An Analysis of the Effectiveness of Using Computer-Based Training in Preparation for Cisco Chapter Tests at Western Wisconsin Technical College

By

Cory J. Kleman

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Juli Taylor, Investigation Advisor

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The Graduate College
University of Wisconsin-Stout
Menomonie, WI 54751

Abstract

	Kleman	Cory	J
(Writer)	(Last Name)	(First)	(Initial)

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Due much to the computer revolution, the increase in technical computer related jobs, and alternate forms of education, Computer-Based Training (CBT) is growing in popularity and the number offerings available. Education and industry are making large commitments to training individuals through the used of self-paced, online, and CBT. With each of these methods of content delivery comes the challenge of measuring the successful use of this material for educating the student. Computer related content seems to be one of the most widely used curriculum via CBT.

Cisco academies are located worldwide and offer computer networking curriculum offered via CBT. Western Wisconsin Technical College (WWTC) is a local Cisco academy and offers 4 semesters of the CCNA curriculum. While offering the curriculum based on CBT, textbooks are also available with content similar to that offered in the CBT. In the fall of 2003, a study was undertaken in a single Cisco class at WWTC to evaluate the effectiveness of different types of study methods used to prepare for Cisco chapter tests. The class consisted of 18 students in their third semester of the CCNA academy.

During the semester the students were asked to complete a survey concerning the method they used for preparing for a chapter test. Their choices were textbook only, CBT only, or a combination of textbook and CBT. In preparation for the tests, students were all subject to the same amount of in-class lecture and lab time. Supplemental readings and studying outside of class was an uncontrolled variable.

The purpose for this study was to find out what methods students were using to prepare for the Cisco chapter tests. Students were polled on their usage of textbook, CBT, or a combination of both for preparing for the chapter tests. Students were diverse in their methods used to prepare, and the use of textbooks, CBT, and the combinations were well balanced. Using the data collected from the students following the test, no significant correlations were able to be found and therefore it was not feasible to draw any conclusions about the study method that worked best to prepare students for chapter tests in the WWTC Cisco academy.

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Chapter One

Introduction

The Growth of Computer-based Learning

Historically classroom learning has been confined to instructor lecture and student preparation through textbook reading. Today, lecture continues to play a large role in curriculum delivery throughout most institutions around the world. "Teachers continue to use lectures as a commonplace mode for the delivery of information" (McKethan & Everhart, 2001, p. 2). As technology and teaching methods advance, technology has bred a new form of learning where the student is supplemented with instruction in the form of interaction with a computer.

Two forms of this new wave of learning are Internet-based and computer-based instruction. Internet or online courses, classes taught outside of the classroom via the Internet, allow students to isolate themselves by completing entire courses outside of the classroom when and where they choose. "The Internet is capable of eliminating the time, geographic, socioeconomic, racial, and ethnic boundaries that can limit access to education and advancement" (Cisco, 2003b, p. 1). Computer-based instruction (CBI), unlike Internet-enhanced classes, can be taught in a classroom environment where instructors are present.

The role of classroom instruction has changed to conform to new technologies and methods that are available to modern instructors. Instructors must learn to bridge the gap between CBI self-paced learning and classroom lecture.

> Teachers also need time for planning computer-based lessons that focus on appropriate matches between the lessons' instructional objectives and computer software, and they need assistance in juggling the multiple tasks necessary for integrating CBI effectively into the classroom. Some of these tasks concern the teacher's role as direct instructor,

learning facilitator, classroom manager, schedule maker, and general trouble-shooter. (Smith, 1997, p. 2)

With many new options of curriculum delivery and different student learning styles, students are able to make choices about the style that best suites their ability to learn. Students are able to supplement classroom lecture by using CBI to aid them in the learning process. Brown stated that when comparing instructor-led training versus computer delivered training, the computer-led training typically offers the student more control over their own instruction (Brown, 2001).

Often times the terms computer-based instruction (CBI), computer-aided instruction (CAI), and computer-based training (CBT) are definitions of technologies that are used interchangeably. Using any of the three terms to describe online training is in essence using the same term to describe instruction led via a computer, and Lewis defined CBI as the computer facilitating a role of the instructor and allowing the student to view the information or participate in guided practice (Lewis, 1993).

CBI, courses taught by reading content on and interacting with a computer, are increasing in both popularity and the number of classes being offered. McKethan and Everhart showed that in recent years CBI has helped educators to become more involved in learning activities and can increase students contact with the learning material (McKethan & Everhart, 2001). Corporate America, industry, and education are all affected as technology cuts into the bleeding edge of our everyday lives; it is only rational that computers make their presence in today's classroom as a tool for increasing learning.

CBT is able to present content in a uniform fashion to all students in the same format regardless of institution or instructor. Students are able to personally tailor their learning to the content and their ability to use it to best suit their needs. "A major advantage of computer-based

instruction (CBI) over traditional forms of instruction is its potential to allow students to proceed through instruction at their own rates" (Eom & Reiser, 2000).

Cisco Academies

CBT is offered by numerous private vendors and has been a constant in teaching technical curriculum to students and professionals. Cisco has created a host of networking curriculum based on proprietary equipment while keeping in mind the basic concepts that are important to understanding concepts as a whole. Cisco is an industry leading provider of network hardware, solutions, and training. As a supplement to Cisco's product line, they offer network training at partnered academy sites around the world. "Launched in 1997 – the Networking Academy has spread to more than 145 countries and all 50 U.S. states" (Cisco, 2003a, p. 1). The academies strive to educate students with knowledge of networking using a combination of lab, lecture, and CBT. By using an e-learning model and integrating multimedia, the Cisco Networking Academy Program delivers curriculum to the learner via a Web interface through methods such as testing, evaluation, personal feedback, and performance-based skill assessment (Cisco, 2001).

Cisco in the Wisconsin state technical college system is continually growing. According to a conversation with June Rogers (personal conversation, December 12, 2003), the administrator for the Cisco academy at WWTC, 14 out of 16 state technical colleges are offering the Cisco curriculum along with many of the state high schools. The popularity and significance the curriculum carries in industry has caused many schools to add the curriculum as a core for their networking programs.

Western Wisconsin Technical College has been educating students in western Wisconsin, southeast Minnesota, and northwest Iowa since 1911. WWTC is establishing its presence in the

marketplace and industry with its commitment to the Cisco Academy. The network specialist program at WWTC was established in 1998 and has most recently added the Cisco Certified Network Associate (CCNA) curriculum as a core requirement to the program. CCNA consists of a 280-hour curriculum that is taught at the college level (Cisco, 2002). WWTC has been a local Cisco academy instructing students since 2001. The goal of the local academies is to prepare students for certification in their specific field of study, in this case Cisco Certified Network Associate (CCNA), an industry-standard certification exam (Cisco, 2003e). These exams and certifications are used to strengthen learners' skills, making them better educated and more marketable to potential employers. Each academy must be licensed by Cisco with instructors certified to teach the Cisco networking curriculum.

Student Learning Choices

Students learn the Cisco curriculum through a classroom environment with a mixture of lab, CBT, and lecture. As a Cisco academy, WWTC offers students choices of how material is presented including textbook, CBT, and classroom instruction, with classroom instruction being the only common means enforced as a means of presenting the material in all classes. Supplemental readings to accompany lecture are offered to the students in the form of lab manuals, lab journals, textbooks, and CBT. An excerpt from the Cisco press textbook states that the book should be used as a resource above and beyond the training materials that are provided by Cisco online via CBT (Cisco, 2001). Through a collaboration of Cisco academy instructors at WWTC, it is suggested to all students that they should use all resources available to them. Because online curriculum and textbook learning cannot be monitored, students have the choice of using the textbook as a supplement, or if they choose as their only method of resource for the material.

Cisco presents the CBT portion of the classes as being the mainstay of the curriculum based learning of the academy. "Students access the curriculum from their workstations over the classroom LAN. Students also have access to view the curriculum online during non-classroom time" (Cisco, 2003c, p. 1). "The Cisco networking Academy Program is a comprehensive e-learning program, which provides students with the Internet technology skills essential in a global economy" (Cisco, 2003a, p. 1). The courses are built to best suit individual learning styles by delivering the content in formats that take into consideration different learners and their environments and preferences (Cisco, 2002). At the end of the chapters, students are required to take an online test covering the content from the chapter or combination of chapters.

Western Wisconsin Technical College's (WWTC) local Cisco academy has been educating students for several years, allowing students to use many methods in reference to learning the curriculum. Students, much like instructors, have the freedom to examine any or all of the material presented to them to prepare for chapter tests, hands-on practice, oral and written exams, and the final cumulative exam which requires a score of 70% or better to move on to the next semester. WWTC and the Cisco academy are committed to providing all students with the information they need to be successful in the online chapter tests.

Students at WWTC have many options from which they may choose concerning how and what they will use to learn the curriculum and prepare for chapter tests. Students can choose from CBT, textbooks, supplemental study guides and quizzes, lecture, and labs offered from each chapter covered throughout the semester. In order to prepare for tests, students typically choose from either CBT or the textbook to prepare themselves for chapter tests, or a combination of both. However, no data has been gathered about students' chapter test scores in Cisco and the correlation to their chosen means of studying the curriculum.

Statement of the Problem

To date, no study has been conducted at WWTC to show the significance of using different study methods, particularly CBT, and the relationship of this study method to student chapter test scores.

Purpose of the Study

The purpose of this study is to determine the students' effectiveness of using Cisco CBT curriculum as a means for preparing for chapter tests at Western Wisconsin Technical College's Local Cisco Academy during the fall of 2003. Data will be collected through an online survey and test scores recorded throughout the semester. The results will be used to make students aware of the significance, or lack there of, of using CBT and it relationship to scores on chapter tests.

Research Questions

The questions to be answered by this study are:

1. What is the percentage of students not using the Textbook as a means to prepare for chapter exams?

2. What is the percentage of students not using the CBT as a means to prepare for chapter exams?

3. What is the percentage of students using both the textbook and CBT as a means for preparing for chapter exams?

4. Do students who use CBT as a means of studying for chapter tests score higher on those tests than students that do not use CBT?

5. Do students who use a combination of CBT and textbook score higher on chapter tests than those that use only textbook?

6. Do students that use a combination of CBT and textbook score higher on chapter tests than those that use CBT only?

7. What is the percentage of students using each of the different methods of curriculum delivery?

8. Do students who use Cisco CBT curriculum as a means of studying average a passing grade of 70% on chapter tests?

9. Which method or combination of methods used to prepare for the test yielded the highest average test score?

10. Do students that spend time outside of class, the textbook, and CBT score higher on chapter tests?

11. Do scores on the tests increase as the percentage of textbook use increases?

12. Do scores on the tests increase as the percentage of CBT use increases?

13. Do scores on the tests increase as the percentage of minutes spent outside of the textbook and CBT increases?

14. Did any combination of the study methods and minutes spent outside of those methods produce a statistically significant correlation with the achievement level on tests?

Significance of the Study

This study is important for the following reasons:

1. CBT is relatively new with many different options and opinions being administered by developers and uses alike. The significance of the impact of new technologies is still in its infancy and determination of the effectiveness of such methods could provide momentum for future usage and elaboration at WWTC and other Cisco Academies.

2. Results of the correlation of CBT and test scores could be important for other Cisco CCNA academies, both local and regional.

3. WWTC Cisco instructors concerned about which techniques work best for curriculum delivery in relation to success of students on chapter tests could make educated decisions that could benefit their student's choice of methods of curriculum usage.

4. Instructors will be able to relay to my students the effects of using CBT as a form of learning Cisco curriculum and how it fits as a working piece of the entire learning puzzle.

5. Cisco students will find this a means for determining the most effective method for learning and studying the curriculum for the best results on chapter tests.

Assumptions of the Study

The assumptions of this study are:

1. It is assumed that the terms Computer-based training (CBT), Computer-aided instruction (CAI), and Computer-based instruction (CBI) are terms that can be used interchangeably and imply the same contextual approach to the use of the computer to assist the learner in content delivery.

2. The use of CBT in Cisco classes affects student's grades on chapter tests.

3. WWTC instructors are following the guidelines of teaching Cisco curriculum set by Cisco for local academies.

4. This study assumes that all Cisco students use at least one of the three listed methods for studying for chapter tests.

5. This study assumes that all WWTC Cisco students have the option of choosing their own study methods.

6. All students have a basic knowledge of the Internet and can fill out an online survey.

Definition of Terms

Terms used within this study are defined as the following:

1. WWTC Local Cisco Academy – The local Cisco academy falling under the Southwestern Technical College regional academy. Consists of CCNA curriculum spanning four semesters of study in preparation for the CCNA exam.

Limitations of the Study

The limitations of this study are:

1. Some students have better study and work ethics than other students and this may impact their success on test scores.

2. Some students have a higher intellectual knowledge or IQ than other students. This may allow them to learn differently or more effectively no matter which method they use to prepare for tests. Having a greater ability to learn may cause their method of choice to show positive results.

3. Some students have more knowledge or experience in the networking field, which allows them a flatter learning curve for the new material presented in the chapters.

4. Individual learn differently, via kinesthetic, auditory, or visual. Cisco instructors at WWTC has the freedom to choose their own method of content delivery, procedures, and the amount of classroom lecture. The supplemental classroom discussion may help some learners understand the material more effectively than others. This supplemental learning could taint the effectiveness of their study method.

5. The scope of this study was limited to students taking Cisco semester 3 at WWTC during the fall of 2003.

6. The material in the book and the CBT are similar, but not exact. The test questions may favor material from one or the other.

7. Some students spent extra time studying supplemental material above and beyond the textbook and CBT. This extra studying and acquisition of material could be a reason for better performance on the exam.

8. Some students may have learning disabilities that inhibit them from using one of the methods of preparation looked at in this study. This study will not differentiate student characteristics such as special needs, learning disabilities, etc.

9. The instructor for this course spends an extensive amount of time covering material from both the textbook and CBT, and the level of exposure and understanding from this may cause each of the results on the tests of each study methods to be dramatically skewed and therefore irrelevant.

10. The limitation of isolating CBT in a Cisco course is a difficult task as long as it is used in combination with classroom lecture, textbook, and supplemental learning.

Methodology

Second semester-first year Cisco students will be used to gather the data for this study from a single class at WWTC's local Cisco academy during the fall of 2003.

A simple survey will be used to label the students into one of three categories concerning their preferences in preparing for chapter tests; text only, CBT only, or a combination of text and CBT. Once students are labeled into one of the above learning groups, chapter test scores will be recovered from their semesters work and used to show the achievement level of each group.

Chapter Two

Review of Literature

Introduction

This chapter will include a discussion of computer-based instruction and interests in the technology it creates for learning and teaching, followed by the self-regulatory skills that are needed by the learner. Also in this chapter, the skills and techniques needed by the creators and teachers of the CBI in order to produce it effectively as a learning tool will be presented. In addition, the integration and choices for CBI will be presented. The chapter will conclude with past and present successes and failures of implementing and using CBI.

Interest in CBI

"Computer-based instruction (CBI) is becoming an integral part of our teaching and learning process and a dominant educational delivery system in many parts of the world due to the continued innovations in multimedia technology and programming software" (Boles & Pillay, 1999, p. 372). According to Oakes (2003), over the past few years e-learning technology and methods have been predicted to be at the forefront of future learning methods. Smith (1997) viewed technology integration into the classroom as an alternative intervention to traditional teaching styles in 21st century curriculum that will prove to be a challenge for teachers and their goals. Success of such technological integrations depends largely on teachers' skills involved with computers and their ability to choose the correct software to effectively deliver the content. According to McKethan and Everhart (2001), even here in the 21st century, teachers use lectures as the common delivery method for providing information to learners, but experts suggest that CBI can be more effective than lecture for delivering content due to its active involvement. "The effectiveness of microcomputers in school settings depends on how they are integrated with

educational goals and activities and with the organizational patterns of schools" (MacArthur & Malouf, 1991, p. 44). Eom and Reiser (2000) have shown that learners have the ability to adjust CBI instruction to fit their own needs and learning styles. Furthermore, Brown (2001) reported that while using CBI, learners retained the ability to choose their tasks and time spent on those tasks, including time spent on examples and practice problems, which in turn can be critical when evaluating the effectiveness of their training. Bloom and Hanych (2002) stated that computer-based instruction has a following of both skeptics and true believers, and opinions vary within each group concerning the benefits and shortcomings of implementing CBI as an instructional tool. These groups argue about the effectiveness of CBI and whether it will enhance our learning and test scores, or fall by the wayside along with previous technology disappointments.

CBI and Self-Regulatory Skills

Eom and Reiser (2000) defined self-regulatory skills as a set of metacognitive, motivational, and behavioral techniques learners use to control their own process of learning. Conflicting results in the effectiveness of CBI is largely due to learners' different preferences, capabilities, environments, and self-regulatory skills. In an earlier study of self-regulatory skills, Yong-Chi Yang (1993) hypothesis concurs with Eom and Reiser, relating the fact that results in user controlled learning is largely dependant upon the self-regulatory skills of the learner. Yang reported that self-regulatory skills were an important variable to consider when looking at a learner's control of CBI, and thought enough of the relationship to base an entire study upon the possible effects. Yang's finding supported his hypothesis, that is, that high self-regulatory skills in students tended to lead to significantly higher test scores than students with low self-regulatory skills, therefore showing that it was important to consider when trying to integrate

learner control strategies into CBI. A study conducted by Brown (2001) produced results that favored employees who had a high degree of learner control, and showed tendencies to using CBI successfully to increase learning by spending time utilizing practice opportunities and taking time to complete the content within the CBI. It was found that learners who skipped parts and shortened time on tasks with the CBI reduced their chances of knowledge gain. Brown also found that learners with high self-efficacy and high performance orientation were more likely to utilize practice extensively. According to Zimmerman (cited in Eom & Reiser, 2000), learners who were self-regulated must be aware of the skills and information they need to be successful, and then acquire these items. Earlier, Yang (1993) found that learners with high self-regulatory skills outperformed learners with low self-regulatory skills in computer-based instruction.

According to Overbaugh (1994), the freedom provided by computers allowing learners' to choose how much time is spent on the lesson, the actual lessons chosen, and time spent on questions, and questions answered is controlled by the learner. Due to learner control, the learner has the choice to work harder or spend less time on the self-controlled instruction. In conclusion to the study done by Yang (1993), the results yielded that the design of CBI needed to take into consideration the self-regulatory skills of learners when they were expected to use CBI in a learner controlled environment.

Findings in a study conducted by Eom and Reiser (2000) showed that learners needed to possess the correct learning strategies and self-regulation during learner-controlled CBI. The study posed high versus low self-regulators pre- and post-tests scores using both CBI and traditional learning styles. The results of this study were consistent with the literature research. According to Balajthy (cited in Eom & Reiser, 2000, p. 252) "learners who did not possess appropriate learning strategies performed poorly when they received computer-based instructions

that was learner-controlled." Furthermore in the same study, Tennyson, Park, and Christensen (cited in Eom & Reiser, 2000) also found that success in a learner-controlled CBI was dependant on learners' ability to posses the correct learning strategies. Eom and Reiser (2000) concluded that learners with high self-regulatory skills will show similar success in traditional and CBI learning, however, learners with low self-regulatory skills placed in a learner-controlled CBI environment will not fare as well as in a typical environment. The question raised by the researchers concerned the size of their sample, but the findings in their study concurred with other studies that contained larger sample sizes.

Integration and CBI Choices

According to MacArther and Malouf (1991), CBI is not an educational tool in itself, but can be used effectively depending on how it is integrated and arranged to coordinate with goals and activities. Furthermore, Yinger (cited in MacArther & Malouf, 1991) stated that implementation of CBI needs to consider the requirements and possible problems involved in presenting the instruction via a computer versus methods of traditional instruction. Smith (1997, p. 65) revealed, "as with any innovation in curriculum and instruction, teachers must be aware of and plan for a variety of problems and promises concerning technological integration, in particular, CBI." Smith added to this by stating that it was important to select the right software in order to produce learning outcomes that would be positive.

According to Reeves (cited in Overbaugh, 1994, p. 32), "Gagne's nine events of learning serve as a framework for successful courseware development." As stated by Wager and Gagne (cited in Overbaugh, 1994, p. 32), "the nine events include (a) gaining attention, (b) informing the learner of the lesson objective(s), (c) stimulating recall of prior learning, (d) presenting stimuli with distinctive features, (e) providing learning guidance, (f) eliciting performance, (g)

providing feedback, (h) assessing performance, and (i) enhancing retention and learning transfer." According to Overbaugh (1994), the nine events provide a solid foundation for developing computer-based instruction because of their logical framework and design. It is also important to clearly identify and separate components of CBI in order to allow learners to choose a sequence that interests them, and also to make these components small enough to retain their interests.

Success of CBI

According to Vichitvejpaisal et al. (2001), affects of computer use as a means of learning during a study conducted on 3rd year medical students studying arterial blood gas interpretation produced negative results as the two control involved in the study groups were compared. One group studied for the tests using textbooks only, while volunteers for the other group used CAI. The researchers' results reported that although pre-test scores did not show statistically significant differences, and age, GPA, and gender were evenly distributed, the group using textbooks had higher test scores and better recall compared to the group using CAI. The authors were concerned with the fact that students may have been accustomed to text-type learning and that it may have taken more time to tailor/customize CBI learning to fit their style, and this may have caused the study to have some limitations and may have in turn affected the results.

Inversely, Compton (1993) used employees at Banc One and showed the results of how they utilized CBI for training employees on three new information systems. With the new implementation of the information systems, Banc One needed to train numerous employees in many geographic locations. The goal of the company was to reduce the time employees spent in an instructor-led classroom by implementing a method that used combined hands-on and on-line reference via a personal computer that employees used at their own pace from their own desks.

This train-at-your-own-pace saved Banc One time, money, and released them from the daunting task of forcing adults back into the classroom. Employees admitted that they had very little interest in participating in training that did not pertain to their jobs. The reference material provided to all employees was also consistent across the entire company, allowing employees to all have access to the same knowledge; the positive results in productivity found their way directly to the bottom line in the form of cost savings estimated to be in the millions. A study conducted by an outside corporation found that staff using CBI remembered 40% more than if they participated in instructor led classes, and the CBI was faster

A study conducted by Stinson and Claus (2000) showed promising results from the physical standpoint of learners. Learners involved in an electronic classroom were compared against learners taking the same class in the traditional instructor-led lecture based classroom. Learners involved in the electronic classroom showed positive increases in attendance, punctuality, on-time assignments, grades, and had nearly no dropouts versus a 10%-15% average attrition rate in typical lecture classrooms.

Summary

Literature research has surfaced some interesting aspects of CBT. CBT is showing an increasing presence in both industry and the classroom as a means for delivering material to students, and the trend is showing increasing offerings for the future. A lot of the success of CBT in delivering material effectively is the responsibility of the coordinator or facilitator of the classroom in which the CBT is being presented. Many new challenges and changes in techniques are presented to the facilitator that invites CBT into the learning environment and finding the correct balance between CBT and traditional classroom instruction and methods can be the biggest hurdle in content delivery.

Students are for the most part in charge of their own instruction and pace when using CBT. Students can choose to pace themselves through CBT and go back and cover the material as many times as necessary to feel comfortable. Students also have the choice of picking different parts of the CBT at any given time. These choices include reading, movies, labs, and other material. This can in fact also be a problem itself for students with poor study habits and self-regulatory skills, proving CBT is not a one size fits all delivery method. Not all CBT is created equal. In order for CBT to be effective at any level of the learning process, the learning process itself must be developed into the CBT. As a whole, CBT has had its successes and failures throughout its somewhat short tenure as a means of content delivery.

Chapter Three

Methodology

Introduction

This chapter will include information about the methodologies included and used in this study. The beginning of this chapter will discuss the reasoning these specific subjects were chosen and a description of the sample of the subjects, followed by a look at the instrumentation that was used and why it was chosen. Also in this chapter, we will look at how the data was collected and analyzed will be discussed. This chapter will conclude with an explanation of the limitations that were discovered about the sampling, data collection, and instrumentation.

Description of Methodology

A survey was used to ask participants the method used to study for the chapter test. The survey was used to put the participants in groups and compare and average the test scores based on the groups. The information needed from the participants in this study revolved around the study method used to prepare for the test, and not the test itself in which scores on the chapter test had already been recorded.

Selection of Subjects

The subjects who were used in this study consisted of WWTC first year Cisco students involved in their second semester of the Cisco curriculum. As a prerequisite to the second semester of the Cisco curriculum, these students must have received a passing grade in the first semester of Cisco. The curriculum runs in a linear fashion, 1st and 3rd semesters in the fall and 2nd and 4th semesters in the spring, so that students will have a smooth flow from the start of the curriculum through the completion of the fourth semester.

A small sample was selected to fill out the survey and was representative of the four Cisco semester two classes that were being offered. The section that completed the survey was from Cory Kleman's second semester Cisco class day section. The class consisted of 19 students, all males.

Instrumentation

A simple survey was used to label the students into one of three categories concerning preferences in preparing for chapter tests. The categories consisted of text only, CBT only, and a combination of text and CBT.

The researcher created the instrument that was used to gather data about the students' preferences was by. No prior surveys were viewed or studied due to the direct nature of the data that was to be collected. The survey, including the directions and disclaimer, was composed on a single sheet of 8 ½ by 11 paper.

Once students were labeled into one of the three learning groups, chapter test scores were recovered from their second semester chapter 5 work and used to show the achievement level of each group versus the achievement levels on the test of the other groups that used different methods to study for the chapter exam.

The questions were created to gather information about the students studying habits prior to taking the online exam. The instrument surveyed the students by asking yes/no questions followed by an elaboration if both of the yes/no questions responses were yes. The yes/no questions consisted of asking the students if they used the online material (CBT), or the textbook as a resource for preparing for the chapter exam. Question number 1 asked… Students who then responded yes to both questions were then asked to elaborate slightly on their previous responses by putting a percentage next to both the CBT and the textbook in Question 2. This percentage

was a measure used to see the distribution of time spent on each if both of the resources were used for studying. The research questions and the corresponding survey question are listed in table 1 below.

Table 1

Research questions and corresponding survey item

Research Question	Survey Item(s)
1. What is the percentage of students using the Textbook as a means to prepare for chapter exams?	1. Please circle the method(s) you used to study for the Chapter 11 Cisco online exam. (Circle both if you used both.) 1.1 Cisco Textbook Yes No
2. What is the percentage of students using the CBT as a means to prepare for chapter exams?	1. Please circle the method(s) you used to study for the Chapter 11 Cisco online exam. (Circle both if you used both.) 1.2 Cisco Computer Based Training (CBT) Yes No

(table coninues...)

Research Question	Survey Item(s)
3. What is the percentage of students using a combination of the textbook and CBT as a means for preparing for chapter exams?	2. If you answered yes to both of the above methods, please fill in the percentage of time you spent using each below. Your total percentage should equal 100% between the two methods. 2.1 Percentage of study time spent using Textbook_____% 2.2 Percentage of study time spent using CBT_____%
4. Do students who use CBT as a means of studying for chapter tests score higher on tests than students that do not use CBT?	1. Please circle the method(s) you used to study for the Chapter 11 Cisco online exam. (Circle both if you used both.) 1.1 Cisco Textbook Yes No 1.2 Cisco Computer Based Training (CBT) Yes No

(table coninues...)

Research Question	Survey Item(s)
5. Do students who use a combination of CBT and textbook score higher on chapter tests than those that use only textbook?	1. Please circle the method(s) you used to study for the Chapter 11 Cisco online exam. (Circle both if you used both.) 1.1 Cisco Textbook Yes No 1.2 Cisco Computer Based Training (CBT) Yes No
6. Do students that use a combination of CBT and textbook score higher on chapter tests than those that use CBT only?	1. Please circle the method(s) you used to study for the Chapter 11 Cisco online exam. (Circle both if you used both.) 1.1 Cisco Textbook Yes No 1.2 Cisco Computer Based Training (CBT) Yes No

(table coninues...)

Research Question	Survey Item(s)
7. What is the percentage of students using each of the different methods of curriculum delivery?	2. If you answered yes to both of the above methods, please fill in the percentage of time you spent using each below. Your total percentage should equal 100% between the two methods. 2.1 Percentage of study time spent using Textbook_____% 2.2 Percentage of study time spent using CBT_____%
8. Do students who use Cisco CBT curriculum as a means of studying average a passing grade of 70% on chapter tests?	1. Please circle the method(s) you used to study for the Chapter 11 Cisco online exam. (Circle both if you used both.) 1.2 Cisco Computer Based Training (CBT) Yes No Researcher analysis of test scores.

(table coninues...)

Research Question	Survey Item(s)
9. Which method, or combination of methods used to prepare for the test yielded the highest average test score?	2. If you answered yes to both of the above methods, please fill in the percentage of time you spent using each below. Your total percentage should equal 100% between the two methods. 2.1 Percentage of study time spent using Textbook_____% 2.2 Percentage of study time spent using CBT_____% Researcher analysis of test scores.
10. Do students that spend time outside of class, the textbook, and CBT score higher on chapter tests?	How much time did you spend using study resources other than Text or CBT? _____ hours and/or _____ minutes
11. Do scores on the test increase as the percentage of textbook use increases?	2. If you answered yes to both of the above methods, please fill in the percentage of time you spent using each below. Your total percentage should equal 100% between the two methods. 2.1 Percentage of study time spent using Textbook_____%

(table coninues...)

Research Question	Survey Item(s)
12. Do scores on the test increase as the percentage of CBT use increases?	2. If you answered yes to both of the above methods, please fill in the percentage of time you spent using each below. Your total percentage should equal 100% between the two methods. 2.2 Percentage of study time spent using CBT_____% Researcher analysis of test scores.
13. Do scores on the tests increase as the percentage of minutes spent outside of the textbook and CBT increase?	How much time did you spend using study resources other than Text or CBT? _____ hours and/or _____ minutes
14. Did any combination of the study methods and minutes spent outside of those methods produce a statically significant correlation with the achievement level on tests?	All questions on the survey, one through three, were used to address this question.

Subject matter experts and design experts at both UW-Stout and WWTC reviewed the survey instrument for content validity. The instrument was then also evaluated by a University of Wisconsin-Stout Research & Statistical Consultant for face validity and aesthetics. The instrument accompanied an application and was submitted to the Institutional Research Board for protection of human subjects for review and approval. Revisions were made at various levels. Reliability of the instrument cannot be determined at this time because the researcher will only

administer the instrument once. Further research and analysis would be needed to establish reliability.

The surveys were printed with black ink on single-sided 8.5 by 11 inch white paper.

Data Collection

The survey was passed out to the students enrolled in the Cisco Routing and Switching course at 9:00 am on November 17, 2003. This class is a traditional daytime course that is held on the WWTC campus in the business education building. This class period was the second period following the chapter five exam of the Cisco curriculum. Students in this class had completed two semesters of Cisco curriculum as a prerequisite to this course. Therefore, all participants were third semester students in a four-semester curriculum.

There were three students not present on the day that the instrument was handed out in person. Students who were not present were emailed the survey with the same explanation as students in class and asked to return it in the form of hard copy or by completing the survey on their computer and returning it via email. All students were informed that the survey was optional and that grades would not be affected by answers. Students were also informed that the results and data collected would be kept confidential. The students were reminded that the total of the two percentages for CBT and textbook usage on Questions 2.1 and 2.2 must equal 100%, therefore ruling out additional resources they may have used. All students participating in this study were age 18 or older so no parental permissions were required.

The time it took to introduce and complete the survey was less than five minutes. The surveys were returned to the researcher face down, passed forward in rows, and collected by the researcher at the head of each row in the classroom.

Data Analysis

The researcher used the Statistical Package for the Social Sciences (SPSS) software to tabulate the responses for Questions 1.x, 2.x, and 3. Due to the nominal and ratio form of data collected by the survey, the Pearson statistical significance test was used. The tests run against the data was used to show frequencies and percentages to answer questions addressed by the study.

Limitations

The limitations of the method, sample, and procedures are:

1. The instructor who taught the class was present during the completion of the surveys (except for the students who answered via email). This may have caused student report of the methods used to be skewed.

2. In order to allow students to choose and use their own preferred method, students were not warned prior to studying for the test to keep track of time spent, so exact percentages may not be an exact representation of the actual percentage of time spent using each or both methods.

3. Students were asked to include their name on each of the surveys for 2nd phase of the study. Even though it was explained that the survey, answers, and results would not play any part changing their grade in the class, this may have affected students' willingness to answer truthfully.

4. The survey instrument did not allow for responses of study methods other than CBT or textbook (i.e. student study groups, study guides, etc.).

Chapter Four

Results and Discussion

Introduction

This chapter indicates the results received from responses on the survey instrument. The chapter will begin with an introduction to the demographics of the survey population, including the number of surveys handed out and returned. An item analysis will also show the breakdown behind the design of each question and its intention, which reports the results of the survey questions. The chapter will conclude with data reporting according to each question in the survey along with tables showing the actual results.

Survey Returns

Of the 18 possible students enrolled in section one of the WWTC Cisco academy fall 2003, 15 were present. There were 15 surveys handed out to Cisco academy students during November of 2003. Of the 15 surveys handed out, 15 were returned. All participants in the class were male.

Study Methods

Item one on the survey asked respondents to circle the method(s) they used to study for the Chapter 11 Cisco online exam and instructed them to circle both if they used both. The first choice presented to students following this instruction concerned the students choice to use the Cisco textbook as a means of preparation. The results were as follows: 11 of 15, or 73%, of the participants indicated that they used the textbook as a means to study for the exam, while 4 of 15, or 27%, indicated that the textbook material was not used to prepare for the exam. The results for this item can be seen in Table 2 on the following page.

The second choice presented to students asked them if they used the CBT as a method to prepare for the test. The results were as follows: 12 of 15, or 80%, of the participants indicated that they used the CBT as a means to study for the exam, while 3 of 15, or 27%, indicated that the CBT material was not used to prepare for the exam. The table for textbook and CBT usage is summarized in table 2 below.

Table 2

Number of students using each study method

Method	N	Percent of Student
Textbook	11	73
CBT	12	80
Text and CBT	8	53

Using the Pearson test for correlation calculations on the data, it was found that there is no statistical significance ($r = .242$, $p > .05$) of using the textbook only as a means of preparing for the tests. The results of the Pearson correlation test with the textbook only method is shown in the Table 3 on the next page.

Table 3

Test score and textbook correlation

		Test Score	Textbook Use
Test Score	Pearson Correlation	1.000	.242
	Sig. (2-tailed)		.385
	N	15	15
CBT Use	Pearson Correlation	.242	1.000
	Sig. (2-tailed)	.385	.
	N	15	15

Using the Pearson correlation statistic, the increase in test score was found not to be statistically significant ($r = -.169$, $p > .05$) to the use of CBT as a means for preparing. The results are shown in table 4 below.

Table 4

Test score and CBT correlation

		Test Score	CBT Use
Test Score	Pearson Correlation	1.000	-.169
	Sig. (2-tailed)1		.548
	N	15	15
CBT Use	Pearson Correlation	-.169	1.000
	Sig. (2-tailed)	.548	
	N	15	15

The second item on the survey asked the students to input the percentage of both textbook and CBT usage if both methods were used in combination. The students were told that the total percentage of textbook and CBT usage should equal 100%. This question was to be answered by students that had chosen "yes" as a response to both textbook and CBT use. The results from the first question of the survey indicated that just over half, or 53%, of the participants used both the textbook and CBT as a means for preparing for this chapter exam. The first choice presented to students in this second item on the survey after asking them if they answered yes to both concerned the percentage of time they spent using the textbook. The second choice presented to the students in this second item on the survey following the initial instruction was the percentage of time they spent using the CBT. The data showing percentage of time students spent with each method is shown in table 5 below.

Table 5

Percentage of time using textbook and CBT

Percentage of Time	Textbook	CBT	Totals
76-100%	4	5	9
0%	4	4	8
51%-75%	4	2	6
26%-50%	2	3	5
1%-25%	1	2	3
Totals	15	15	

Four students responded that they used the textbook 0% as a means of preparing for the test out of their total time of 100%. One student reported using the textbook 1%-25% of the time

out of 100% total time. Two students responded that they used the textbook 26%-50% as a means of preparing for the test out of 100% total time. Four students responded that they used the textbook 51%-75% as a means of preparing for the test out of 100% total time. 4 students responded that they used the textbook 76%-100% as a means of preparing for the test out of 100% total time. The dispersion of time students reported using the textbook is reported in table 6 below.

Table 6

Dispersion of time using the textbook

Percentage of Time	N	Percentage
1%-25%	4	27
51%-75%	4	27
76%-100%	4	27
26%-50%	2	13
0%	1	6
Totals	15	100

Of the 11 students that used this combination method to study, the percentage for use of textbooks ranged from 40 to 100 percent, with a mean of 68%. Students using this textbook method did so as a sole means of study or a combination with CBT. Using the Pearson test for correlation calculations on the data, it was found that there is no statistical significance ($r = -.145$, $p > .05$) of the percentage of textbook use and an increase in test scores. The result of the Pearson correlation test with the textbook percentage is shown in table 7 on the next page.

Table 7

Test score and textbook percentage correlation

		Test Score	% Textbook Use
Test Score	Pearson Correlation	1.000	-.145
	Sig. (2-tailed)		.605
	N	15	15
CBT Use	Pearson Correlation	-.145	1.000
	Sig. (2-tailed)	.605	
	N	15	15

The second choice presented to students concerned the percentage of study time spent using the CBT. Three students responded that they used the CBT 0% as a means of preparing for the test out of 100% total time. Two students responded that they used the CBT 1%-25% as a means of preparing for the test out of 100% total time. Three students responded that they used the CBT 26%-50% as a means of preparing for the test out of 100% total time. 2 students responded that they used the CBT 51%-75% as a means of preparing for the test out of 100% total time. 5 students responded that they used the CBT 76%-100% as a means of preparing for the test out of 100% total time. The percentage dispersion of time student reported using the CBT is reported in table on the next page.

Table 8

Dispersion of time using the CBT

Percentage of Time	N	Percent
76%-100%	5	33
0%	3	20
26%-50%	3	20
1%-25%	2	13
51%-75%	2	13
Totals	15	100

Of the 12 students using this method, the percentage of CBT usage ranged from 2 to 100%, with a mean of 62.6%. Students using this method did so as a sole means of study or a combination with CBT. Using the Pearson statistical method to evaluate the data, there was no significant correlation shown ($r = .145$, $p > .05$). The results of the Pearson test run on increased CBT use and test scores are shown in table 9 the next page.

Table 9

Test score and CBT percentage correlation

		Test Score	% CBT Use
Test Score	Pearson Correlation	1.000	.145
	Sig. (2-tailed)		.605
	N	15	15
CBT Use	Pearson Correlation	.145	1.000
	Sig. (2-tailed)	.605	
	N	15	15

As stated earlier, 53% of students responded that they used both the textbook and CBT as a means to prepare for the test.

The results showed that 20% of students used the textbook, 26.6% of the students used the CBT only, and 53.3% of students used a combination of both textbook and CBT. The results are shown in the table 10 below.

Table 10

Percentage of students using each method

Method Used	Percentage
Combination Textbook and CBT	53.4
CBT Only	26.6
Textbook Only	20
Total	100

By using the Pearson correlation statistic to evaluate the data for combination use it was found that there was not a statistically significant ($r = .079$, $p > .05$) correlation for the use of the textbook and CBT as a means for preparing for tests and the test score. The results of the Pearson test for using both the textbook and CBT as a combination to study for the test is shown in table 11 below.

Table 11

Test score and combined use of textbook and CBT correlation

		Test Score	Combined Use
Test Score	Pearson Correlation	1.000	.079
	Sig. (2-tailed)		.779
	N	15	15
CBT Use	Pearson Correlation	.079	1.000
	Sig. (2-tailed)	.779	.
	N	15	15

The third item on the survey stated "How much time did you spend using study resources other than Text or CBT?". The results ranged from 0 to 360 minutes spent on resources outside of the textbook or CBT. The dispersion of time student reported using resources outside of the textbook and CBT is reported in table 12 on the next page.

Table 12

Dispersion of time spent outside of the textbook and CBT

Time (in Minutes)	N	Percent
0	4	27
60-119	3	20
180-239	3	20
120-179	2	13
240 or more	2	13
1-59	1	7
Totals	15	100

Of the 11 students that used time outside of the textbook and CBT greater than zero, the percentage for use of textbooks ranged from 40 to 100 percent with a mean of 68%. Students using this method did so in combination with the textbook, the CBT, or a combination of both. By using the Pearson correlation statistic to evaluate the data for minutes outside of class it was found that there was not a statistically significant ($r = .128$, $p > .05$) correlation. The results are shown in table 13 on the next page

Table 13

Test score and time spent outside of the textbook and CBT correlation

		Test Score	Minutes Outside Text/CBT Use
Test Score	Pearson Correlation	1.000	.128
	Sig. (2-tailed)		.649
	N	15	15
CBT Use	Pearson Correlation	.128	1.000
	Sig. (2-tailed)	.649	
	N	15	15

Chapter Five

Discussion, Conclusions, and Recommendations

Introduction

This chapter will encompass discussion, conclusions, and recommendations about the study, the findings, and the results as compared to other similar studies. The chapter begins with a comparison of the findings and the literature research completed in chapter two. This discussion is followed by conclusions about the study, followed by recommendations and considerations concerning future studies of this type and the pitfalls and successes experienced by the researcher.

Summary

The purpose of this study was to evaluate the effectiveness of using CBT as a means of preparation for Cisco chapter exams. It was shown through the literature review that studies have produced both positive and negative results and opinions concerning the use of CBT. Student's choices for preparation included textbook, CBT, or a combination of both. Results of the effectiveness of each method were taken from a single test in one class at WWTC in La Crosse, Wisconsin. Through the use of an in class survey, students were asked to report their preference of study method for a single chapter test. Results were collected and analyzed with intentions to provide data to support strength to one of the study methods.

Conclusions

There were 14 research questions addressed by this study. Each question will be restated and conclusions made for each.

Research Question # 1 - What is the percentage of students not using the textbook as a means to prepare for chapter exams?

The results indicated that just over one fifth of the participants did not use the textbook as a means for preparing for this chapter exam. It would be tough to put a finger on what this number should be, but knowing the students have a choice, and some choose not to use all sources available to them, twenty percent seems about right. Using all means available would seem to be the most logical way to prepare for a test, and we should hope that students that use all methods would score higher than students that do not. Interestingly enough, the group that did not use the textbook had the highest average test score, although statistical significance was not shown.

Research Question # 2 -What is the percentage of students not using the CBT as a means to prepare for chapter exams?

The results indicated that just over one fifth, 20%, of the participants did not use the CBT as a means for preparing for this chapter exam. The same can be said about this method only as the results reported in research question one. However, one would think that this number would be lower or zero considering the number of activities included in the CBT, such as: reading, e-labs, and interactive media activities. CBT also seems to be a little better fit to go hand in hand with online testing. To give strength to this thinking, although there was not statistical significance, students that did not use the CBT as a means to prepare had the lowest average of all of the methods.

Research Question # 3 - What is the percentage of students using both the textbook and CBT as a means for preparing for chapter exams?

The results indicated that just over half (53%) of the participants used both the textbook and CBT as a means for preparing for this chapter exam. This group, while being the largest, was closest to the mean test score, only .02% higher than the mean. To defend the thinking stated

previously concerning using all resources available, this method should have carried the highest average.

Research Question # 4 - Do students who use CBT as a means of studying for chapter tests score higher on those tests than students that do not use CBT?

For these students, preparation for the test as recorded by the results of the survey was a selection of "yes" to the question about Cisco Computer Based Training (CBT) usage. These students could have used CBT or a combination of the textbook and CBT to prepare for the test. The score of students that used the CBT as the only method of preparing for the exam, excluding any weight on minutes spent beyond the CBT on supplemental material, was the largest positive percentage from the mean. Their score was 3.35% higher than the mean score. These CBT only students outscored textbook only students by over 5.5% on average. Students that used the CBT in combination with the text gave up a very menial .02% to the mean. Using the Pearson correlation statistic, the increase in test score was found not to be statistically significant ($r = -.169$, $p > .05$) to the use of CBT as a means for preparing. The results are shown in the table below.

Research Question # 5 - Do students who use a combination of CBT and textbook score higher on chapter tests than those that use only textbook?

This group used a combination of textbook and CBT, and the weighted use of how each student used the combination varied and was previously shown in table 4. The answer to this question resulting from the survey data is yes, but it was not shown to have statistical significance. The combination users averaged 2.5% higher than their counterparts that used textbook only.

By using the Pearson correlation statistic to evaluate the data for combination use it was found that the increase in test score was not statistically significant ($r = .079$, $p > .05$) for the use of the textbook and CBT as a means for preparing. Therefore it is not possible to show that using a combination of using both methods is beneficial over each of the single methods.

It was also found that there is no statistical significance ($r = .242$, $p > .05$) of using the textbook only as a means of preparing for the tests. Without any statistical significance it is not probable to find whether a combination of methods will result in higher test scores than textbook only.

Research Question # 6 - Do students that use a combination of CBT and textbook score higher on chapter tests than those that use CBT only?

Again, as previously stated, one would be led to believe that using all methods at your disposal would provide more material and a better understanding of that material. However, combination users were actually outperformed by the CBT only users who averaged just over 3.5% higher. The average was higher, but the Pearson correlation statistic used to evaluate the data found that the increase in test score was not statistically significant ($r = -.169$, $p > .05$) for the use of CBT only as a means for preparing. Nor was it found that increasing the use of CBT over textbook, if a combination of both methods were used, increased test scores.

Research Question # 7 - What is the percentage of students using each of the different methods of curriculum delivery?

The results showed that 20% of students used the textbook, 26.6% of the students used the CBT only, and 53.3% of students used a combination of both textbook and CBT.

Research Question # 8 - Do students who use Cisco CBT curriculum as a means of studying average a passing grade of 70% on chapter tests?

All 12 students that used the CBT as a method of preparing for the chapter test achieved a passing grade.

Research Question # 9 - Which method or combination of methods used to prepare for the test yielded the highest average test score?

The highest test score was achieved by the group that used CBT only (+3.35 % higher than the mean score), but by using the Pearson statistics from the data collected by the survey no significant correlation at any level was able to be shown between any of the methods and the students related test scores.

Research Question #10 – Do students that spend time outside of class, the textbook, and CBT score higher on chapter tests?

Reported ranges were from 0-360 additional minutes spent outside of class with a mean of 112 minutes on supplemental material besides the textbook or CBT. Of the 11 students that used time outside of the textbook and CBT, the percentage for use of textbooks ranged from 40 to 100 percent with a mean of 68%. The significance of spending time on supplemental material was not shown to have any significance ($r = .128$, $p > .05$) to the scores on the tests.

Research Question #11 – Do scores on the tests increase as the percentage of textbook use increases?

Of the 11 students that used the textbook method, the percentage for use of textbooks ranged from 40 to 100 percent with a mean of 68%. Students using this method did so as a sole means of study or a combination with CBT. Surprisingly there was a negative correlation (-.145) shown, but it was not significant ($p > .05$).

Research Question #12 – Do scores on the tests increase as the percentage of CBT use increases?

Of the 12 students using this method, the percentage of CBT usage ranged from 2 to 100%, with a mean of 62.6%. Students using this method did so as a sole means of study or a combination with the textbook. Using the Pearson statistical method to evaluate the data, here was no significant correlation shown ($r = .145$, $p > .05$).

Research Question #13 – Do scores on the tests increase as the percentage of minutes spent outside of the textbook and CBT increases?

Of the 11 students that used additional resources and time outside of the textbook and CBT, the time spent ranged from 30 to 360 minutes. Students using additional resources could do this with any other combination of methods used in this study. Students' choice supplemental materials and methods were not monitored or surveyed. Using the Pearson statistical method to evaluate the data, here was no significant correlation shown ($r = .128$, $p > .05$).

Research question #14 – Did any combination of the study methods and minutes spent outside of those methods produce a statistically significant correlation with the achievement level on tests?

Using the Pearson statistical analysis on the nominal and ratio data, the results did not show any statistically significant correlation at any level with the achievement level on tests by using a combination of the study methods and minutes spent outside of those study methods.

Summary of Findings

Although some of the initial raw data pointed towards possible trends in study methods and resulting test scores, the Pearson statistics did not show any significant correlations based on the survey results on the participating students. As shown in the literature review, there are many opinions concerning CBT, and for the most part it may still be in its infancy as a solution to educating students as either a part or whole solution. CBT has found success in both industry and

education, but can lack the very important variable of human interaction and intervention. The uncertainty of the results of CBT and it use in Cisco warranted a study of this type, but significant results were not found with this population.

Recommendations

The results of this study present several suggestions for individuals affected by or conducting similar studies to consider. Results in this area of study can be tainted by extraneous resources and variables to students such as instructor lecture, supplemental readings, and lab work. It is due to these resources that a small sample size can possibly show results favorable or unfavorable to the studies purpose. With all of the different material and means of preparation for exams, students use what works for them, and students study to a point that makes them feel comfortable in preparation for the test. Time spent above and beyond this comfort level is extraneous and unwarranted by each student, and this may be the reason students do not seek additional resources or use the all the current resources at their disposal.

Recommendations for general educators. CBT is a way for students to proceed through self-paced learning, but it should not replace classroom activities such as discussion, learning, and labs. CBT can not stand alone as an education tool, although it may be successful for some students. Furthermore, CBT should be used as a tool, and not a solution.

Recommendations for CISCO educators. Recommendations for CISCO educators would be to continue to encourage students to use all resources available to them to prepare for chapter tests, including texts, CBT, lecture, lab, and other outside resource (web, books, etc.). The CBT seems to map a little better to the curriculum than the textbooks. Currently, WWTC uses the CBT and textbook from Cisco press. Perhaps additional texts considering the Cisco press text and the CBT generally present the same material.

Related to this Study. CISCO educators should also consider a few additional recommendations related to this study:

1. Include a larger sample size for the study. The sample size useful for determining the effectiveness within one class at one college, but results showing many classes at the same or many different colleges may yield results giving strength to one of the study methods as a whole.

2. Conduct the study on multiple tests/units within the Cisco course. One test may be too small to make a generalization and establish reliability. The longevity of method used throughout a semester would be great grounds for developing a pattern that might surface the most effective way to study for the Cisco exams.

3. Consider restricting the students participating in the study to distance education students. By being strictly off campus and CBT based, these students would not receive lectures or participate in exercises in class. The results might be different from a strict textbook and CBT study. In this study, all students taking the test were exposed to the same lecture and exercises in class. This information presented in class covered information from both the CBT and textbook. Therefore, this method of learning and preparing for the exam was above and beyond the normal textbook or CBT method.

4. The study should be replicated in a few years when CBT in general and also Cisco CBT has had a chance to develop and mature. Continual usage and redesign of CBT curriculum should help to create a better platform for CBT to be used effectively as a tool for learners.

5. The study could be replicated for all computer networking degree programs within the Wisconsin Technical College System that use CBT or some form of it to educate students.

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APPENDIX A - Consent form and survey instrument

Consent Form for Research Involving Human Subjects

I understand that by returning this questionnaire, I am giving my informed consent as a participating volunteer in this study. I understand the basic nature of this study is to evaluate a correlation between the type of method used to study for tests and the associated test scored earned. The potential risks of my participation is data collected concerning my test score. The benefits of this study will provide data that can be used to evaluate the effectiveness of study methods used in preparing for Cisco chapter exams. I am aware that the information is being sought in a specific manner so that only minimal identifiers are necessary and so that confidentiality is guaranteed. I realize that I have the right to refuse to participate and that my right to withdraw from participation at any time during the study will be respected with no coercion or prejudice.

NOTE: Questions or concerns about the research study should be addressed to Cory Kleman at (608) 789-6149, the researcher, or Juli Taylor at (715) 232-1443, the research advisor. Questions about the rights or research subjects can be addressed to Sue Foxwell, Human Protections Administrator, UW-Stout Institutional Review Board for the Protection of human Subjects in Research, 11 Harvey Hall, Menomonie, WI, 54751, phone (715) 232-1126.

This survey's purpose it to see how students are preparing for Cisco online tests. Your grade will <u>not</u> be affected by your response to any of the following questions, so please be honest. Your name and test results will be kept totally confidential. Thank you for your time, participation, and honesty in this survey.

Please circle the method(s) you used to study for the Chapter 5 Cisco online exam.
(Circle both if you used both.)

Cisco Textbook	Yes	No
Cisco Computer Based Training (CBT)	Yes	No

If you answered yes to both of the above methods, please fill in the percentage of time you spent using each below. Your total percentage should equal 100% between the two methods.

Percentage of study time spent using Textbook _____%

Percentage of study time spent using CBT _____%

Total = 100 %

How much time did you spend using
study resources other than Text or CBT? _____ hours and/or _____ minutes

APPENDIX B - Email sent to students absent during the survey

From: Cory Kleman
To: (name)
CC: (none)

Subject: Cisco Study Method Survey

Attachments: Cisco CBT vs. Textbook survey.doc

Please answer the following survey concerning the method used to study for the Module 5 exam. Module 5 was the first switch exam and it mapped to the old books chapter 2. Answering this survey will not affect your grade, and your name will remain anonymous. Please be honest with your responses. This is for my graduate studies and has no link or connection to Cisco.

This survey is completely voluntary.

Thank you for your help!

Cory Kleman
CIS-NS Program Head/Instructor
Western Wisconsin Technical College
304 Sixth Street N
PO Box C-0908
La Crosse, WI 54602-0908
(608)-789-6149
klemanc@wwtc.edu