HANDS-ON FUNCTIONAL EDUCATION

by

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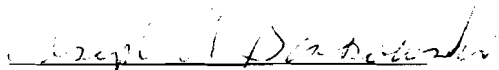

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ABSTRACT

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The purpose of this study was to examine student satisfaction of traditional and accelerated courses using functional application based lab-learning activities or interactive computers assisted instruction component, completed at the student's residence/off campus, without direct instructor supervision. It was thought that when compared, students would find no substantial difference between traditional and accelerated course.

The study documented two courses, Fundamentals of Refrigeration and Electricity/Electronic HVAC at Moraine Park Technical College over a three-year period from the fall of 2002 to spring 2004. Data was collected from students who had taken these courses. A total of 107 questionnaires were administered with 83 filled out and

returned, leading to a response rate of 77 percent. A four-point Likert scale was used for the questionnaire and to rate the responses received.

Data analysis was broken down by courses; if it was a traditional 16 week or accelerated and by the semester the student took the course. Data was calculated and compared separating the data into, mean, median and standard deviation. The empirical information was analyzed using Statistical Program for Social Sciences, version 13 (SPSS 13.0). The largest course section surveyed had an enrollment of 18 students.

Results of this study found using functional application based lab learning activities off campus was not the leading cause of students' dissatisfaction with courses. The students were not distracted by the off campus lab activity. The revealing student displeasure with these courses was the accelerated format. Courses using hands-on functional training materials whether in an electric lab kit or computerized refrigeration training system does not cure students' dissatisfaction when taking accelerated classes; they are just one component.

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My thanks go to Dr. Joe Benkowski for his advice and contributions to my research project. Joe made it fun and interesting taking his courses.

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CHAPTER 1

Introduction

Offering courses in various delivery modes including online, traditional, accelerated, and interactive television is becoming the norm in technical college systems. Distance Education (DE) students are looking for alternative ways to achieve their educational goals and more and more students are electing not to physically attend campuses for classes. A dean at William Paterson University in Wayne, NJ, stated, "about 75 percent of the student bodies do not reside on campus" (Presby, 2001, p.1). Most of the courses offered in various delivery modes are not meant to be different from the traditional courses on campus. Over the past years, distance-learning initiatives have expanded rapidly. During the 1997-1998 academic year over 1.6 million distance learning students were enrolled in the United States (Lewis, Snow, Farris & Westat, 1999). These courses are not substitutes for traditional courses, but are used to supplement our teaching approaches (Presby, 2001). If more students are living off-campus and the courses are not to be altered, how do we maintain a synergetic product? Many courses offered at technical colleges, especially in the trade programs, have hands-on activities to encode the information into the student's long-term memory. In addition, many students entering the trades are hands-on learners. How do we meet the needs of these learners?

"It takes courage to leave the galaxy of the familiar, to unknown" (Rutherford, Grana, 1994, p.1).

Meeting the needs of the student who wants the education now, and in an off campus format, has led many colleges to offer courses via Interactive Television, On-

line, and using the Internet Protocol Network. "Distance learning technology may not make the traditional campus obsolete, but an institution without an appropriate plan of action could get left behind" (Earls, 1999, p30). "The Internet also becomes a playground for the interested student to independently investigate text-based and multimedia material beyond the course's curriculum" (Sherer, Shea, 2002, p.15). Most DE classes rely on written communication, discussion boards, chat rooms, white board and e-mails. The four most popular modes for DE learning are asynchronous followed by synchronous-telephone contact and live chat (Shea, Motiwalla, Lewis, 2001) The final category of communication with the instructor is represented by new technologies of multimedia, audio and video streaming. The top two wishes that students wanted for improvement with DE were more frequent interactions and faster interactions (Shea, Motiwalla, Lewis, 2001). The learning style left behind is hands-on activities for the dexterous learners. Students who are not proficient with computers or asynchronous learning may be discouraged from taking DE courses. Incorporating functional application-based learning activities into DE curriculum should be the goal of all distance education courses. By adding application-based learning into the course students who are apprentice style learners should be attracted to the distance educational phenomena.

The achievements of students with functional application-based learning activities in their courses are measured against courses with traditional asynchronous, synchronous and multimedia communication media. The vision and mission is that non-traditional delivery modes are not meant to be different from the traditional courses taught on campus. The mission statement of Moraine Park Technical College (MPTC) is "Our

technical college strives to make a positive difference in the lives of students, staff and the larger community" (Moraine Park Technical College, 2002).

With the technology to offer courses using multiple formats, the question arises: how will the learner that learns by hands-on activities participate in non-traditional and distance education? Traditional campus activities have included interactive Computers Assisted Instruction (CAI) and hands-on laboratory activities under an instructor's supervision. How will instructors include application-type curriculum in their non-traditional accelerated and distant education courses that students complete off campus without direct instructor supervision?

In the fall of 2000 the Wisconsin Technical College System (WTCS) started a "Virtual Campus"(Wisconsin Technical College System, 2000). The focal point media is web-based courses. The first courses converted to web-base were the general education courses.

Moraine Park Technical College of Fond du Lac offered all of their general education courses on-line as options for the students by the end of 2002. Other options such as non-traditional accelerated/intensive and distance education was implemented to meet students' desires. General education courses are easily converted to this format. How will courses that have a hands-on lab component compete for and meet student satisfaction?

Statement of the Problem

Moraine Park Technical College needs to determine if the students' expectations for doing the hands-on lab/computer portion of their courses work at home are fulfilling the course competencies, and student's needs and satisfaction.

Purpose of the Study

The purpose of this study was to examine student satisfaction of traditional and accelerated courses using functional application based lab-learning activities or interactive computers assisted instruction component, completed at the student's residence/off campus, without direct instructor supervision. Do the learning activities and delivery methods used fulfill the course competencies and aid in the student's satisfaction rate? Does the instructional method facilitate a learning environment using functional application based lab-learning activities at the residence/off campus location? Data collected are from students enrolled in the Air Conditioning, Heating, and Refrigeration Technology program at Moraine Park Technical College in Fond du Lac Wisconsin.

Research Questions

1. What is the satisfaction rate of students enrolled in accelerated courses with the stated course objectives/competencies?
2. What is the satisfaction rate of students enrolled in accelerated courses to delivery methods used?
3. What is the satisfaction rate of students enrolled in accelerated courses with functional application based lab-learning activities without direct instructor supervision?
4. What is the satisfaction rate of students enrolled in accelerated courses with interactive Computers Assisted Instruction without direct instructor supervision?

5. What is the overall satisfaction rate of students taking accelerated courses using functional application based lab-learning activities or interactive computers-based instruction component?

Significance of the study

The Significance of the study:

1. Some students did not explore the possibilities of enrolling in non-traditional accelerated courses missing hands-on learning activities for fear of failure, because they lacked written communication skills that are prevalent in other courses.
2. This data will assist MPTC in identifying learning activities that enhance students' satisfaction of courses that were traditionally hands-on learning.
3. Industry could examine what and how to incorporate functional application based lab-learning activities lab kits with textbook materials.

Assumptions

Assumptions of this study were as follows:

1. Students want functional application based lab-learning activities without direct instructor supervision.
2. When answering the surveys, students gave honest responses.
3. Demographic data extracted about students by Student Services at MPTC is complete and accurate.

Definition of Terms

Academic success: The letter grade assigned upon completion of a course at MPTC. The grading scale is on four-point scale. (Moraine Park Technical College. 2002)

Accelerated courses: Instructional delivery mode where the course material is delivered in a condensed time frame and students' learning activities are self-paced out of direct instructor supervision. (Moraine Park Technical College. 2004)

Asynchronous: Communication between individuals that does not occur simultaneously. (Willis, B 2004)

Hands-on: Learning activities where students work on actual equipment, or trainers. The students need critical thinking skills and there is a realistic possibility human error may occur, with performance outcomes semi-predicable. (The Merriam-Webster Dictionary, 1997)

Computers Assisted Instruction: Learning activities where students work on computers using simulations of equipment that is used in the field and that students will work on after completion of the program. The computer program forces the student to interact with the program, and solicits questions or responses from the student. The design of the program is directing the student to a predetermined outcome. (Willis, B 2004)

Multimedia: Multiple forms of communication such as streamed audio and video. (Willis, B 2004)

On-line: Instructional delivery mode through the Internet where the student and teacher are separated by distance and or time. Delivery of course material may be asynchronous or synchronous (Willis, B 2004)

Internet Protocol Video Teleconferencing: Standard, rules and format for exchanging data between the computer and video and audio interactions through television applications to the end user. (Moraine Park Technical College. 2004)

Synchronous: Communication between individuals that occurs simultaneously. (Willis, B 2004)

Traditional courses: Instructional delivery mode where the student attends a classroom and where the instructor facilitates the learning activities. (Moraine Park Technical College. 2004)

Limitations

1. The study is restricted to the students enrolled in Fundamentals of Refrigeration and Electricity/Electronics courses at MPTC. This is not representative of other technical colleges.
2. Data obtained was from one semester of beginning students at MPTC and may not be indicative of other semesters.
3. The participants may have been trying to please the researcher, which may have biased the responses.
4. There is no available measured criterion of validity or reliability for the survey instruments used in the study.

Methodology

The methodology used in this study was a two-part questionnaire that was given to each participant, in the form of a Likert type scale. Each part contained ten to fifteen questions. The participants had five different choices from "Strongly Agree" to "No Opinion".

CHAPTER 2

Literature Review

Moraine Park Technical College needs to determine if the students' expectations for doing the hands-on lab/computer portion of their course work at home is fulfilling the course competencies, and students' needs and satisfaction.

The purpose of this study was to examine student satisfaction of traditional and accelerated courses using functional application based lab-learning activities or interactive computer assisted instruction component, completed at the students' residence/off campus, without direct instructor supervision. Do the learning activities and delivery methods used fulfill the course competencies and aid in the students' satisfaction rate? Does the instructional method facilitate a learning environment using functional application based lab-learning activities at the residence/off campus location? Data collected are from students enrolled in the Air Conditioning, Heating, and Refrigeration Technology program at Moraine Park Technical College in Fond du Lac Wisconsin.

Marketing Education

The fastest areas of growth in post-secondary education are non-traditional courses highlighted by accelerated/intensive offerings. Accelerated courses are also one of the most controversial and challenging to the main stream established instructional format. Wlodkowski (2003) stated, "They are one of the most controversial changes as well, challenging such fundamental academic structures as faculty tenure and the standard forty-five clock hours of instruction" (p5). Dr. Michael Rosen addressing the Wisconsin Technical College System Board (WTCSB) noted that 70% of all new jobs

would require a postsecondary education. State aid has also declined from 33% in the 1970's to about 20% today (Wisconsin Technical College System, 2000). The skilled worker shortage is not bypassing the WTCS and each district will have to compete with business and industry for a well-trained staff. It is not just a student's likes or dislikes, but also an academic structural change in course scheduling and instructors' workloads. The driving force behind non-traditional courses is the competition of post secondary education and educators to attract students. The needs of the students to acquire knowledge and to advance their careers and the need for money in post secondary education has led to innovative ways for schools to offer their curriculum. This, plus the explosion of technology to aid in the delivery of the courses to the students has been at odds with the established pedagogy. How the student receives and encodes the learning to their long-term memory is still being determined. Delivery methods such as computer assisted instruction, accelerated courses; distance education and on-line web based offerings have met with limited success. Much of the new deliveries of education have been missing hand-on relevant practice activities for the dexterous learners. This chapter will review the various ways that courses are being offered and how successful they are perceived by the students. The focus of this review will be on accelerated and distance education with hands-on components. Estimates predict that in the next ten years approximately 25% of adult students will be enrolled in accelerated programs Wlodkowski (2003). A 2001 report by the National Center for Education Statistics, stated that 41% of the students' enrolled in higher education were adults, and that 6 million were age twenty-five or older Wlodkowski (2003). Many of these students' had families, worked full time and had other commitments. Surplus times that adult learners

have open and are willing to attend courses are weekends. A traditional course with established sixteen week instructional format is too long of a commitment and balancing act for this group of adults.

Accelerated Course Delivery

Accelerated/Intensive programs are found in many traditional institutions, and are meant to fulfill the desires and needs of the working adult. The format of an accelerated course is for the students to complete the necessary competencies in less than the traditional sixteen weeks, without any degradation in learner outcomes. With completion of a course in as little as five sessions, institutions are able to offer courses in the evenings, weekends, on and off campus, face-to-face, online and at employer sites. With one quarter of adult learners wanting to enroll in accelerated courses in the next ten years it appears to be a win-win proposition. Institutions achieve higher fulltime-equivalent (FTE) enrollments, students receive a degree in a shorter time and employers have a well-trained work force.

Tralatitious educators have criticized accelerated programs and have compared them to the fast food industry; it can be looked at as education on the fly. The perception is with fewer hours, there are fewer competencies and an inferior product. The accepted quarter/semester arrangement was appropriate for the past. Left behind is the agricultural society and now is the digital age; the sun does not dictate learning anymore. The disapproval of accelerated courses by traditionalists as lacking academic rigor and short changing the students to achieve higher enrollments lacks supportive research and empirical evidence Scott (2003). Numerous studies in the past decade have indicated that

accelerated/intensive courses are as good as and even better than traditional courses. Intensive courses can yield equivalent and even superior results when compared to traditional courses Wlodkowski and Westover (1999).

Factors that are indicators for a high quality learning experience in a superior accelerated program and courses are: instructor enthusiasm and experience, active learning, classroom atmosphere, organization, student input, rectitude atmosphere and a relaxed learning environment Scott (2003). When accelerated/intensive programs and courses are designed that include the high quality attributes, students' report focused learning, memorable experiences, better discussions and stronger academic performances.

Distance Education

There are many modes of delivery that define Distance Education (DE), Correspondence courses, Online Computer, Interactive Television (ITV), and Internet Protocol Video Teleconferencing (IP VTC). It is estimated that 56 percent of all post secondary institutions offer distance education courses and 90 percent of 2-year institution offer DE courses National Postsecondary Education Cooperative (2004).

Correspondence courses are one of the oldest forms of distance education, where the students use a read write format for completing assignments. Communication between the student and instructor is asynchronous through the postal service.

Computer assisted online courses are making rapid advancements because of new technologies, information processing programs, communication infrastructures, and the growing percentage of the population that has computers. In the 1997-98 school year over

1.4 million students were enrolled in Internet-based courses Shea, Motiealla, & Lewis, (2001). In August 2000 the Wisconsin Technical College System Board funding of the Virtual Campus demonstrated the need to offer online courses now. Its intentions are to remove the barriers of working adult to on campus attendance. The funding of the Virtual Campus will be shared other Wisconsin Technical Colleges, and will deliver courses onsite to businesses, as well as other educational intermediaries such as high schools. Mr. Clancy at a Special Meeting held by the Wisconsin Technical College System, (2000) stated "increase student access by reducing barriers of time and place, to provide a competitive advance for the system given the growing interest in web delivered instruction" (p. 8) Asynchronous is the prevalent means of correspondents for Internet based courses and are the top four communication methods used for an online course community interaction Shea, Motiealla, & Lewis, (2001). The four methods are E-mail to the instructor, posting class notes, bulletin board and E-mail to other students. The next methods used in courses are synchronous communication, such as telephone contact with the instructor, videoconferencing and on line chat. Other methods for learner to interact in the learning process for online courses are streamed audio and streamed video.

Interactive television aspires to synchronous communication plus it's trying to integrate hands-on instructor guided learning activities. The instructor and students are able to interact with one another at remote sites through direct links. A typical ITV setup at each site is equipped with phone, fax, tabletop microphones, cameras, computer, Elmo Visualizer, and a minimum of two TV monitors. Instructors can now observe students in-group projects and answer questions in real time.

Internet Protocol Video Teleconferencing is similar to ITV and computer assisted online courses, except it is all done through the Internet. Equipment needed is a computer with Internet Protocol software, video cameras, microphones and speakers, plus the World Wide Web Internet network. IP VTC combines the four methods of asynchronous communication such as E-mailing the instructor, posting class notes, bulletin board and E-mail to other students, with synchronous communication that ITV fostered. Courses can now be offered to anyone anywhere who has the equipment, whether at home, workplace or on campus.

Historical Implementation

As more colleges and universities are attracted to the new technologies offered via electronic means, a recurring theme surfaces. How do we span the gap between the classroom delivery and the hands-on practical application in our courses? "A gap between the classroom and job practice is now recognized as an obstacle that education has to overcome" (Vescoukis, Retalis, & Anagnostopoulos, 2003, p. 170). Other problems with web based instruction is still the teach and the test evaluation used by many post secondary institutions to assess the student's competency with what is being delivered.

Kidney and Puckett found the following:

> "For example, Web course design teams had failed to create rich and engaging learning environments. Most of the courses were of the "teach and test" modality and included graphics to make them appear pleasing or for navigational rather

than instructional purposes. The courses were also typically designed without regard for long-term maintenance". (p. 203)

Opposite of teach and test course, is a course that has a hands-on activity and the associated problem is how the instructor will evaluate the activity. Three questions need answering. Did the student actually do the activity? Was it done correctly? Was the learning objective achieved?

There are many theories and models presented for instructional design. McCarthy developed the 4-MAT theory, Andre had the Instructional Episode, Schank's Learning by Doing, and Vanderbilt Learning Technology Center presented a learning cycle called the Star Legacy. Each of these theories starts with the learners, what do they know, how to activate their curiosity, demonstrate and then apply what they need to know and then incorporate these skills into real life situations. M. D. Merrill in his article First Principles of Instruction identified four distinct phases of learning: activation of prior knowledge, demonstration of skills, application, and integration of the skill into real life situations (2001). When practice accommodates the demonstration skill and an appropriate follow up posttest that is consistent with the implied objectives is given to the learner and the learner passes, knowledge was transferred. Society does not expect Tiger Woods to be good at golf, or Yo Yo Ma Cellist to be good at their careers without hours of practice. "Appropriate practice is the single most neglected aspect of effective instruction" (Merrill, 2001, p. 7).

After six years of providing Web-base instruction the University of Houston-Clear Lake assessed students performance, likes and dislikes with this format. Test designed to measure student's learning indicated that there was no significant difference

between traditional face-to-face courses and Web-based courses. This data led the instructional design team to believe that they were a success with their design and implementation for online courses. Upon reflection the feeling of joy receded to disappointment. Among the expressed disappointments, "We saw that the sequence of instructional events in our courses was typically teach, discuss, and test" (Kidney and Puckett, 2003, p. 206). Hands-on and practice was missing. The thought was that if they used the tools such as e-mail, chat rooms, discussion boards that were in the computer program, they had interactivity. The missing element from many DE courses is the appropriate practice that the mind needs for memory encoding of the skill that was presented.

Missing Hands-on Delivery Activities

Courses that are missing from the accelerated and distance education format are the many courses from the Trade and Technical (T&T) division. Trade and Technical division courses budget with higher operating costs for equipment and supplies. Many of the post-secondary simulated manufacture laboratories are multi-million dollar rooms filled with sophisticated machines. The traditional course delivery is classroom/lecture, then hands-on lab/equipment work assignments. For obvious reasons most of the lab/equipment work assignments cannot be done off campus. But would the student who attends a basic theory course from the T & T division in a non-traditional format with take home labs be satisfied with this alternative delivery method? Studies have demonstrated students who interact with the equipment have a better retention of the material and learning objectives. Learning is a process of trial and error. Most learners

learn from the error they make, especially when they are shown how to identify the error, correct the error and how to avoid the error.

From the start the Wisconsin Technical College System Board wanted the Virtual Campus initiative to serve as a model of how skilled worker could be trained through the electronic media. They rejected the primary focus of other states of limiting courses to just the liberal arts or general education courses, and included technical courses. The board stated that effort should be made that courses taken over the Virtual Campus system through the Internet have the same level of qualifications as those in a hands-on laboratory (Wisconsin Technical College System, 2000).

To overcome the missing hands-on element for their Electricity/Electronic and Fundamentals of Refrigeration courses Moraine Park Technical College requires students to purchase a hands-on lab component for each of these courses. The lab packet required in the curriculum for the Electricity/Electronic course is a 25 in 1 magnetism hands-on kit. The students wire and test various electronic circuits working with actual energized current. The required lab component for Fundamentals of Refrigeration as outlined in the curriculum is a computer simulated refrigeration system. No definitive data has been analyzed as to how well this is working for Moraine Park Technical College.

Summary

Many attempt are being made to deliver quality instruction through Distance Education and Accelerated/Intensive course offerings, but they are still falling short when it comes to student satisfaction. Surveys suggest that the competencies identified are being transferred to the learner. Distance Education and Accelerated/Intensive courses

are offering an immense opportunity, challenge and change for higher education. But teaching will not occur and learning will not happen to the fullest extent, if instructional designers do not include the strategies of present, practice and learner guidance. "Web course design teams had failed to create rich and engaging learning environments" (Kidney and Puckett, 2003, p. 203)

CHAPTER 3

Research Methodology

Moraine Park Technical College (MPTC) needs to determine if the students' expectations for doing the hands-on lab/computer portion of their courses work at home are fulfilling the course competencies, and students' needs and satisfaction.

Moraine Park Technical College offered all of their general education courses on-line as options, for the students by the end of 2002. Other options such as non-traditional accelerated/intensive and distance education was implemented to meet students' desires. General education courses are easily converted to this format. How will courses that have a hands-on lab component compete for and meet student satisfaction?

Two courses at MPTC, part of the Air Condtioning Heating and Refrigeration Technology program were offered in non-traditional formats, such as accelerated. One offering for each course was also offered to the students in the traditional format, face to face. In each course offering the lab portion of the curriculum required the student to complete the hands-on lab assignments off campus. The two courses targeted were Fundamental of Refrigeration and Electricity/Electronics. The objective of this study will be to compare the student satisfaction of accelerated courses to a traditional lecture/discussion semester course, using a hands on labs assignment or computer-based instruction component, completed at the students residence/off campus, without direct instructor supervision.

This chapter discusses the population and sample size, how the data was analyzed and what instruments were used to collect the data. Methodological limitations and assumptions are also identified.

Population and Sample

The multipart questionnaire was administered by the researcher, with the assistance of Moraine Park Technical College to the students in a cluster sampling of two courses. Students selected took courses that had a hands-on lab requirements that needed to be completed off campus and were enrolled in either or both, Fundamental of Refrigeration 601-120 and Electricity/Electronics 601-107. These students had enrolled in the Air Conditioning, Heating, and Refrigeration Technology Program as either a full or part time students from the fall of 2002 thru the fall of 2004. The voluntary participation was explained to the participants. All participants were college students and over eighteen years of age. All of the participations were male.

Data Collection Instrument

A questionnaire was given to each participant by the researcher, the survey (Appendix A, p. 45) in the form of a five point Likert type scale. The first part contains fifteen questions. This section surveyed the student's satisfaction for the course taken. The second section asked the students ten question with their judgment based on their satisfaction with the instructional methods. The questions are taken from a questionnaire used by Moraine Park Technical College. The participants will have five different choices from "Strongly Agree" to "Strongly Disagree" and "No Opinion".

Data Collection

Data was collected from students who had taken courses at Moraine Park Technical College starting in the fall of 2002 to the spring of 2004. The addresses for the students were obtained from Student Services at Moraine Park Technical College. A questionnaire was administered to each student in the courses surveyed. The courses surveyed were Fundamental of Refrigeration 601-120 and Electricity/Electronics 601-107. Four section of Fundamental of Refrigeration 601-120 and three sections of Electricity/Electronics 601-107 were offered during this time. A total of 107 questionnaires were administered with 83 filled out and returned, leading to a response rate of 77 percent.

Data Analysis

Data analysis was broken down by courses; if it was a traditional 16 week or accelerated and by the semester the student took the course. Data was calculated and compared separating the data into, mean, median and standard deviation. Moraine Park Technical College analyzed the empirical information using Statistical Program for Social Sciences, version 13 (SPSS 13.0) for the reseacher. The researcher agreed that all empirical information collected from the student's would be destroyed to protect the students' privacy after the data was compiled.

Limitations

There are several limitation of this study; they are:

1. The sample size is small and only students enrolled at Moraine Park Technical College and took Refrigeration 601-120 and Electricity/Electronics 601-107 were surveyed and this is not necessarily representative of other technical colleges.
2. All participants surveyed were male and do not represent a cross section of the population that attends Moraine Park Technical College.
3. The researcher was the instructor of all but one course and section and the participants may have been trying to influence the researcher, which may have resulted in biased responses.
4. There are no available measures of validity or reliability for the instrument used for this study.

Assumptions

Assumptions of this study were as follows:

1. Students want functional application based lab-learning activities without direct instructor supervision.
2. When answering the surveys, students gave honest responses.
3. Demographic data extracted about students by Student Services at MPTC is complete and accurate.

CHAPTER 4

Results

When courses are accelerated, the classroom time is shortened, but the expected outcomes remain the same. The students were expected to complete the traditional hand-on lab component at home for each of the courses surveyed. Two courses selected for the survey started requiring the students to purchase and complete the lab portion of the curriculum outside of the traditional class time starting in 2002. One of the courses Electricity/Electronics 601-107 used a purchased electronics kit from a standard supply house. The lab kit was a 25 in 1 experiment packet and covered magnetism/motor theory that cost about $30.00. The instructor for the course chose it because it closely aligned with the curriculum and its outcomes. The other course, Fundamentals of Refrigeration 601-120, used an interactive computerized refrigeration training system. This computer program cost the student about $54.00. The program covered physics, the basic refrigeration system, and then more complex refrigeration systems. The students could review as often as they wanted before the final online test for each section.

The survey covered students' enrollments for three years and two different types of instructional designs were used during this same time period. Electricity/Electronics required hands-on functional electronics lab kit for either format that the student was enrolled in and the computerized refrigeration training system was required for all Fundamentals of Refrigeration sections. Two noted differences existed between the traditional and accelerated course delivery; there was on campus time to start working on the outside lab work and the instructor was present for interaction.

Electricity/Electronics offered one traditional course and two accelerated sections. The Electricity/Electronics traditional section was the first time the hands on functional electronics lab kit was used. Statistical comparisons will compare the traditional format with the succeeding offerings as accelerated sections.

Fundamentals of Refrigeration had enrollments in one traditional and three accelerated sections. Implementation of the computers assisted refrigeration training system was first used in an accelerated venue. All comparisons with the accelerated course data to the traditional course data will be made with this in mind. The last time the course was offered, it was a traditional section of sixteen weeks.

The data collected was used to answer the following questions about the student's satisfaction for each course taken.

1. What was the perceived satisfaction for the students enrolled in accelerated courses with the stated course objectives/competencies?
2. What was the perceived satisfaction for the students enrolled in accelerated courses to delivery methods used?
3. What was the perceived satisfaction for the students enrolled in accelerated courses with functional application based lab-learning activities without direct instructor supervision?
4. What was the perceived satisfaction for the students enrolled in accelerated courses with interactive Computers Assisted Instruction without direct instructor supervision?

5. What was the perceived satisfaction for the students taking accelerated courses using functional application based lab-learning activities or interactive computers-based instruction component?

Statistics collected were analyzed and complied into mean, median and standard deviation for each course and section. The largest course section had an enrollment of 18 students. Because of the small numbers of students in each course the compiled median statistic would be a 3.00, 3.50, or 4.00. The standard deviation ranged from 1.00 to .30 for any questions. The question that had the standard deviation of 1.00 was for the first time Electricity/Electronic was offered. The question was "The instructor met with the learners at scheduled times" which had a mean of (3.08), a median of (3.00) and as was stated a s. d. of (1.00). The lowest standard deviation was a question asked for Fundamental of Refrigeration, "I felt I was held to the same performance standards as other students". Its mean was (3.09), median (3.00) and s. d. (.30). For actual questions and the participants', answers, see (Appendix D, p. 52).

The researcher used a four-point Likert scale to rate the responses received. The numeric values given each response were:

4.00 = Strongly Agree

3.00 = Agree

2.00 = Disagree

1.00 = Strongly Disagree

Statistical Analysis Electricity/Electronics for 601-107

Student satisfaction for the stated course objectives/competencies dropped across the board from the traditional course delivery method, compared to the first time the accelerated course was given in the fall of 2003. The largest drop was for the question "A variety of learning activities were used in the course" from a mean of 3.75 to a 2.91, a drop of .84. The second time the course was offered in the accelerated format all of the numbers rebound, but not up to the levels when it was a traditional courses offering (See Table 1).

Table 1:

Mean values for the satisfaction rate of the students with the stated course objectives/competencies:

Questions	Traditional Fall 2002	Accelerated Fall 2003	Accelerated Fall 2003
The course requirements were distributed to students	3.50	3.08	3.40
The course objectives were clearly stated	3.50	2.75	3.33
The course evaluation and grading plan was clearly stated	3.42	2.83	3.30
The course assignments were clearly stated	3.50	2.75	3.10
A variety of learning activities were used in the course	3.75	2.91	3.00
The textbook was a useful tool in the learning process	3.42	2.75	2.90

The responses to the second research question were consistent with the responses to the first research question of course objective/competencies. There was an overall decline with students' satisfaction with the first offering in the accelerated format as presented. The largest drop was for the question "I am satisfied with the delivery method used for this course (i. e. ITV, online, face-to-face class, accelerated, etc.)" from a mean of 3.64 down to 2.58, a satisfaction decline of 1.06 (See Table 2). There was a rebound of the number with the second accelerated offering of the course.

Table 2:

Mean values for satisfaction rate of the students with the delivery methods used:

Questions	Traditional Fall 2002	Accelerated Fall 2003	Accelerated Fall 2003
The course progressed at a satisfactory rate	3.25	2.36	3.20
The physical environment contributed to my learning process	3.67	3.00	3.00
I am satisfied with the delivery method used for this course (i. e. ITV, online, face-to-face class, accelerated, etc.)	3.64	2.58	3.00
I am satisfied with the scheduled course time	3.25	2.42	2.80
I felt encouraged to participate in class discussions	3.50	3.36	3.33
I was kept sufficiently informed on my progress in the course	3.08	2.92	2.56
I felt I was held to the same performance standards as other students	3.67	3.08	3.33

In researcher's question three, were the students satisfied using functional based lab-learning activities; the result was the same as previous questions. The largest drop occurred with the first accelerated offering and the question that declined the most was the question, "As a result of this course I developed skills that I can use in other aspects of my life learning process", which went from 3.67 down to 2.75 a drop of .92 points (See Table 3).

Table 3:

Mean values for satisfaction rate of the students using functional based lab-learning activities:

Questions	Traditional Fall 2002	Accelerated Fall 2003	Accelerated Fall 2003
The learning resources were appropriate to the skill I need to know (i.e. module, videos, handouts, CDs, labs, etc.)	3.33	2.67	3.00
As a result of this course I developed skills that I can use in other aspects of my life	3.67	2.75	3.00
The physical environment contributed to my learning process	3.33	2.67	3.00
The instructor was prepared for the sessions	3.75	3.08	3.10
The instructor met with learners at scheduled times	3.75	3.08	3.33
The instructor was knowledgeable about the course content	3.58	3.33	3.40
In the course I had opportunity to ask questions	3.75	3.33	3.30
My questions related to this course were sufficiently answered	3.82	3.17	3.30
I felt encouraged to participate in class discussions	3.50	3.27	3.22

Student overall satisfaction for the fourth research question was consistent with the other three questions. The biggest decline was for the question "Overall, I am satisfied with this course" it went from 3.42 to 2.55 a decline of .87 (See Table 4).

Table 4:

Mean values for the overall student satisfaction with functional based lab-learning activities

Questions	Traditional Fall 2002	Accelerated Fall 2003	Accelerated Fall 2003
I developed occupation skills/knowledge in this course	3.67	2.83	3.10
I am satisfied with the grade I am earning in this course	3.44	3.00	3.00
Overall, I am satisfied with this course	3.42	2.55	2.89
Overall, I am satisfied with the instructor for this course	3.58	3.27	3.10

Statistical Analysis Fundamentals of Refrigeration for 601-120

Students' satisfaction rates with the stated course objectives/competencies were lower with the accelerated delivery mode when compared with traditional course offerings. The largest discrepancy occurred the second time the accelerated refrigeration course was offered fall 2003. The question that varied the most and had the largest drop when compared with traditional design was "The textbook was a useful tool in the learning process". The mean went from 3.73 to 2.64 a difference of 1.09 (See Table 5).

Table 5:

Mean values for the satisfaction rate of the students with the stated course objectives/competencies:

Questions	Traditional Spring 2004	Accelerated Fall 2003	Accelerated Fall 2003	Accelerated Fall 2004
The course requirements were distributed to students	3.50	3.29	3.17	3.45
The course objectives were clearly stated	3.58	3.14	3.10	3.18
The course evaluation and grading plan was clearly stated	3.67	3.29	3.08	3.36
The course assignments were clearly stated	3.58	3.21	2.75	3.18
A variety of learning activities were used in the course	3.42	3.14	2.64	2.80
The textbook was a useful tool in the learning process	3.73	3.31	2.64	3.09

Generally students' satisfaction ratings for the all of the question were the lowest the second time Fundamentals of Refrigeration was offered in the accelerated format. Reviewing how the course was presented did not reveal any noticeable differences in the delivery methods, times or instructor. The question that varied the most was, "The course progressed at a satisfactory rate", differences between a traditional sixteen-week to an

accelerated eight weeks was 3.64 as compared to 2.58 a point difference of 1.06 points (See Table 6).

Table 6:

Mean values for satisfaction rate of the students with the delivery methods used:

Questions	Traditional Spring 2004	Accelerated Fall 2003	Accelerated Fall 2003	Accelerated Fall 2004
The course progressed at a satisfactory rate	3.64	3.00	2.58	3.09
The physical environment contributed to my learning process	3.42	3.29	2.91	3.00
I am satisfied with the delivery method used for this course (i. e. ITV, online, face-to-face class, accelerated, etc.)	3.58	3.14	2.67	3.11
I am satisfied with the scheduled course time	3.50	3.00	2.75	3.00
I felt encouraged to participate in class discussions	3.73	3.14	2.91	3.45
I was kept sufficiently informed on my progress in the course	3.58	2.93	2.73	3.10
I felt I was held to the same performance standards as other students	3.75	3.23	3.09	3.22

The biggest variance for the respondents when assessing satisfaction with the computers assisted refrigeration training system occurred when the participants responded to the survey question, "The learning resources were appropriate to the skill I need to know (i.e. module, videos, handouts, CDs, labs, etc.)", a mean contrast of 1.14 points was recorded. A mean of 3.50 was compiled for this presentation in the traditional format and 2.36 mean score for the second delivery in accelerated format in the fall of 2003 (See Table 7).

Table 7:

Mean values for satisfaction rate of the students using interactive computer assisted instruction

Questions	Traditional Spring 2004	Accelerated Fall 2003	Accelerated Fall 2003	Accelerated Fall 2004
The learning resources were appropriate to the skill I need to know (i.e. module, videos, handouts, CDs, labs, etc.)	3.50	3.14	2.36	3.27
As a result of this course I developed skills that I can use in other aspects of my life	3.60	3.29	2.75	3.30
The physical environment contributed to my learning process	3.42	3.29	2.91	3.00
The instructor was prepared for the sessions	3.67	3.43	2.92	3.55
The instructor met with learners at scheduled times	3.75	3.29	2.92	3.55
The instructor was knowledgeable about the course content	3.75	3.36	3.08	3.64
In the course I had opportunity to ask questions	3.64	3.38	3.25	3.45
My questions related to this course were sufficiently answered	3.82	3.14	3.00	3.36
I felt encouraged to participate in class discussions	3.73	3.14	2.91	3.45

Overall the participants' satisfaction rate with accelerated course delivery design was considerably less than with the traditional format. All indicators had negative ratings when the courses were delivered and the discrepancies were the greatest the second time the accelerated course ran in the fall of 2003. The indicator that dropped less than the others, but was still less than the traditional course delivery configuration was for the overall rating of the instructor. The third time the accelerated format was presented to the students' fall of 2004; the difference between the overall ratings of the instructor was only down .22 points when compared to traditional course delivery (See Table 8).

Table 8:

Mean values for the overall student satisfaction with functional based lab-learning activities

Questions	Traditional Spring 2004	Accelerated Fall 2003	Accelerated Fall 2003	Accelerated Fall 2004
I developed occupation skills/knowledge in this course	3.64	3.00	2.82	3.09
I am satisfied with the grade I am earning in this course	3.67	3.17	2.75	2.90
Overall, I am satisfied with this course	3.64	3.00	2.73	3.00
Overall, I am satisfied with the instructor for this course	3.67	3.21	3.08	3.45

CHAPTER 5

Conclusions and Recommendations

Introduction

This study does not establish that adding hands-on functional activities completed off campus enhanced students' satisfaction. The delivery format change from a traditional sixteen weeks to an accelerated design had a larger than anticipated negative affect on student satisfaction. This chapter includes the purpose of the study, a summary of the research, and recommendations. An overview of the data provided by the questions in the survey and how that collected data ties into the recommendations will be discussed. The chapter will end by making recommendations for future studies.

Purpose

The purpose of this study was to examine student satisfaction of traditional and accelerated courses using functional application based lab-learning activities or interactive computers assisted instruction component, completed at the student's residence/off campus, without direct instructor supervision. Did these learning activities and delivery methods fulfill the course competencies and aid in the student's goals and fulfill their educational endeavors? The goal of this study was to answer the following questions:

- What is the satisfaction rate of students enrolled in accelerated courses with the stated course objectives/competencies?
- What is the satisfaction rate of students enrolled in accelerated courses to delivery methods used?

- What is the satisfaction rate of students enrolled in accelerated courses with functional application based lab-learning activities without direct instructor supervision?
- What is the satisfaction rate of students enrolled in accelerated courses with interactive Computers Assisted Instruction without direct instructor supervision?
- What is the overall satisfaction rate of students taking accelerated courses using functional application based lab-learning activities or interactive computers-based instruction component?

Summary

The significance of the learning activities did not play as an important of role in students' satisfaction as did the course delivery format. When the courses were delivered in an accelerated format, there was a considerable drop across the board in students' satisfaction. There were however, improvements made according to the data collected, which by the last time the accelerated courses were offered modifications to the courses occurred. Participants in the last section generally gave a more favorable rating than the first respondents did for the section they attended.

Summarizing the Electricity/Electronics course, the largest drop in student satisfaction occurred the first time this course was presented in the accelerated mode. Totaling up the students' dissatisfaction with the course objectives/competencies which is the first research question of this study, it dropped .67 points. The comparison was done by averaging the mean rating for all of the survey questions in the table. The mean for the traditional sixteen week courses was then compared to the mean rating of the accelerated

sections. The mean for all of the participant responses in Table 1 traditional delivery was 3.52. The mean average drop for the Fall 2003 first delivery of the accelerated section dropped .67 points in Table 1, the first time the accelerated course was presented (Appendix E).

The researcher is using this technique and averaging the results because for every survey question that was answered by the participants in the survey, the students were less satisfied with the accelerated format.

The second key research questions for Electricity/Electronics focused on delivery of the course, Table 2 had a drop .62 for the first accelerated delivery (Appendix E). The next time the course was presented in an accelerated format the average difference from the traditional design was only down .41 points, an improvement over the first presentation of .21 points. These drops answered the objective about the satisfaction rate of students enrolled in accelerated courses with the delivery methods used, and the answer was that they were less satisfied.

The researchers third question was presented in Table 3. Students' satisfaction rate for application based lab learning activities were down an average of .56 points when compared to traditional delivery average mean score of 3.60 (Appendix E). Students thought that the traditional course delivery with the application based lab learning activities was better.

The overall student satisfaction rate with these courses is addressed in Table 4; it rated the accelerated delivery section down by .62 points, as compared to the traditional sixteen weeks (Appendix E).

A good point to note is that all averages for students' satisfaction in each Table detailed for Electricity/Electronics improved the second time the courses were delivered as an accelerated course.

Fundamentals of Refrigeration differed from Electricity/Electronics in that the second section delivered in the accelerated format had a lower overall student satisfaction rate than the first time it was offered. Fundamentals of Refrigeration lessons were delivered in the accelerated format three times. All three times that it was presented the students rated it lower than traditional delivery (Appendix D).

Calculating the students' diminished satisfaction with this course and averaging the mean drops for all of the participant responses, satisfaction with the course objectives/competencies Table 5 dropped .35 points the first time given as an accelerated course. This declined even further when the second section of refrigeration was taught in the accelerated mode in fall 2003; it was off another .33 points down to .68 (Appendix F). Students were not as satisfied with the accelerated mode.

Answering the second research question for Fundaments of Refrigeration, were the students satisfied with the delivery methods, is Table 6. The traditional delivery format had a satisfaction rate of 3.60 and then dropped .50 in the first accelerated course offering, then down another .29 points for the section in the fall of 2003 (Appendix F). Again students were less satisfied.

Table 7 showed students' satisfaction with interactive computer assisted instruction was down .38 for the first accelerated delivery, down another .37 point to .75, but rebounded to just .25 points lower than the traditional course delivery. This was the

highest increase in student satisfaction for any of the researcher's questions (Appendix F).

Overall student satisfaction with Fundamentals of Refrigeration is in Table 8. Data received showed it down .56 from the traditional course, down more for the second accelerated offering and then up to just .35 points below the traditional class presentation (Appendix F). Students were not as satisfied with the accelerated format as they were with traditional sixteen week courses.

The researcher does not have an answer for the low ratings given the course for the second section given in the fall of 2003. The facilities, instructor, delivery and computer programs were the same. What was positive is that by the third time the course was offered in an accelerated delivery mode, student satisfaction rating increased and was the best for any of the accelerated section.

Recommendations

Courses using hands-on functional training materials whether in an electric lab kit or computerized refrigeration training system does not cure students' dissatisfaction when taking accelerated classes; they are just one component. This study has shown that if the all elements of course designs are not synchronically connected students will not be satisfied. Recommendations for developing accelerated courses with hands-on functional learning tools are:

- Knowledgeable experienced instructor
- Hands-on functional learning activities
- Good course organization

- Relaxed environment
- Student interaction
- Appropriate college atmosphere

All of these are essential for the design of a good accelerated or traditional course using hands-on functional learning activities.

Recommendations for future studies

Moraine Park Technical College should continue offering accelerated courses in Fundamentals of Refrigeration and Electricity/Electronics. Subsequent courses showed improvement. Data showed that the students' satisfaction rates were improving. A follow-up study should be conducted in a few more years to verify that the improvements in students' satisfaction that were documented in this study have continued. The researcher would recommend that an interview survey be included in the next study.

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Appendix A

Moraine Park Technical College
Air Conditioning, Heating & Refrigeration Technology

Course Number (circle one)	**601-120**	**601-107**	
Course Name (circle one)	**Fundamental of Refrigeration**	**Electricity/ Electronics**	
Year Course Was Taken (circle one)	**2002**	**2003**	**2004**

1. The following statements relate to your satisfaction with the course.

Please state your level of agreement with each of the following statements	Strongly Agree	Agree	Disagree	Strongly Disagree	No Opinion
a. The course requirements were distributed to students	O	O	O	O	O
b. The course objectives were clearly stated	O	O	O	O	O
c. The course evaluation and grading plan was clearly stated	O	O	O	O	O
d. The course assignments were clearly stated	O	O	O	O	O
e. A variety of learning activities were used in the course	O	O	O	O	O
f. The textbook was a useful tool in the learning process	O	O	O	O	O
g. The learning resources were appropriate to the skill I need to know (i.e. module, videos, handouts, CDs, labs, etc.)	O	O	O	O	O
h. The course progressed at a satisfactory rate	O	O	O	O	O

i. As a result of this course I developed skills that I can use in other aspects of my life	O	O	O	O	O
j. The physical environment contributed to my learning process	O	O	O	O	O
k. I developed occupation skills/knowledge in this course	O	O	O	O	O
l. I am satisfied with the delivery method used for this course (i. e. ITV, online, face-to-face, class, accelerated, etc.)	O	O	O	O	O
m. I am satisfied with the scheduled course time	O	O	O	O	O
n. I am satisfied with the grade I am earning in this course	O	O	O	O	O
o. Overall, I am satisfied with this course	O	O	O	O	O

2. The following statements relate to your satisfaction with the instructional methods:

Please state your level of agreement with each of the following statements	Strongly Agree	Agree	Disagree	Strongly Disagree	No Opinion
a. The instructor was prepared for the sessions	O	O	O	O	O
b. The instructor met with students at scheduled times.	O	O	O	O	O
c. The instructor was knowledgeable about the course content	O	O	O	O	O
d. In the course I had opportunity to ask questions.	O	O	O	O	O

e. My questions related to this course were sufficiently answered	O	O	O	O	O
f. I felt encouraged to participate in class discussions	O	O	O	O	O
g. I felt encouraged to think innovatively	O	O	O	O	O
h. I was kept sufficiently informed on my progress in the course	O	O	O	O	O
i. I felt I was held to the same performance standards as other students	O	O	O	O	O
j. Overall, I am satisfied with the instructor for this course	O	O	O	O	O

Appendix B

Tom Wagner
Moraine Park Technical College
235 N. National Ave
Fond du Lac, WI 54936

Name
Address
City

December 16, 2004

Moraine Park Technical College (MPTC) of Fond du Lac started offering all of their general education courses as an on-line option, for the students in 2002. Other options such as accelerated, IP video and distance education are also being implemented to meet students' desirers. As a student that has completed one of the new instructional formats that Moraine Park Technical College offered, you have been selected to voice your opinion. All of the students enrolled in either Fundamentals of Refrigeration 601-120 or Electricity/Electronics 601-107 for the years 2002 to 2004 have been selected to complete a survey. The questionnaire will be used for the continuous improvement of these courses.

Names are not required on these questionnaires and all answers are voluntary. The only identifier from your survey is on the envelope for tracking purposes to check your name off from our list. Your name will never be put on the questionnaire. Your participation in this study is entirely voluntary. You may choose not to participate without any adverse consequences to you. Should you choose to participate and later wish to withdraw from the study, you may discontinue your participation in this survey anytime by notifying the researcher.

The results of this research will be made available to Moraine Park Technical College, and the University of Wisconsin Stout. You may receive a summary of this survey by contacting Tom Wagner at 920-924-3418, or email twagner@morainepark.edu

If you have any questions, concerns, or reports regarding your rights as a research subject, please contact Sue Foxwell, Director, Research Services at, UW Stout, 715-232-2477 or email foxwells@uwstout.edu or Dr. Joseph Benkowski, research advisor at, UW Stout, 715-232-5366 or email benkowskij@uwstout.edu

Thank you for your assistance.

Sincerely

Tom Wagner CM
Air Conditioning Heating & Refrigeration
Instructor

Appendix C

Electricity and Electronics HVAC
601-107-001, Fall 2002
16 weeks – Traditional
Students Enrolled = 18

The following statements relate to your satisfaction with the course:

Mean Score Rating 4.00 = Strongly Agree 2.00 = Disagree 3.00 = Agree 1.00 = Strongly Disagree	Count	Mean	Median	s.d.
The course requirements were distributed to students	12	3.50	3.30	.52
The course objectives were clearly stated	12	3.50	3.50	.52
The course evaluation and grading plan was clearly stated	12	3.42	3.50	.67
The course assignments were clearly stated	12	3.50	3.50	.52
A variety of learning activities were used in the course	12	3.75	4.00	.45
The textbook was a useful tool in the learning process	12	3.42	4.00	.79
The learning resources were appropriate to the skill I need to know (i.e. module, videos, handouts, CDs, labs, etc.)	12	3.33	3.00	.49
The course progressed at a satisfactory rate	12	3.25	3.00	.62
As a result of this course I developed skills that I can use in other aspects of my life	12	3.67	4.00	.49
The physical environment contributed to my learning process	12	3.67	4.00	.49
I developed occupation skills/knowledge in this course	12	3.67	4.00	.49
I am satisfied with the delivery method used for this course (i. e. ITV, online, face-to-face class, accelerated, etc.)	12	3.64	4.00	.50
I am satisfied with the scheduled course time	12	3.25	3.00	.75
I am satisfied with the grade I am earning in this course	12	3.44	3.00	.53
Overall, I am satisfied with this course	12	3.42	3.00	.51

The following statements relate to your satisfaction with the instructional methods:

Mean Score Rating 4.00 = Strongly Agree 2.00 = Disagree 3.00 = Agree 1.00 = Strongly Disagree	Count	Mean	Median	s.d.
The instructor was prepared for the sessions	12	3.75	4.00	.45
The instructor met with learners at scheduled times	12	3.75	4.00	.45
The instructor was knowledgeable about the course content	12	3.58	4.00	.51
In the course I had opportunity to ask questions	12	3.75	4.00	.45
My questions related to this course were sufficiently answered	12	3.82	4.00	.40
I felt encouraged to participate in class discussions	12	3.50	4.00	.80
I felt encouraged to think innovatively	12	3.58	4.00	.67
I was kept sufficiently informed on my progress in the course	12	3.08	3.00	.90
I felt I was held to the same performance standards as other students	12	3.67	4.00	.49
Overall, I am satisfied with the instructor for this course	12	3.58	4.00	.53

Electricity and Electronics HVAC
601-107-001, Fall 2003
8 weeks – Accelerated
Students Enrolled = 13

The following statements relate to your satisfaction with the course:

Mean Score Rating 4.00 = Strongly Agree 2.00 = Disagree 3.00 = Agree 1.00 = Strongly Disagree	Count	Mean	Median	s.d.
The course requirements were distributed to students	12	3.08	3.00	.67
The course objectives were clearly stated	12	2.75	3.00	.75
The course evaluation and grading plan was clearly stated	12	2.83	3.00	.72
The course assignments were clearly stated	12	2.75	3.00	.75
A variety of learning activities were used in the course	12	2.91	3.00	.83
The textbook was a useful tool in the learning process	12	2.75	3.00	.62
The learning resources were appropriate to the skill I need to know (i.e. module, videos, handouts, CDs, labs, etc.)	12	2.67	3.00	.65
The course progressed at a satisfactory rate	12	2.36	2.00	.92
As a result of this course I developed skills that I can use in other aspects of my life	12	2.75	3.00	.62
The physical environment contributed to my learning process	12	3.00	3.00	.74
I developed occupation skills/knowledge in this course	12	2.83	3.00	.72
I am satisfied with the delivery method used for this course (i. e. ITV, online, face-to-face class, accelerated, etc.)	12	2.58	2.00	.79
I am satisfied with the scheduled course time	12	2.42	2.50	.90
I am satisfied with the grade I am earning in this course	12	3.00	3.00	.71
Overall, I am satisfied with this course	12	2.55	3.00	.93

The following statements relate to your satisfaction with the instructional methods:

Mean Score Rating 4.00 = Strongly Agree 2.00 = Disagree 3.00 = Agree 1.00 = Strongly Disagree	Count	Mean	Median	s.d.
The instructor was prepared for the sessions	12	3.08	3.00	.79
The instructor met with learners at scheduled times	12	3.08	3.00	1.00
The instructor was knowledgeable about the course content	12	3.33	3.00	.65
In the course I had opportunity to ask questions	12	3.33	3.00	.65
My questions related to this course were sufficiently answered	12	3.17	3.00	.83
I felt encouraged to participate in class discussions	12	3.36	3.00	.67
I felt encouraged to think innovatively	12	3.27	3.00	.79
I was kept sufficiently informed on my progress in the course	12	2.92	3.00	.90
I felt I was held to the same performance standards as other students	12	3.08	3.00	.79
Overall, I am satisfied with the instructor for this course	12	3.27	3.00	.79

Electricity and Electronics HVAC
601-107-002, Fall 2003
8 weeks – Accelerated
Students Enrolled = 13

The following statements relate to your satisfaction with the course:

Mean Score Rating 4.00 = Strongly Agree 2.00 = Disagree 3.00 = Agree 1.00 = Strongly Disagree	Count	Mean	Median	s.d.
The course requirements were distributed to students	10	3.40	3.00	.52
The course objectives were clearly stated	10	3.33	3.00	.50
The course evaluation and grading plan was clearly stated	10	3.30	3.00	.48
The course assignments were clearly stated	10	3.10	3.00	.32
A variety of learning activities were used in the course	10	3.00	3.00	.71
The textbook was a useful tool in the learning process	10	2.90	3.00	.74
The learning resources were appropriate to the skill I need to know (i.e. module, videos, handouts, CDs, labs, etc.)	10	3.00	3.00	.67
The course progressed at a satisfactory rate	10	3.20	3.00	.63
As a result of this course I developed skills that I can use in other aspects of my life	10	3.00	3.00	.50
The physical environment contributed to my learning process	10	3.00	3.00	.67
I developed occupation skills/knowledge in this course	10	3.10	3.00	.32
I am satisfied with the delivery method used for this course (i. e. ITV, online, face-to-face class, accelerated, etc.)	10	3.00	3.00	.67
I am satisfied with the scheduled course time	10	2.80	3.00	.63
I am satisfied with the grade I am earning in this course	10	3.00	3.00	.76
Overall, I am satisfied with this course	10	2.89	3.00	.60

The following statements relate to your satisfaction with the instructional methods:

Mean Score Rating 4.00 = Strongly Agree 2.00 = Disagree 3.00 = Agree 1.00 = Strongly Disagree	Count	Mean	Median	s.d.
The instructor was prepared for the sessions	10	3.10	3.00	.32
The instructor met with learners at scheduled times	10	3.33	3.00	.50
The instructor was knowledgeable about the course content	10	3.40	3.00	.52
In the course I had opportunity to ask questions	10	3.30	3.00	.48
My questions related to this course were sufficiently answered	10	3.30	3.00	.48
I felt encouraged to participate in class discussions	10	3.33	3.00	.50
I felt encouraged to think innovatively	10	3.22	3.00	.44
I was kept sufficiently informed on my progress in the course	10	2.56	2.00	.73
I felt I was held to the same performance standards as other students	10	3.33	3.00	.50
Overall, I am satisfied with the instructor for this course	10	3.10	3.00	.32

Appendix D

Fundamentals of Refrigeration
601-120-003 Spring 2004
16 weeks – Traditional
Students Enrolled = 17

The following statements relate to your satisfaction with the course.

Mean Score Rating 4.00 = Strongly Agree 2.00 = Disagree 3.00 = Agree 1.00 = Strongly Disagree	Count	Mean	Median	s.d.
The course requirements were distributed to students	12	3.50	3.50	.52
The course objectives were clearly stated	12	3.58	4.00	.51
The course evaluation and grading plan was clearly stated	12	3.67	4.00	.65
The course assignments were clearly stated	12	3.58	4.00	.51
A variety of learning activities were used in the course	12	3.42	4.00	.79
The textbook was a useful tool in the learning process	12	3.73	4.00	.47
The learning resources were appropriate to the skill I need to know (i.e. module, videos, handouts, CDs, labs, etc.)	12	3.50	4.00	.67
The course progressed at a satisfactory rate	12	3.64	4.00	.50
As a result of this course I developed skills that I can use in other aspects of my life	12	3.60	4.00	.70
The physical environment contributed to my learning process	12	3.42	3.50	.67
I developed occupation skills/knowledge in this course	12	3.64	4.00	.50
I am satisfied with the delivery method used for this course (i. e. ITV, online, face-to-face class, accelerated, etc.)	12	3.58	4.00	.51
I am satisfied with the scheduled course time	12	3.50	3.50	.52
I am satisfied with the grade I am earning in this course	12	3.67	4.00	.49
Overall, I am satisfied with this course	12	3.64	4.00	.50

The following statements relate to your satisfaction with the instructional methods:

Mean Score Rating 4.00 = Strongly Agree 2.00 = Disagree 3.00 = Agree 1.00 = Strongly Disagree	Count	Mean	Median	s.d.
The instructor was prepared for the sessions	12	3.67	4.00	.49
The instructor met with learners at scheduled times	12	3.75	4.00	.45
The instructor was knowledgeable about the course content	12	3.75	4.00	.45
In the course I had opportunity to ask questions	12	3.64	4.00	.50
My questions related to this course were sufficiently answered	12	3.82	4.00	.40
I felt encouraged to participate in class discussions	12	3.73	4.00	.47
I felt encouraged to think innovatively	12	3.73	4.00	.47
I was kept sufficiently informed on my progress in the course	12	3.58	4.00	.51
I felt I was held to the same performance standards as other students	12	3.75	4.00	.45
Overall, I am satisfied with the instructor for this course	12	3.67	4.00	.49

Fundamentals of Refrigeration
601-120-001, Fall 2003
8 weeks – Accelerated
Students Enrolled = 16

The following statements relate to your satisfaction with the course.

Mean Score Rating 4.00 = Strongly Agree 2.00 = Disagree 3.00 = Agree 1.00 = Strongly Disagree	Count	Mean	Median	s.d.
The course requirements were distributed to students	14	3.29	3.00	.47
The course objectives were clearly stated	14	3.14	3.00	.53
The course evaluation and grading plan was clearly stated	14	3.29	3.00	.61
The course assignments were clearly stated	14	3.21	3.00	.58
A variety of learning activities were used in the course	14	3.14	3.00	.77
The textbook was a useful tool in the learning process	14	3.31	3.00	.75
The learning resources were appropriate to the skill I need to know (i.e. module, videos, handouts, CDs, labs, etc.)	14	3.14	3.00	.77
The course progressed at a satisfactory rate	14	3.00	3.00	.88
As a result of this course I developed skills that I can use in other aspects of my life	14	3.29	3.00	.47
The physical environment contributed to my learning process	14	3.29	3.00	.61
I developed occupation skills/knowledge in this course	14	3.00	3.00	.68
I am satisfied with the delivery method used for this course (i. e. ITV, online, face-to-face class, accelerated, etc.)	14	3.14	3.00	.86
I am satisfied with the scheduled course time	14	3.00	3.00	.78
I am satisfied with the grade I am earning in this course	14	3.17	3.00	.39
Overall, I am satisfied with this course	14	3.00	3.00	.68

The following statements relate to your satisfaction with the instructional methods:

Mean Score Rating 4.00 = Strongly Agree 2.00 = Disagree 3.00 = Agree 1.00 = Strongly Disagree	Count	Mean	Median	s.d.
The instructor was prepared for the sessions	14	3.43	3.00	.65
The instructor met with learners at scheduled times	14	3.29	3.00	.61
The instructor was knowledgeable about the course content	14	3.36	3.00	.63
In the course I had opportunity to ask questions	14	3.38	3.00	.51
My questions related to this course were sufficiently answered	14	3.14	3.00	.77
I felt encouraged to participate in class discussions	14	3.14	3.00	.86
I felt encouraged to think innovatively	14	3.14	3.00	.86
I was kept sufficiently informed on my progress in the course	14	2.93	3.00	.92
I felt I was held to the same performance standards as other students	14	3.23	3.00	.83
Overall, I am satisfied with the instructor for this course	14	3.21	3.00	.80

Fundamentals of Refrigeration
601-120-002, Fall 2003
8 weeks – Accelerated
Students Enrolled = 14

The following statements relate to your satisfaction with the course.

Mean Score Rating 4.00 = Strongly Agree 2.00 = Disagree 3.00 = Agree 1.00 = Strongly Disagree	Count	Mean	Median	s.d.
The course requirements were distributed to students	12	3.17	3.00	.58
The course objectives were clearly stated	12	3.10	3.00	.74
The course evaluation and grading plan was clearly stated	12	3.08	3.00	.51
The course assignments were clearly stated	12	2.75	3.00	.75
A variety of learning activities were used in the course	12	2.64	3.00	.67
The textbook was a useful tool in the learning process	12	2.64	3.00	.67
The learning resources were appropriate to the skill I need to know (i.e. module, videos, handouts, CDs, labs, etc.)	12	2.36	2.00	.92
The course progressed at a satisfactory rate	12	2.58	3.00	.79
As a result of this course I developed skills that I can use in other aspects of my life	12	2.75	3.00	.75
The physical environment contributed to my learning process	12	2.91	3.00	.54
I developed occupation skills/knowledge in this course	12	2.82	3.00	.75
I am satisfied with the delivery method used for this course (i. e. ITV, online, face-to-face class, accelerated, etc.)	12	2.67	3.00	.65
I am satisfied with the scheduled course time	12	2.75	3.00	.62
I am satisfied with the grade I am earning in this course	12	2.75	3.00	.89
Overall, I am satisfied with this course	12	2.73	3.00	.90

The following statements relate to your satisfaction with the instructional methods:

Mean Score Rating 4.00 = Strongly Agree 2.00 = Disagree 3.00 = Agree 1.00 = Strongly Disagree	Count	Mean	Median	s.d.
The instructor was prepared for the sessions	12	2.92	3.00	.51
The instructor met with learners at scheduled times	12	2.92	3.00	.51
The instructor was knowledgeable about the course content	12	3.08	3.00	.29
In the course I had opportunity to ask questions	12	3.25	3.00	.45
My questions related to this course were sufficiently answered	12	3.00	3.00	.43
I felt encouraged to participate in class discussions	12	2.91	3.00	.54
I felt encouraged to think innovatively	12	3.00	3.00	.43
I was kept sufficiently informed on my progress in the course	12	2.73	3.00	.79
I felt I was held to the same performance standards as other students	12	3.09	3.00	.30
Overall, I am satisfied with the instructor for this course	12	3.08	3.00	.51

Fundamentals of Refrigeration
601-120-001, Fall 2004
8 weeks – Accelerated
Students Enrolled = 16

The following statements relate to your satisfaction with the course.

Mean Score Rating 4.00 = Strongly Agree 2.00 = Disagree 3.00 = Agree 1.00 = Strongly Disagree	Count	Mean	Median	s.d.
The course requirements were distributed to students	11	3.45	3.00	.52
The course objectives were clearly stated	11	3.18	3.00	.40
The course evaluation and grading plan was clearly stated	11	3.36	3.00	.50
The course assignments were clearly stated	11	3.18	3.00	.87
A variety of learning activities were used in the course	11	2.80	3.00	.63
The textbook was a useful tool in the learning process	11	3.09	3.00	.70
The learning resources were appropriate to the skill I need to know (i.e. module, videos, handouts, CDs, labs, etc.)	11	3.27	2.00	.65
The course progressed at a satisfactory rate	11	3.09	3.00	.70
As a result of this course I developed skills that I can use in other aspects of my life	11	3.30	3.50	.82
The physical environment contributed to my learning process	11	3.00	3.00	.63
I developed occupation skills/knowledge in this course	11	3.09	3.00	.54
I am satisfied with the delivery method used for this course (i. e. ITV, online, face-to-face class, accelerated, etc.)	11	3.11	3.00	.33
I am satisfied with the scheduled course time	11	3.00	3.00	.45
I am satisfied with the grade I am earning in this course	11	2.90	3.00	.32
Overall, I am satisfied with this course	11	3.00	3.00	.45

The following statements relate to your satisfaction with the instructional methods:

Mean Score Rating 4.00 = Strongly Agree 2.00 = Disagree 3.00 = Agree 1.00 = Strongly Disagree	Count	Mean	Median	s.d.
The instructor was prepared for the sessions	11	3.55	4.00	.52
The instructor met with learners at scheduled times	11	3.55	4.00	.52
The instructor was knowledgeable about the course content	11	3.64	4.00	.50
In the course I had opportunity to ask questions	11	3.45	3.00	.52
My questions related to this course were sufficiently answered	11	3.36	3.00	.50
I felt encouraged to participate in class discussions	11	3.45	3.00	.52
I felt encouraged to think innovatively	11	3.36	3.00	.50
I was kept sufficiently informed on my progress in the course	11	3.10	3.00	.88
I felt I was held to the same performance standards as other students	11	3.22	3.00	.67
Overall, I am satisfied with the instructor for this course	11	3.45	3.00	.52

Appendix E

Table Averages and Deviations for Electricity/Electronics Survey Questions

Generalizing students satisfaction rate, an average of the responses to all of the survey questions in the particular table, will be used as a comparison between course sections. Deviations from the calculated average of the traditional sixteen-week format will be shown and the differences for the accelerated sections will be recorded in the appropriate columns.

Table 1 Average an Deviations

Traditional Average Fall 2002	Accelerated Deviation Fall 2003	Accelerated Deviation Fall 2003
3.52	-.67	-.34

Table 2 Average an Deviations

Traditional Average Fall 2002	Accelerated Deviation Fall 2003	Accelerated Deviation Fall 2003
3.44	-.62	-.41

Table 3 Average an Deviations

Traditional Average Fall 2002	Accelerated Deviation Fall 2003	Accelerated Deviation Fall 2003
3.60	-.56	-.42

Table 4 Average an Deviations

Traditional Average Fall 2002	Accelerated Deviation Fall 2003	Accelerated Deviation Fall 2003
3.52	-.62	-.51

Appendix F

Table Averages and Deviations for Fundamentals of Refrigeration Survey Questions

Generalizing students satisfaction rate, an average of the responses to all of the survey questions in the particular table, will be used as a comparison between course sections. Deviations from the calculated average of the traditional sixteen-week format will be shown and the differences for the accelerated sections will be recorded in the appropriate columns.

Table 5 Average an Deviations

Traditional Average Spring 2002	Accelerated Deviation Fall 2003	Accelerated Deviation Fall 2003	Accelerated Deviation Fall 2004
3.58	-.35	-.68	-.35

Table 6 Average an Deviations

Traditional Average Spring 2002	Accelerated Deviation Fall 2003	Accelerated Deviation Fall 2003	Accelerated Deviation Fall 2004
3.60	-.50	-.79	-.46

Table 7 Average an Deviations

Traditional Average Spring 2002	Accelerated Deviation Fall 2003	Accelerated Deviation Fall 2003	Accelerated Deviation Fall 2004
3.65	-.38	-.75	-.25

Table 8 Average an Deviations

Traditional Average Spring 2002	Accelerated Deviation Fall 2003	Accelerated Deviation Fall 2003	Accelerated Deviation Fall 2004
3.66	-.56	-.81	-.35