate electronic feedback. Students were informed when they had obtained the correct result by macros built into the application they were using. This feature of the lab homeworks allowed students to continue modifying their homework until they had successfully obtained the correct result. The lab homework percent variable was calculated by summing each student's scores on the eight lab homeworks (seven worth 15 points, one worth 10 points) and then dividing by 115. The average lab homework percent was 96% with a standard deviation of 6%.

3.4.2 Lecture and Lab Exam Performance: The lecture portion of the course required the students to take three exams worth a total of 200 points throughout the semester. All lecture exams consisted of a mixture of multiple choice, true/false, modified true/false, sentence completion, and short answer questions, each counting two points. Exam questions covered topics discussed either in the assigned readings or in class. The questions were designed to test declarative knowledge (RAM is short term memory), procedural knowledge (When designing a database one should start with a schema), and critical thinking (Under what circumstances should a firm choose to develop its own

Variable	N	$\bar{x}$	s	Comp Exp	Attend	Gender	Extra Credit Percent	Lab Exam Percent	Lect Exam Percent	Lect HW Percent	Lab HW Percent	Section
Computer Exp	225	2.88	0.89	1	.033	.254***	.068	.200**	.149*	.151*	.109	.087
Attendance	225	7.24	2.03		1	.102	.352***	.188**	.242***	.433***	.202**	.156 *
Gender	225	0.45	0.5			1	.175 **	-.053	-.093	.087	.136 *	-.036
Extra Credit Prct	225	0.49	0.37				1	.310***	.207 **	.353***	.319***	-.034
Lab Exam Percent	225	0.87	0.11					1	.434***	.397***	.443***	.060
Lect Exam Percent	225	0.83	0.07						1	.438***	.328***	.030
Lect HW Percent	225	0.77	0.14							1	.593***	.152 *
Lab HW Percent	225	0.96	0.06								1	.095
Section	225	2.0	0.99									1

***Correlation is significant at the .001 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 1. Descriptive Statistics and Pearson Correlation Coefficients

software?). Questions were designed so that much of the grading could be automated. The lecture exam percent variable was calculated by summing each student's performance across the three exams and dividing by 200. The average lecture exam percent was 83% with a standard deviation of 7%.

The lab portion of the course required the students to take two exams worth a total of 200 points. Both exams consisted of computer-based exercises and were graded automatically by macros built into the exam software. The first tested students' knowledge of Microsoft Excel while the second tested their mastery of Microsoft Access. The lab exam percent variable was calculated by summing each student's performance across the two exams and dividing by 200. The average lab exam performance percent was 87% with a standard deviation of 11%.

4. RESULTS

4.1 Descriptive Statistics.

Means, standard deviations, and Pearson correlation coefficients for all variables are displayed in Table 1. There was a wide range of perceived computer experience across the participants in the study, with 6% of the students reporting very little computer experience and 5% reporting extensive computer experience. The majority of students reported moderate levels of computer experience, with 24% indicating somewhat lower than average computer experience, 47% indicating average computer experience, and 18% indicating somewhat higher than average computer experience.

Pearson correlation coefficients are reported here using the symbol r, and corresponding degrees of freedom for tests of significance are reported parenthetically. As anticipated, correlation analysis results indicate a significant relationship between perceived computer experience and performance on both lecture ($r(223) = .15, p < .05$) and lab ($r(223) = .20, p < .01$) exams, providing preliminary support for Hypotheses H5 and H6. Correlation analysis results provide mixed preliminary support for the relationship between perceived computer experience and homework performance, H3 and H4. Perceived computer experience was significantly related to lecture homework performance ($r(223) = .15, p < .05$), but only marginally related to lab homework performance ($r(223) = .11, p < .1$). Perceived computer experience was not significantly related to either of the class behavior variables, attendance ($r(223) = .03$) or extra-credit participation ($r(223) = .07$), providing no preliminary support for Hypotheses H1 and H2.

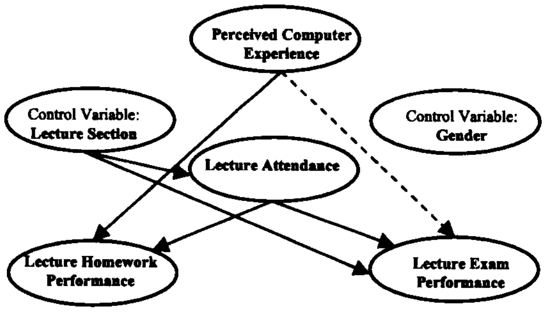
The correlation analysis results do suggest a strong relationship between class behaviors and performance. Attendance and extra-credit participation were both significantly and positively related to both lab and lecture homework and exam performance.

4.2 Impact of perceived computer experience on class behaviors.

Univariate analyses of covariance (ANCOVA) were conducted to test Hypotheses H1 and H2 (perceived computer experience will significantly affect class behaviors). ANCOVA is useful when exploring the relationship between a continuous dependent variable (e.g., exam performance) and one or more categorical independent variables (e.g., gender), while controlling for the effect of one or more continuous independent variables (e.g., perceived computer experience). F-tests were used to test for significance of the ANCOVA models, and degrees of freedom are reported parenthetically.

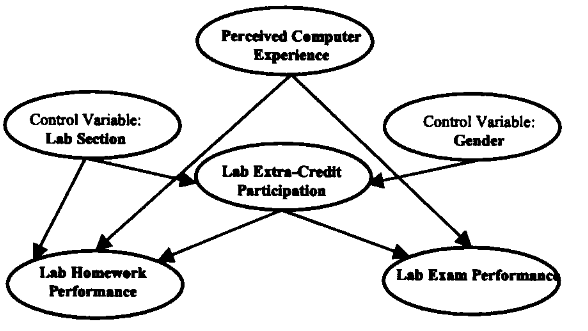
For the testing of Hypotheses H1 and H2, the control variables gender, lecture section, and lab section were treated as categorical variables while all other variables (perceived computer experience, attendance, and extra-credit participation) were treated as continuous variables. The significant relationships described in the next few paragraphs are depicted in Figures 3 and 4.

4.2.1 Lecture Attendance: It was predicted in H1 that perceived computer experience would significantly affect class attendance. An ANCOVA was conducted that included perceived computer experience, gender, lecture section, and the interaction of lecture section and gender to test the hypothesis. The results of the ANCOVA do not support H1. The model itself was significant (R^2 = .08, F(8, 216) = 2.33, p < .05) but perceived computer experience was not (F(1,216) = .54, p > 0.1). The only significant predictor of attendance was lecture section (F(3, 216) = 1.38, p < .01), while gender (F(1, 216) = 4.95, p > 0.1) and the gender by lecture section interaction (F(3, 216) = .10, p > 0.1) were not. Mean attendance was 7.17 for Section One, 6.65 for Section Two, 8.02 for Section Three, and 7.90 for Section Four.



Solid lines significant at the p <.05 level or less
Dashed line significant at the p < .01 level

Figure 3. Significant Relationships among Lecture Model Variables



Solid lines significant at the p <.05 level or less

Figure 4. Significant Relationships among Lab Model Variables

4.2.2 Extra-Credit Participation: It was predicted in H2 that perceived computer experience would significantly affect extra-credit participation. An ANCOVA that included perceived computer experience, gender, lab section, and the interaction of lab section and gender was conducted to test the hypothesis. The results of the ANCOVA do not support H2. The model itself was significant (R^2 = .25, F(17, 207) = 3.97, p < .001) but perceived computer experience was not (F(1, 207) = 1.64, p > 0.1). Both control variables, gender (F(1, 207) = 11.78, p < .001) and lab section (F(8, 207) = 6.28, p < .001) did significantly affect extra-credit participation but their interaction (F(7, 207) = .91, p > 0.1) did not. An examination of the male and female extra-credit participation means showed that women had higher rates of participation (60%) than men (40%). Extra-credit participation averages ranged from a low of 23% in one lab section to a high of 70% in another.

4.3 Impact of perceived computer experience on lab and lecture exam performance.

Univariate ANCOVA's were conducted to test H3-H6 (perceived computer experience would significantly and positively affect lecture and lab homework and exam performance). Again, control variables (gender, lecture section, and lab section) were treated as categorical variables while all other variables (perceived computer experience, attendance, extra-credit participation, lab and lecture homework performance, lab and lecture exam performance) were treated as continuous variables.

4.3.1 Lecture Homework Performance: It was predicted in H3 that perceived computer experience would positively affect lecture homework performance. An ANCOVA was conducted that included perceived computer experience, gender, lecture section, the interaction of lecture section and gender, and attendance to test the hypothesis. The results of the ANCOVA support H3. The model itself was significant (R^2 = .23, F(9, 215) = 7.27, p < .001) and perceived computer experience significantly and positively affected lecture homework performance (F(1, 215) = 6.42, p < .05). In addition, attendance was a significant predictor of lecture homework performance (F(1, 215) = 41.91, p < .001), with higher rates of attendance associated with better homework performance. Neither control variable, gender (F(1, 215) = .50, p > 0.1), or lecture section (F(3, 215) = .50, p > 0.1), nor their interaction (F(3, 215) = 1.28, p > 0.1) significantly affected lecture homework performance.

4.3.2 Lab Homework Performance: It was predicted in H4 that perceived computer experience would also positively affect lab homework performance. An ANCOVA was conducted that included perceived computer experience, gender, lab section, the interaction of lab section and gender, and extra-credit participation to test the hypothesis. The results of the ANCOVA support H4. The model itself was significant (R^2 = .27, F(18, 206) = 4.15, p < .001) and perceived computer experience significantly and positively affected lab homework performance (F(1, 206) = 6.21, p < .05). In addition, extra-credit participation was a significant predictor of lab homework performance (F(1, 206) = 41.43, p < .001), with higher rates of extra- credit participation associated with better homework performance. The control variable, lab section, was also significantly related to lab homework performance (F(8, 206) = 3.93, p < .001) while gender (F(1, 206) = 2.63, p > 0.1) and the interaction of gender and lab section (F(7, 206) = .77, p > 0.1) were not. Lab homework performance section means varied from a low of 94% to a high of 99%.

4.3.3 Lecture Exam Performance: It was predicted in H5 that perceived computer experience would significantly affect lecture exam performance. An ANCOVA was conducted that included perceived computer experience, gender, lecture section, the interaction of lecture section and gender, and attendance to test the hypothesis. The significant relationships described in this model are depicted in Figure

3. The model was significant ($R^2 = .15$, $F(9, 215) = 4.24$, $p < .001$). Perceived computer experience was marginally predictive of exam performance ($F(1, 215) = 3.21$, $p < 0.1$). Attendance was significantly and positively related to exam performance ($F(1, 215) = 9.30$, $p < .01$). Of the control variables, gender ($F(1, 215) = 2.70$, $p > 0.1$) was not related to lecture exam performance but lecture section ($F(3, 215) = 5.03$, $p < .01$) was. The interaction of gender and lecture section was not significant ($F(1, 215) = .591$, $p > 0.1$). Mean lecture exam performance by lecture section ranged from a low of 80% to a high of 85%.

4.3.4 Lab Exam Performance: It was predicted in H6 that perceived computer experience would significantly affect lab exam performance. An ANCOVA was conducted that included perceived computer experience, gender, lab section, the interaction of lab section and gender, and extra-credit participation to test the hypothesis. The significant relationships described in this model are depicted in Figure 4. The model was significant ($R^2 = .21$, $F(18, 206) = 2.99$, $p < .001$) and perceived computer experience was significantly predictive of lab exam performance ($F(1, 206) = 6.92$, $p < .01$). Extra-credit participation was also significantly related to exam performance ($F(1, 206) = 24.20$, $p < .001$). Neither of the control variables, gender ($F(1, 206) = .13$, $p > .1$) or lab section ($F(8, 215) = 1.66$, $p > .1$) nor their interaction ($F(7, 206) = .84$, $p > .1$) was related to lab exam performance.

5. DISCUSSION

5.1 Summary of results.

The results of the study show that higher levels of perceived computer experience positively affected both lecture and lab homework and exam performance in an introductory IS course. Higher levels of positive class behaviors (attendance and extra-credit participation) also positively affected both lecture and lab homework and exam performance. Gender and lab/lecture section were included as control variables and both had an impact on behavior and performance. Women participated more in extra-credit opportunities. Lecture and lab sections varied significantly with regard to attendance, extra-credit participation, lab homework performance, and lab and lecture exam performance.

5.2 Impact of perceived computer experience.

In this study students' perceptions regarding their computer experience had palpable ramifications for their homework and exam performance. Students with more perceived computer experience had an advantage in both lab and lecture portions of the course. The advantage may have had a number of causes. Students with higher perceived computer experience may have come to the class knowing more about computers, and, therefore, had less work to do to perform well on homeworks and exams. They may have had more positive attitudes about computers or confidence using them, again leading to more practice and better performance. If students' perceived computer experience affected their commitment to learning, that commitment was not demonstrated by increased attendance or extra-credit participation but by better performance on the homeworks and exams. Students who rate themselves as having lower levels of computer experience may need extra support and/or motivation to achieve the homework and exam success that other students find comes easier.

5.3 Impact of class behaviors.

This study's results show that class behaviors have very important impacts on exam performance. Consistent with previous studies (Barrington & Johnson 2005; Clump et al 2003; Shimoff & Catania 2001; Silvestri 2003), higher levels of attendance were associated with higher performance on both lecture homework and exams. These effects could have multiple explanations. Consistent attendance may have helped students acquire the knowledge needed to perform well on the homework. Alternatively, consistent attendance may be associated with higher levels of motivation to do well in the course, and that motivation may be responsible for both high attendance and superior homework and exam performance.

Extra-credit participation had a strong, significant impact on lab homework and exam performance. This finding is consistent with previous studies' results in which opportunities for practice in IS courses increased students' computer self-efficacy beliefs and their knowledge about computers, leading to better course performance (Karsten & Roth 1998; Levine & Donitsa-Schmidt 1998; Rawlings et al. 2005; Shiue 2003; Vincent et al. 2002). In the course on which this study was based, extra-credit was given to students who could prove that they were diligently working though the application tutorials when they were assigned. Students with higher levels of extra-credit participation were therefore working more with the applications than other students, which likely resulted in improved facility with the applications, helping both lab homework and exam performance. As was the case with attendance, however, it may be that highly motivated students perform well on extra-credit opportunities, homeworks, and exams, and our results demonstrate the impact of that motivation.

5.4 Impact of gender.

Gender was included as a control variable in this study's models because a large literature testified to gender differences in computing experience and confidence (Cassidy & Eachus 2002; Dyck & Smither 1994; Harris 1993; Shashaani 1997). Consistent with other research, women's perceived computer experience ($\bar{x} = 2.64$) was lower than that of men ($\bar{x} = 3.09$). However, in the present study women had significantly higher lab extra-credit participation rates. In addition, their performance on homework and exams was equal to that of men. These results are consistent with other education studies that have found female students able to overcome initial computer experience disadvantages through a strong commitment to learning, resulting in equal or better performance than their male counterparts (Shashaani 1997).

5.5 Pedagogical recommendations.

The pedagogical insights derived from this study diverge based on the student composition of the introductory IS course. For schools where all students, regardless of prior computer experience, are required to take the introductory IS course, the results of this study point strongly toward the power of practice (homework, extra-credit based on practice) to allow students with limited computer experience to perform as well as their more experienced peers. Required introductory IS courses should provide as many opportunities for practice as possible so that students can increase their computer self-efficacy and knowledge during the course. In addition, students should be provided with high levels of support when completing these practice problems. Students who initially feel less confident regarding their computer skills can use professors' office hours, professor or teaching assistant-led help sessions, and computer-based training exercises to increase their computer confidence and mastery. In this way, the advantage students with higher levels of perceived computer experience have on the homeworks may be mitigated. It may also be helpful to assign students with higher levels of perceived computer experience as mentors or tutors to students with lower levels.

On the other hand, schools that are able to provide different versions of the introductory IS course could offer a more challenging version of the course to students with high levels of previous experience and a more basic version of the course to students with low levels of previous experience. More support and practice could be incorporated into the basic version of the course to provide students with the opportunities they need to acquire computer confidence and knowledge. High computer experience students would benefit from exposure to more advanced material and less repetition of information they already know. Because students' reports of their computer experience seem to be correlated with their actual prior experience, it may be possible to allow students to sign up for the version of the course they feel best fits their experience level, rather than relying on extensive pre-course testing.

In summary, this study shows that instructors of the introductory IS course need to understand that students who report different levels of computer experience need different kinds of support and opportunities in the course. It is easy to ask students to rate their level of prior experience either before taking the course or at the beginning of the course. Instructors should acquire this information and use it to provide students with the types of practice, support, and information that will make the course most useful to them and provide them with the greatest opportunity for success.

5.6 Limitations of the present study and suggestions for future research.

This study was based on the students enrolled in and the professors teaching an introductory IS course at a single university. Therefore the results of the study may not be generalizable to the wider population of introductory IS courses, professors, and students due to differences in course delivery, content, and/or the student population.

Another potential confound lies in instructor bias towards students with higher levels of computer experience. It is possible that professors who are aware of students with higher than average knowledge of computers single these students out for special attention and assistance. This instructor bias may increase the advantage students with higher levels of experience have in the introductory IS course.

Two different avenues are recommended for future research in this area. First, given the limitations of the data used in this study, it is impossible to know whether motivation may be the internal state that drives the relationship between higher extra-credit participation, attendance, homework performance, and exam scores. It is possible that high levels of motivation may be the underlying cause of the relationships discovered in this paper between class behaviors and performance. Future studies should incorporate a measure of motivation at the start of the course in order to tease out these relationships.

Second, it would be useful to conduct a study that pairs students reporting high levels of computer experience with students reporting low levels of computer experience to see what effect this pairing might have on the homework and exam performance of the low experience students. The high experience students could serve as mentors and/or tutors to the low experience students. This may be an effective, non-resource draining alternative to offering more professorial and/or teaching assistant-based help to lower experience students during the course.

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