An Examination of the Computer Self-Efficacy and Computer-Related Task Performance Relationship

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Introduction

Today students arrive in introductory computer applications courses with a wide range of computer proficiencies. Although students' performance levels vary, greater availability of computers and reduced anxiety has elevated perceived ability to interact successfully with computers.

Computer self-efficacy refers to individual confidence in one's capability to use a computer and may help determine ease of skill acquisition. However, self-efficacy about ability to complete computer-related tasks may heighten or weaken performance. Previous computer experience may lead students to believe computer applications courses are easy. Heightened self-efficacy may cause students to expend little effort toward learning new computer concepts. Bandura (1982) stated "in approaching learning tasks, however, those who perceive themselves to be supremely self-efficacious in the undertaking feel little need to invest much preparatory effort in it" (p. 123).

Computer self-efficacy in conjunction with computer performance assessment may help identify academic strengths while supplying insight into the students' self-perceived barriers to learning about computers. Classroom assessment guides the education process by providing educators with directions on how to facilitate learning and providing students with realistic performance indices.

Problem and Purpose

Marakas, Yi, and Johnson (1998) highlighted the complexity of the computer self-efficacy construct and solicited additional research. Computer self-efficacy may possibly have a strong association with computer task performance, however research in this area has not been conducted.

The purpose of this study was to investigate perceptions of computer self-efficacy, computer task performance level, and the difference between computer self-efficacy and computer task performance. In accordance with Bandura's (1986) criterion regarding consistency of self-efficacy and performance assessment measures, this research formulated the following research questions:

1. What is the level of computer self-efficacy among students enrolled in an introductory computer applications course?
2. What is the computer performance level of students enrolled in an introductory computer applications course?
3. Is there a difference between computer self-efficacy beliefs about computer-related tasks and actual computer-related task performance?

Review of Literature

According to Bandura (1986), self-efficacy can be a better predictor of performance than actual capability because self-percepts are instrumental in determining what individuals do with the

knowledge and skill they possess. Hackett and Betz (1989) found a moderate correlation between math self-efficacy and math problem solving. Pajares and Miller (1994) found a high correlation between math self-efficacy and performance. In addition, the strongest direct effect on math problem-solving performance was math self-efficacy, in comparison to perceived usefulness of math, math background, and gender. Pajares and Miller (1995) found confidence to solve math problems a stronger predictor of ability than confidence to perform math tasks (e.g., calculate income taxes) or earn high grades in college courses that require knowledge and mastery of mathematics (e.g, statistics).

Method

This section addresses the selection of participants and the research procedure. Details of research instruments used to conduct the study and the data analysis are discussed.

Participants and Procedure

Participants. The participants were 10 (6 males and 4 females) undergraduate students at a Midwest university. Seven of the students were sophomores, 2 freshmen, and 1 junior. Students were primarily business majors 60% (n=6), 30% (n=3) were sports management majors, and 10% (n=1) majored in communications. Students were enrolled in an introductory computer applications course entitled Business Information Systems. The course met daily for 5 weeks during the summer session. The course is 60 percent professor-led lecture and 40 percent computer task performance. Due to the exploratory nature of this study, a small sample was used to validate instruments and procedures.

Procedure. Students completed the computer self-efficacy assessment within one class period. The day following the computer self-efficacy assessment, students were administered the computer performance assessment. Completion of the computer performance assessment required two ninety-minute class periods. All instruments were completed within the last three days of the five-week summer session. Bandura (1986) stated that self-efficacy and performance should be assessed within a close period and that self-efficacy assessment precedes performance assessment. Students were not provided assistance from the professor and received a limited amount of written instructions.

Instrumentation

Computer Self-Efficacy Assessment (CSEA). Measures of self-efficacy that are specifically tailored to the task assessed provide greater predictability of performance outcome. In addition, judgments of self-efficacy are task and domain specific. Bandura (1977) stated self-efficacy measures in academic areas are operational of the belief that one can successfully accomplish the behavior to produce the desired outcome. Therefore, the investigator designed the CSEA to measure confidence in ability to perform specific computer task activities. Students were asked to rate their level of confidence on a 5-point Likert scale from completely confident (5) to not at all confident (1). The 23-item assessment was composed of six performance units: word processing, spreadsheet, database, presentation graphics, graphical user interface (GUI)

management, and telecommunications. For example, an item in the word processing unit asked students about their level of confidence in their ability to "use a software application template."

Computer Performance Assessment (CPA). Consistent with the CSEA, the investigator designed the CPA to measure computer task performance. The 16-item assessment asked students to produce documents in accordance with the 23 items based on the six performance units listed on the CSEA. For example, in the word processing unit, students were provided a hardcopy of a memo. Students were instructed to reproduce the memo using a word processing template.

Data Analysis

A scoring matrix was developed to analyze the results of the Computer Performance Assessment (CPA). The CPA rating was designed to complement the confidence rating on the Computer Self-Efficacy Assessment (CSEA). CPA ratings ranged from successful task completion (5) to no evidence of task completion (1). The investigator rated each student's CPA documents. Students' personal ratings on the CSEA were compared to the investigator's CPA ratings.

Due to the small sample, only descriptive statistics were calculated. Data includes perception and performance mean scores and the frequency of students' computer self-efficacy perception and computer task performance rating differences.

Findings

Table 1 describes the descriptive statistics for computer self-efficacy and computer task performance. The perception column addresses the first research question: What is the level of computer self-efficacy among students enrolled in an introductory computer applications course? The performance column addresses the second research question: What is the computer performance level of students enrolled in an introductory computer applications course?

Table 2 shows the percent of students and the range of difference between the student's computer self-efficacy rating and the investigator's computer task performance rating. The rating difference was calculated using the students' self-efficacy rating based on the Computer Self-Efficacy Assessment (CSEA) and the investigator's rating of student task performance based on the Computer Performance Assessment (CPA) documents. A positive rating denotes performance exceeded perception; a rating of zero denotes equivalent perception and performance, and a negative rating denotes perception exceeded performance. Each assessment item shows the rating difference and student frequency.

Table 1
Descriptive Statistics for Computer Self-Efficacy (Perception) and Computer Performance

	Perception				Performance			
Assessment Item	***M***	***SE***	***Min***	***Max***	***M***	***SE***	***Min***	***Max***
Unit 1 - Word Processing								
1. Keyboard documents	3.67	.29	2	5	3.89	.51	1	5
2. Use template	4.11	.26	3	5	3.00	.50	1	5
3. Save and print documents	4.67	.24	3	5	4.67	.33	2	5
4. Edit documents	4.22	.28	3	5	2.67	.50	1	5
5. Ensure quality	3.78	.22	3	5	3.67	.50	1	5
Unit 2 - Spreadsheet								
6. Create spreadsheet	3.89	.26	2	5	3.78	.52	1	5
7. Enhance spreadsheet	4.11	.26	3	5	3.00	.47	1	5
8. Use formulas	3.44	.29	2	5	3.56	.60	1	5
9. Perform special functions	3.44	.29	2	5	3.67	.55	1	5
Unit 3 - Database								
10. Create database	3.00	.29	2	4	3.56	.53	1	5
11. Perform database functions	2.67	.41	1	5	3.44	.38	1	4
Unit 4 - Presentation Graphics								
12. Create visual aids	2.89	.35	2	5	1.78	.46	1	5
13. Incorporate special effects	2.56	.34	1	4	1.89	.48	1	5
Unit 5 - GUI Management								
14. Exchange data between software	2.89	.35	2	5	2.11	.45	1	5
15. Create folders	3.67	.33	2	5	3.00	.65	1	5
16. Use virus detectors	3.22	.43	1	5	3.44	.56	1	5
17. System software commands	3.67	.41	1	5	2.56	.63	1	5
18. Locate hardware devices	3.22	.40	1	5	3.00	.53	1	5
19. Manage files and disks	3.67	.33	2	5	2.44	.58	1	5
Unit 6 - Telecommunications								
20. Communicate using e-mail	4.44	.29	3	5	3.67	.67	1	5
21. Electronic attachments	3.67	.50	1	5	2.22	.62	1	5
22. Electronic communications	3.33	.41	2	5	2.33	.67	1	5
23. Use a web server	4.33	.29	2	5	3.00	.67	1	5

Students' computer self-efficacy was the highest on item number three - save and print documents (4.67). The lowest item was number 13 - incorporate special effects into a presentation (2.56).

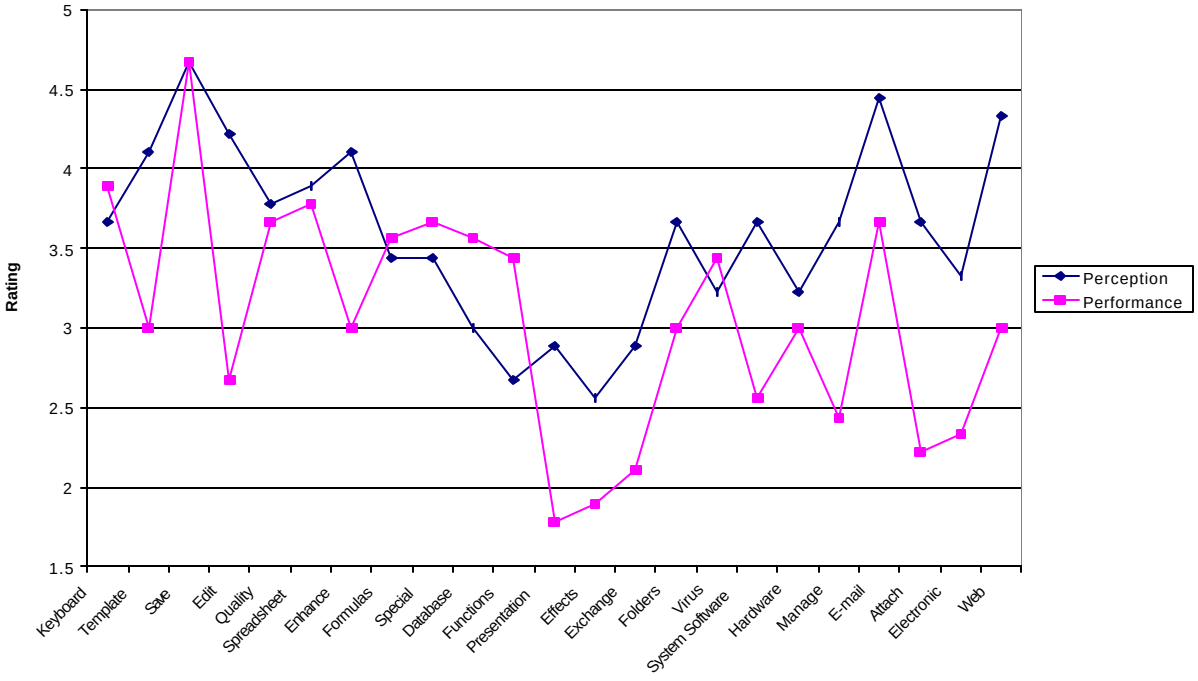
Research question number three addressed the difference between computer self-efficacy and performance of computer-related tasks. Table 2 and figure 1 illustrate the difference.

Table 2
Frequencies for Computer Self-Efficacy and Computer Performance Differences

Number of Students and Rating Difference								
	-4	**-3**	**-2**	**-1**	**0**	**1**	**2**	**3**
Assessment Item	**#**	**#**	**#**	**#**	**#**	**#**	**#**	**#**
Unit 1 - Word Processing								
1. Keyboard documents			1	3	1	4	1	
2. Use template		2	4	4				
3. Save and print documents				1	8	1		
4. Edit documents		1	5	1	3			
5. Ensure quality			1	4	1	3	1	
Unit 2 - Spreadsheet								
6. Create spreadsheet			1	3	2	4		
7. Enhance spreadsheet		1	3	2	3	1		
8. Use formulas			1	2	3	3	1	
9. Perform special functions			1	2	3	2	2	
Unit 3 - Database								
10. Create database			1	2	1	3	3	
11. Perform database functions				2	3	2	2	1
Unit 4 - Presentation Graphics								
12. Create visual aids	1		2	3	3	1		
13. Incorporate special effects			2	4	2	2		
Unit 5 - GUI Management								
14. Exchange data between software			2	4	3	1		
15. Create folders			3	2	3	2		
16. Use virus detectors				2	5	2	1	
17. System software commands		2	2		6			
18. Locate hardware devices			1	2	5	2		
19. Manage files and disks		2	2	2	3	1		
Unit 6 - Telecommunications								
20. Communicate using e-mail	2		1	5	1	1		
21. Electronic attachments	2	1	1	1	4	1		
22. Electronic communications		2	1	3	3	1		
23. Use a Web server	1	1	3	1	5			

Item number 20 (communicate using e-mail) had the greatest percent of students performing below the perception rating. Eighty percent (n=8) did not complete or incorrectly completed the e-mail task. Seventy percent (n=7) received performance ratings below their computer self-efficacy rating on item number four that asked students to edit a document. On items 2, 7, 13, 14, 19, and 22, sixty percent (n-6) received a performance rating below their self-efficacy rating.

Figure 1. Difference between computer self-efficacy and computer task performance.



Item three (save, retrieve, and print) within the word processing unit is the only item on the assessments that produced a perception and performance mean score collaboration. Performance ratings were higher than computer self-efficacy for item 1, items 8 – 11, and item 16. The remaining 16 items produced a higher computer self-efficacy perception rating than computer task performance rating. The telecommunications unit produced the greatest difference between the computer self-efficacy and performance rating.

Discussion

Based on the findings, students' computer self-efficacy was high for the word processing and telecommunications units. Lower computer self-efficacy existed for the database and presentation graphics units. In contrast to computer self-efficacy, performance ratings were the highest for the word processing and spreadsheet units. The presentation graphics unit received the lowest performance rating followed by the GUI management unit.

Overall, computer self-efficacy exceeded performance. Only the spreadsheet unit had a comparable perception and performance rating. The performance rating was higher than the computer self-efficacy rating within the database unit. However, creation of the database and the functions specified on the computer performance assessment (CPA) were based on manipulation of the spreadsheet generated in the spreadsheet unit. Spreadsheet software is used to teach database concepts in the introductory computer applications course.

Although self-efficacy judgments are generally associated with performance, a number of conditions can affect the strength of the relationship. Discrepancies may arise because of misjudgments of self-knowledge or task requirements (Bandura, 1982). Many students arrive in introductory computer applications courses with great confidence in their ability to perform a computer-related task, but are often unable to accomplish the task without extensive instructions.

Early identification of computer self-efficacy and performance differences may help students focus on computer performance units with the greatest inconsistencies. Large discrepancies can be remedied with computer tasks designed to eliminate perception and performance differences. Awareness of computer self-efficacy that relates to computer task performance will enhance classroom learning and instruction.

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