Computer-Based Training and Assessments: An Exploratory Study of Social Factors

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Abstract

This paper introduces an exploratory research program on different types of hybrid classes to answer those and other questions around its efficacy and applicability for training and education. Our objective is to develop and perform an initial test of a new model designed to trace the influence of individual and technical characteristics on learning outcomes through their effect on in-class and computer training phases of knowledge and skills acquisition and testing. The overall research question is: “Which and how much do CBT, individual student, class, instructor, and CBA factors affect student learning outcomes?” This paper proposes a research model based upon the Leidner and Jarvenpaa (2001) work where they introduce a research model that helps instructors determine the best teaching method depending on course content, available technology, an individual instructor, and student factors. Thirty-six questions were posed to over 400 students with direct and current experience using CBT and CBA for course credit. The findings show that there is a strong potential for student as well as corporate benefits in training using online assessment tools. Online assessment effectiveness should be given further research study given the explosive jump in reported learning.

1. Introduction

A quick scan of educational institutions and their programs show they are increasingly turning to computer-based training (CBT) and computer-based assessment (CBA) tools, especially for entry-level courses like introductory computing or for administering computer literacy or proficiency exams. Electronic, online, or computer-based training can provide a number of advantages—such as time and place convenience for students and instructors, standardized delivery, self-paced learning, economies of scale in terms of classrooms and instructors, automated feedback to students and instructors, and a variety of available content (Strother, 2002). IT can assist an instructor in extending availability beyond class time and office hours, establish links between classmates, and accomplishing administrative activities (Benbunan-Fich, 2002). One of the leading CBA/CBT providers, Course Technology, boasts on its web site how many millions of exams have been taken using their Skill Assessment Manager software since its inception in 1998.1 Additionally, data from CBA results can be used to conduct item analysis and strengthen course personalization, content, and delivery. There is a potential for computer-based teaching methods to improve classroom learning that remains untapped by the inability to use them effectively (Leidner and Jarvenpaa, 2001).

And it’s not just used in academia. In 1999, companies in the United States spent $62.5 billion on training and educating their employees, with more than $3 billion spent on technology-delivered training—estimated to then to grow to $11 billion by 2003—with some retailers doing 20% of their training online (Khirallah, 2000). Companies are using it to screen job applicants, train employees, and test them on the training. Major vendors like IBM and Hewlett-Packard have established large CBT/CBA programs; IBM alone offers hundreds of subjects in 26 curriculum areas. But does it work well? There is a growing body of literature in and out of the academic community on its pedagogical efficiencies and effectiveness.

One of the issues with CBT and CBA is using "hybrid" courses—combining traditional lecture pedagogy with computer-based technology to reap the best of both worlds. Moreover, many lectures in

1 15,121,146 as of June 16, 2005 (http://samcentral.course.com/default.cfm).
introductory university courses are conducted in large classes to more easily absorb enrollment variations, provide economies of scale in terms of classrooms, and more efficiently use the skills of a professor—especially during times of shrinking financial support. Using CBT and CBA with large classes can reportedly improve personalization, content tailoring, increased flexibility, and decreased administrative overhead. But what is the best mix of traditional and computer-based learning and assessment? What are the issues that need study and addressing? What are the factors that affect learning outcomes? How are they related?

This paper introduces an exploratory research program on different types of hybrid classes to answer those and other questions around its efficacy and applicability for training and education. Our objective is to develop and perform an initial test of a new model designed to trace the influence of individual and technical characteristics on learning outcomes through their effect on in-class and computer training phases of knowledge and skills acquisition and testing. The overall research question is:

Which and how much do CBT, individual student, class, instructor, and CBA factors affect student learning outcomes?

This paper is structured as follows: Section 2 is a review of previous research relative to this study, and Section 3 presents our research model. We describe our research methodology in Section 4 and our data analysis in Section 5. The implied findings based on the results are listed and discussed in Section 6. Our conclusions are stated in Section 7, with the limitations of the research and the implications for future research in Section 8.

2. Literature Review

Previous literature relative to this study's research question is in two major areas: using CBA and online tools in a hybrid course, and the relationships between various technical and individual characteristics and academic performance. Two types of classroom information technologies are reviewed here: using technology to improve student learning, and using technology to improve student performance evaluation.

A hybrid course provides teachers and students with face-to-face lectures and technology-enabled interaction for explanations, small group discussions, presentations, and individual assistance. This instructional format has been found to have many advantages over traditional lectures (Christopher, 2002). First, interaction between the professor and the students is regulated by the professor and occurs one-by-one; interaction via technology is controlled by the students and can occur in parallel. Second, students often receive an advance copy of the lecture slides and some prefer to study "at home" rather than attend class; studying via technology can always be done at home. Third, lectures—even while attended—may not have student attention necessary for learning; training provided through technology may be more likely to keep student attention. Finally, people may learn more by doing than by watching and listening. At the same time, online training may be a viable alternative to those from rural areas and students with nontraditional schedules.

Research has shown that the hybrid format can couple online homework with in-class, active learning exercises to improve attendance (Van Blerkom, 1992). Cameron (2003) used simulation in a hybrid course on networking, and found that it improved conceptual understanding and raised performance. Willett (2002) proposed to use online discussions to provide a good substitute for in-class discussion, and Haggerty, Schneberger, and Carr (2001) found that online discussions lead to better cognition due to the increase in available time to reflect and respond. Cywood and Duckett (2003) discovered no significant differences between quantitative measures of online versus on-campus learning and suggest that there is no actual difference regarding learning. McGraw (2000) demonstrated the potential of IT to enable an instructor to be more efficient and effective in broadening and deepening the learning process for business students in MIS. It has been shown that technology allows individuals to share tacit knowledge in a manner uninhibited by the time and location (Leidner and Jarvenpaa, 1993). Another study, by Caywood and Duckett (2003), looked at the performance of students on campus and online during one specific course; the results showed no significant differences in learning across environments and concurred with the previous studies. But what are the factors involved in hybrid teaching?

Bostrom, et. al., (1988) argued that individual differences are important for end-user training. Two studies in particular examined factors that influence computer training and skill gaining (Leidner, D. and Jarvenpaa, S. (2001); Yi and Davis, 2003). This exploratory study is aimed at identifying and testing specific variables that could predict learning outcomes for CBA.

Leidner and Jarvenpaa (1995) described using technology to support an objectivist model of learning in hybrid courses by facilitating information delivery via a technology-enhanced instructor console and by using CBA. They concluded that
CBA allowed students to learn more effectively and efficiently because they were in control of the pace, time, and location. CBA feedback can be a critical part of learning; active involvement can lead to more effective learning than passive involvement. CBA enables instructors to collect, analyze, and use information about student learning as feedback to improve their teaching, and enable students to demonstrate what they know (Ebert-May, Baltzli, and Lim, 2005). According to Riffell and Sibley (2003), surveyed students responded that the most effective way to learn material was through online homework and email with instructors. Ricketts and Wilks (2001) suggested that well-designed CBA can benefit students by improving their performances in assessments in the introduction of statistics in biology. Noyes, Garland, and Robbins (2004) studied paper-based and computer-based assessments, comparing the test performances of undergraduate students taking each test type. Given the identical multiple choice questions, students who used CBA achieved better results than those taking paper-based tests, and students with higher scores were found to benefit the most from CBA. Finally, CBA helped to improve long term recall of key concepts and resulted in higher scores than conventional exams, and students with computer experience had no additional advantages versus less experienced students (Bocij and Greasley, 1999).

Many researchers have studied the relationships among student individual characteristics and academic performance. Previous academic history and grades, as well as propensity to study, are the most popular dimensions. Arias and Walker (2004) found strong negative relationships between class size and student performance calculated as aggregate exam points while teaching economics. The results suggested to them that student ethics and proximity to an instructor in small classes help students understand economic concepts better. They included several measures of student academic abilities, i.e., SAT, SAT verbal and SAT math, GPA, and demographic data (such as year of study, age, and gender) as explanatory variables and class size as the control variable.

A number of noncognitive individual dimensions not measured by academic outcomes relate to academic performance as well. Gender, family size, and income have been used as academic performance predictors. Availability of support systems and preference of long term goals over short term needs were proposed by Northcote (2002). On the other hand, external collaborations (i.e., cheating) on online assessments have been shown to be problematic—as they are with traditional paper testing (Kozma, 2003). Compeau and Higgins (1995) concentrated on studying self efficacy—the conviction that one can control his/her outcomes and do what is necessary to produce a certain result—and its importance in user acceptance and use of information technology. Learning style defined through demographic variables were found to have an effect on teaching and learning processes (Bostrom, et. al., 1990). Student major as a predictor was mentioned in McGray (2000). There is also literature on the effectiveness of technical support for computer assisted learning. Bocij and Greasley (1999) concluded that students with computer experience had no additional advantages versus less-experienced students.

Another reported factor that affects academic performance and CBA is class size. Hancock (1996) found no significant difference in the performance among students in three large and six small classes on statistics. Tuckman (2002) compared the academic performance and learning in terms of GPA in a hybrid course (189 students in two academic quarters) and a traditional course (74 students in two academic quarters) with the knowledge of the control group (189 students who did not take the course) using the same textbook, content, and performance activities. His results suggested that student skills using the combined classroom and computer-mediated model improved significantly more in academic performance than the students taught the same material by the conventional classroom approach. Siegfried and Kennedy, Durfee, et. al., (2005), and Amoroso (2004) found no evidence to support that teaching strategy should depend on class size.

Hill (1998) investigated the effect of large sections of 120 students in accounting on their performance and perceptions in the introductory courses. Data was collected from student surveys, instructor and university records, and student course evaluations. She used student interest toward accounting, course organization and planning, instructor-student interaction, student course evaluations, GPA and SAT scores, attendance, age, academic hours earned, hours worked, hours studied, and course completion as independent variables; final exam percentage scores and the overall course percentage points were the dependent variables. The study did not find statistically significant differences between student performance and section size. When attendance and university GPA were controlled, the large sections actually outperformed the small sections.

In summary, there are many factors based on previous research that may affect student outcomes in hybrid courses using CBT and CBA. This paper
presents a new model based on those factors and their likely groupings.

3. Research Model

Leidner and Jarvenpaa (2001) proposed a research model that helps instructors determine the best teaching method depending on course content, available technology, an individual instructor, and student factors. They suggested that the amount of class versus in-class learning should depend on the chosen teaching method and impact of out-of-class learning (i.e., computer based training and assessments in our case) and in-class performance (i.e., paper exams). They used graduate students in a small class to investigate the proposed relationship and suggested that this experimental setting can be changed to reveal other interesting relationships. At the same time, Yi and Davis (2003) presented the conceptual framework of the relationships between modeling-based training interventions, pre-training individual differences, learning processes, and training outcomes. They had tested the model with 95 students engaged in computer spreadsheet training. Based on this literature, our observations, and our desire to extrapolate from previous studies on larger undergraduate student bodies, we propose the overall research model shown in Figure 1.

The model incorporates three main groups of factors leading to the dependent variable, the learning outcome. The first group consists of the characteristics of the technology and the characteristics of the individual. The technology characteristics include variables such as ease of use, understandability, easy navigation, and Internet connection speed. The individual student characteristics include variables like previous computer experience, current grade point average, and self-efficacy. The second group is about the training, consisting of computer-based training and traditional classroom lectures. Some variables for computer-based training are technical support, how often it's used, and where it's used (at home or in a school computer laboratory). Classroom lecture variables include the size of the class, the instructor, and when the class meets. It should also be noted that we believe the technology characteristics would directly influence the computer-based training, while the individual characteristics would affect the computer-based training and the classroom lecture training. The third group of variables in the model concern computer-based assessments, with variables such as help from other sources during the assessment, where the assessment is accomplished, and technical support during the assessment. Finally, outcomes are generally measurable variables showing the results of individual training and assessment, such as the difference between pre- and post-tests.

4. Research Methodology

This paper describes the initial, exploratory study of a longer-range research program on computer-based training (CBT) and computer-based assessments (CBA). As such, we purposely chose to use a wide range of variables for the factors identified in our research model shown in Figure 1. The variables were from the aforementioned literature search, our own experiences using CBT and CBA, and reasoned postulation. Even though some variables appeared to overlap, they were still used for subsequent refinement as the program progresses. The key variable driver was to be inclusive, not exclusive, in variable selection.

To be exploratory, our data collection methodology used the survey approach and direct performance measurement. Thirty-six questions...
were posed to over 400 students with direct and current experience using CBT and CBA for course credit. Additionally, the subjective or perceptive survey data was matched with measured, objective course performance scores. On top of that, performance data from about 150 students using the CBT/CBA software was added. The combination of two collection approaches allowed us to search for relationships among the subjective data, among the objective data, and between the subjective and objective data. Moreover, the measured data gave us measured learning outcomes which could be used as dependent variables during data analysis.

The survey instrument consisted of 36 questions on the responder's demographics, computing experiences and skills, and opinions about the CBT/CBA software or its use (see Appendix 1 for a list of the survey questions). Some were open-ended, some checked their perception with known data, and most asked for subjective answers using a Likert scale. The survey was offered online for respondent convenience (i.e., they didn't have to come to class, they could take it anywhere there was Internet access, and they could take it any time of the day) and for automated survey management and data compilation. Students volunteered to take the online survey, but were given token credit toward their final course grade for doing so. The survey was available for two weeks, but students were not allowed to take it more than once. In opening up the survey, students used a personal and unique non-descriptive campus ID code—which could then be correlated with their course performance scores. When the survey was closed, the data was downloaded in spreadsheet format for input to statistical analysis programs.

The measured data consisted of performance scores on CBA exams and traditional paper exams. The CBA exams tested student skills performing specific tasks using Microsoft Office 2003 applications. The software presented a screen exactly duplicating the Office application with a canned document, and asked students to perform an operation (e.g., globally replace all instances of "bought" with "purchased"). To reduce cheating, each CBA exam had a time limit for minimizing the use of notes or textbooks, and the tasks were presented in random order to each student.

Most importantly, the CBA software did not score solely the task result; it scored the steps taken to achieve the result and the order in which they were done. In other words, a student had to perform the right task steps in the right order—it was very difficult to "experiment" in achieving the task result. Realizing that some steps may have been done in error (e.g., mouse-clicking twice instead of once), each student was given two opportunities to correctly perform each task. Each task was scored as right or wrong, and the results were automatically scored for reporting. There were six CBT exams; a comprehensive pre-test exam on the entire course, four exams on specific Office applications, and one comprehensive post-test. Each exam was open online for one 15hr window to minimize conflicts with other courses, outside work, etc. Students could take the CBA exams in the school laboratories, or on their own or anyone else's computer provided the CBT software was loaded on the machine.

The traditional paper exams were administered in class using paper exam booklets and optical-readable scan sheets that were automatically scored, analyzed, and reported to the professor. Each exam tested a student's knowledge about Office 2003 applications; the combination of the paper exams and the computer-based exams measured student knowledge and performance, respectively. There were two paper-based exams; one on each half of the course.

All students used the same CBT/CBA software linked to the same course textbook. Office applications were covered in class using traditional lectures supplemented a large screen projection system for lecture slides, and a podium computer used to demonstrate application tasks onto the large screen display. Six course sections were small (<35 students), and four were large (>100 students). All sections were taught individually by two professors; one had five small sections one semester then three large sections the following semester, the other had one large and one small section the same semester. Both professors followed identical syllabi over both semesters—each taught the same topics in the same sequence using the same textbook, lecture slides, and exams. The students were university undergraduate students of a wide range of ages and of all academic years from all schools across campus. It was a required course for some students, but not for all.

5. Methodology

The initial step in data analysis was to pair CBA performance scores with survey results. The data and the matches were not totally complete; not all students took all CBA and paper exams, not all students took the survey, a few students gave random identification codes when taking the survey (and therefore could not be matched), and some simply skipped to the last survey question. But most analysis didn't require a complete set of all variables from all students, especially with almost 500 students in the entire sample set (n=489). There were 226 students with complete, matched surveys.
Table 1 shows the student demographics of the set of students who completed the survey and were matched with performance scores.

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Table 2. Significant Variable Correlation Coefficients, First Group

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A1A6: difference between pre-test and post-test
Sec: class section
Inst: instructor
GPA: university cumulative grade point average
A1: the comprehensive CBA pre-test
Q3: gender
Q4: age
Q7: Internet connection type
Q9: level of Internet experience
Q10: computer skill level I
Q11: computer skill level II
Q12: computer skill level III
Q13: computer skill level IV
Q14: computer skill level V

6. Results and Implications

Some of the key results are shown in subsequent tables. Not all the statistically significant correlative results are shown—only the correlations with 1-tailed significance of .005 or less given the initial exploratory nature of the data analysis. Only the very strongest correlations are shown. Table 2 shows the correlations among the pre-test/post-test variable A1A6 and some student characteristics (again, only statistically significant correlations at .005 are shown). The regression model had a significance of .003.

Table 2. Significant Variable Correlation Coefficients, First Group

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A1A6: difference between pre-test and post-test
Sec: class section
Inst: instructor
GPA: university cumulative grade point average
A1: the comprehensive CBA pre-test
Q3: gender
Q4: age
Q7: Internet connection type
Q9: level of Internet experience
Q10: computer skill level I
Q11: computer skill level II
Q12: computer skill level III
Q13: computer skill level IV
Q14: computer skill level V
Table 3. Significant Variable Correlation Coefficients, Second Group

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Q18: CBT/CBA software is easy to use
Q19: CBT software helps prepare for CBA
Q21: CBT software reduced time to learn Office
Q22: CBT improved ability to use Office
Q23: using technical support often
Q24: technical support is timely and effective
Q25: technical support is accessible and knowledgeable
Q26: work hard in course
Q27: certain can master the course
Q28: receiving help during CBA
Q29: CBT prepares me well for CBA
Q30: use CBT often
Q31: often discuss course with friends and family
Q32: often receive emotional support from others

CBA performance improvement (A1A6) is correlated to class section and instructor. This suggests that even though students performed computer-based skills training and took computer-based skills assessments, the aggregate group of students and the individual instructor teaching them with traditional lectures still had a significant effect on their computer-based assessments. Follow-on research comparing this data with students who relied solely on CBT and CBA without any classroom lecture sessions might clarify the importance of combining traditional lectures with CBT/CBA. Further research could also investigate whether the section and instructor benefits are due to cognitive, social, procedural, or explanatory factors (Haggerty, Schneberger, and Carr, 2001).

We found that the higher the cumulative GPA, the higher the CBA improvement (A1A6). This implies that high performing students in general also perform well in CBA—not just in classroom environments. This suggests that at least some of the beneficial learning skills used in traditional classroom settings can be beneficially used in computer-based settings.

We also found that the higher the cumulative GPA, the less initially known about computers and the Internet. The implications could be numerous and beg further study. Is academic performance degraded by high levels of student attention to computers? Are computer activities including gaming, Internet surfing, etc., supplanting attention to coursework? Do lesser computer-savvy students realize their shortfall and work harder on CBT and CBA as a result? Are high performing students less inclined or interested in computers, and vice-versa? One implication for CBT and CBA, however, is that high performing students may need special attention in terms of basic computer skills, but their ultimate CBA performance will not suffer as a result of low computer skills (see paragraph 2 immediately above).

Females had higher GPAs than males, and males were initially more computer savvy. This follows on the heels of paragraph 3 immediately above. The more important implication for CBA, however, is in the links with paragraphs 2 and 3 above; that gender may be a factor in how much a student improves—but not directly because of gender per se but because of the gender imbalance in initial computer knowledge.

The higher the initial student computer skills, the higher the initial skills assessment scores. While this may seem inescapable, the two skill sets are not necessarily identical; one involves skills about basic computer operations, while the other concerns specific Microsoft Office application skills. But this positive correlation implies measuring one may be a useful indicator to the other, especially given the widespread use of Microsoft Office applications.

The higher the initial student computer skills, the less they improve overall in computer-based assessments. While this may seem trivial since students who start out with higher skills assessment scores have less room to improve, the data also showed that students with higher initial computer skills did not score commensurately higher in the post-test computer-based assessment. This also begs further investigation. Do computer-savvy students ease off in their efforts during the course because they don’t feel they need to study and practice, while students with less computer knowledge work harder
to compensate for their sense of computer inadequacy?

The more accessible technical support is during computer-based training and assessment, the easier it is to use CBA, the more they take advantage of computer-based training, and the greater their perceived benefit from CBA. The happier a student is about technical support, the greater the student's belief in being able to master the CBT/CBA course. These relationships imply that technical support plays an important role in successful CBT and CBA. Computer-based training and assessments require well-functioning computers and software. When there are problems—especially to students with lower initial computer knowledge and skills—technical support can make or break a CBT or CBA session. These relationships suggest that good technical support may be essential to good CBT and CBA.

The more the perceived benefits of CBT and CBA, the more often it's used. This may also appear insignificant, but the implication for CBT/CBA is that the more the potential benefits are explained and understood, the more they can be realized through increased utilization.

The more other students and friends help, the less time it takes to learn CBA and the CBA material. This suggests that social networking is important to CBA, just as the class section and instructor are. This implies that face-to-face interaction with others can improve individual interaction with computer-based training and assessment software. While isolated CBT and CBA may be the most convenient for students, it may not be optimum for learning efficiency.

The higher students' perceptions about how hard they work, the more they use CBT training, and the more they discuss the course with friends and family. Causal relationships are not readily evident here and suggest further areas of study. But these correlations again suggest that hard work and networking with friends and family may have a role in CBT/CBA effects. If so, it may suggest the importance of a holistic approach to CBT/CBA courses well beyond just the underlying technology.

7. Conclusions

Organizations that use computer-based training and assessment tools can potentially reap significant rewards in improved employee knowledge and skill levels.

As stated earlier, this is the initial, exploratory stage in a series of studies on efficacy of computer-based training and assessment. The findings in this study may be limited to some degree to students at one school in one American region—although the mix of students at this one university appears good for generalization. The motivational factors of students, however, may not correspond with corporative employee motivations; corporate CBT and CBA users need to be studied as well.

Given the convenience factor of CBT, CBA, and online surveys that are available to use on any computer with the right software and Internet access, the students who took CBT, CBA, and the surveys were not all in controlled physical environments. It cannot be said with certainty that the person taking CBT, CBA, and the survey was the actual person supposed to be doing the work, or did not receive undue help from others while online. But if most students would not engage in this deception, we believe that the large number of students involved mitigates this effect in the results.

There appear to be large numbers of opportunities to extend this preliminary research by looking at all correlations with 1-tailed significance less than .05 rather than .005, refining the variables, adding new variables, exploring the cumulative effects of the variables on the proposed research model in Figure 1, and expanding data analysis efforts. Numerous opportunities for searching for causal relationships in the model may be particularly beneficial to CBT/CBA developers, educators, and users. The role technical support plays may be of particular interest, including its educational value in addition to textbooks, lectures, and computer-based training.

References


Bostrom, et. al. (1990), The Importance of Learning Style in End-User Training, MIS Quarterly, March 1990, pp 101-120


Leidner, D. and Jarvenpaa, S. (2001), The Information Age Confronts Education: Case Studies on Electronic Classrooms. *Information Systems Research 4:1,* 24-54


Willett, H. (2002), Not one or the other but both: hybrid course delivery using WebCT. *The Electronic Library Vol. 20, No. 5:* pp. 413-419.

## Appendix 1. Survey Questions

### Demographics
1. English is my primary language (1=Yes, 2=No)
2. My SAM username is __________
3. My gender (1=Male, 2=Female)
4. My age is __________
5. My academic year (1=Freshman, 2=Sophomore, 3=Junior, 4=Senior)
6. My current GPA: __________
7. My Internet connection type (1=Dial-up, 2=Cable/DSL, 3=T1 or better, 4=Don't know)
8. Number of years using the Internet (<1, 1,2,3,4,5,6,7,8,9,>9)
9. Experience with Internet (1=No, 2=Little, 3=Some, 4=Much, 5=Extensive)

### Computing Skills
10. Basic skills like typing a document, etc. (1=strongly disagree, 2=slightly disagree, 3=indifferent, 4=slightly agree, 5=strongly agree)
11. Install programs, etc. (same 5pt. scale)
12. Set up virus checkers, etc. (same 5pt. scale)
13. Install networks, etc. (same 5pt. scale)
14. Install new hardware (same 5pt. scale)

### SAM Expertise
15. Learning SAM was easy (same 5pt. scale)
16. Navigating and accomplishing SAM tasks is easy (same 5pt. scale)
17. What SAM tells me is clear and understandable (same 5pt. scale)
18. Overall, I find SAM easy to use (same 5pt. scale)
19. SAM helps me prepare for assessments (same 5pt. scale)
20. SAM easily trains me on MS Office basic functions (same 5pt. scale)
21. SAM decreased the time to learn MS Office functions (same 5pt. scale)
22. SAM improved my ability to use MS Office (same 5pt. scale)
23. I use SAM technical support often (same 5pt. scale)
24. SAM tech support helps me well and timely with SAM problems (same 5pt. scale)
25. SAM tech support is very accessible and knowledgeable (same 5pt. scale)
26. I receive help from other students while doing assessments (same 5pt. scale)
27. I receive help from SAM/IT tech support while doing assessments (same 5pt. scale)
28. I receive help from my instructor while doing assessments (same 5pt. scale)
29. SAM training reflects what is covered in assessments (same 5pt. scale)
30. SAM training prepares me well for assessments (same 5pt. scale)
31. I use SAM training often (same 5pt. scale)
32. I do assessments (1=on my own computer, 2=in the lab, 3=at a friend's house, 4=elsewhere).

### Self-Efficacy
26. I work very hard and persistently in CIS1025 (same 5pt. scale)
27. I am certain I can master the skills in CIS1025 (same 5pt. scale)
34. I often discuss CIS1025 content with friends/family/etc. (same 5pt. scale)
35. I often receive general emotional support from others (same 5pt. scale)