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ABSTRACT

A study was conducted to determine the effectiveness of computer-based instruction for delivering a cross-cultural module to undergraduate agricultural students enrolled at Texas A&M University. A quasi experimental research method, known as a nonequivalent control group design was used. The population consisted of 68 students enrolled in non-honors sections of the undergraduate course, Agricultural Education 440, Principles of Technological Change, during the fall 1996 semester. A cross-cultural module was developed for delivery by two different instructional methods: traditional classroom and computer based. Three instruments were developed to collect data as pre-test, post-test, and post-posttest. Cronbach's alpha was used to determine the reliability of each instrument. The alphas obtained were pretest=.61; posttest=.80; and post post-test =.77. Students initially had a relatively low cross-cultural knowledge, with the mean score of the pre-test being 49 for the control group and 53 for the treatment group out of 100 points possible. Both traditional classroom and computer based instruction were effective in facilitating learning regarding cross-cultural education. Computer based instruction was more effective. Students perceived computer based instruction to be a valuable teaching tool when used in association with traditional classroom instruction. The null hypothesis that "no difference would exist between the control group and the treatment group" was rejected. (Contains 79 references.) (YLB)

COMPARING AND CONTRASTING THE EFFECTIVENESS OF COMPUTER-BASED INSTRUCTION WITH TRADITIONAL CLASSROOM INSTRUCTION IN THE DELIVERY OF A CROSS-CULTURAL EDUCATIONAL MODULE FOR AGRICULTURALISTS

DEPARTMENT OF AGRICULTURAL EDUCATION

TEXAS A&M UNIVERSITY

COLLEGE STATION, TEXAS 77843

COMPARING AND CONTRASTING THE EFFECTIVENESS OF COMPUTER-BASED INSTRUCTION WITH TRADITIONAL CLASSROOM INSTRUCTION IN THE DELIVERY OF A CROSS-CULTURAL EDUCATIONAL MODULE FOR AGRICULTURALISTS

A Summary Report of Research

by

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FOREWORD

This study conducted by Dr. Theresa Murphrey, using quasi-experimental research, was to compare and contrast the effectiveness of computer-based instruction with traditional classroom instruction in the delivery of a cross-cultural educational module for agriculturalists. The agriculturalists were undergraduate students at Texas A&M University.

Computer-based instruction has been used for a long time in different disciplines to teach knowledge and skills. It has not been used very much to facilitate acquiring higher order apperceptive levels of learning, i.e., interests, understandings, appreciations, values, and ideals. While this study was not intended to appraise the effectiveness of computer-based instruction with respect to students learning cross-cultural concepts above the apperceptive level of knowledge, that was one of the outcomes.

Her findings, conclusions, implications, and recommendations provide food for thought and have implications for application by university instructors, curriculum and instructional designers, people concerned about education for cross-cultural settings, agents of change, program planners, policy makers, and others concerned with the process of improving the effectiveness of educational programs using computer-based instruction. For example, she found that computer-based instruction was significantly more effective in facilitating learning regarding cross-cultural education than was traditional classroom instruction. But, she also found that computer-based instruction was perceived by students to be a valuable teaching tool when used in association with traditional classroom instruction.

Just as important as findings pertaining to the purpose of the study itself were the ancillary findings and implications. For example, it is very evident that there existed both a low level of cross-cultural knowledge and a lack of international experience among the students in the study. This implies that there is a need for cross-cultural education, irrespective of what method is used to provide it. A more important implication may be that agricultural students in college need cross-cultural training. Another implication is that cross-cultural concepts can be learned in a timely manner at a reduced cost by a large number of students in asynchronous settings of time and place.

Dr. Murphrey is to be commended for conducting the research summarized herein. A complete report is on file in the library of Texas A&M University. Dr. Murphrey may be contacted directly for more information about the research as follows:

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January 5, 2000

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Theresa Pesl Murphrey

ABSTRACT

A study was conducted to determine the effectiveness of computer-based instruction to deliver a cross-cultural module to undergraduate agricultural students enrolled in a university. The research design used was a quasi-experimental research method known as a nonequivalent control-group design (Borg & Gall, 1989). The population consisted of sixty-eight students enrolled in non-honors sections of the undergraduate course, Agricultural Education 440, "Principles of Technological Change," during the Fall 1996 semester at Texas A&M University in College Station, Texas.

A cross-cultural module was developed for delivery by two different instructional methods: traditional classroom instruction and computer-based instruction. Three instruments were developed to collect data: pretest, posttest, and post posttest. Cronbach's alpha was used to determine the reliability of each instrument. The alphas obtained were: Pretest = .61; Posttest = .80; and Post posttest = .77.

Students in the population studied initially had a relatively low cross-cultural knowledge as the mean score of the pretest was 49 for the control group and 53 for the treatment group out of 100 points possible. Both traditional classroom instruction and computer-based instruction were effective in facilitating learning regarding cross-cultural education. Computer-based instruction was more effective in facilitating learning regarding cross-cultural education than traditional classroom instruction. Computer-based instruction was perceived by students to be a valuable teaching tool when used in association with traditional classroom instruction. The null hypothesis stating that "no difference would exist between the control group and the treatment group" was rejected.

INTRODUCTION

The world is rapidly moving toward a more global economy, a fact to which agricultural educators must respond by developing educational programs to ensure that agricultural students and professionals will be prepared to meet the challenges and opportunities being created in today's global village.

> Over the past decade or so, the world economy has changed profoundly: it has become a truly global system. International trade has grown rapidly; international flows of money have grown explosively. Economic booms spread more readily from country to country, and so do recessions. Interest rates in one economy affect investments in others. Capital roams freely around the world. Without a doubt, these changes have great implications for the ways people, firms, and governments go about their business. The increasing "globalization" of the world economy is a fact, and one that nobody can ignore ("The myth," 1995, p. 15).

Education serves a very important role in society by ensuring continuous development of a competent workforce. Agricultural educators are specifically responsible for ensuring that agricultural students and professionals receive proper training to function competently in the global agricultural environment. Cross-cultural training, learning how to work with individuals from cultures different from one's own, has become an increasingly important component of globalization training. However, in many cases, cross-cultural training is not available or easily accessible to agricultural students and professionals. A study conducted by Vernon Luft at the University of Nevada (1996) revealed that courses that deal with the culturally diverse are needed to increase the sensitivity of individuals to diversity. With this in mind, it is important for agricultural educators to take the necessary steps to ensure that cross-cultural training is provided to agricultural students and professionals. New technology may offer agricultural educators an opportunity to fill this educational need.

Advances in technology, specifically computer-based instruction, may be creating an opportunity to provide cross-cultural training to many agricultural students and professionals who previously did not have access to this training. Computer-based instruction has been shown to deliver high quality training, assist the educational process, require less time to achieve the same amount of training, and cost less than instructor-led training ("Multimedia training," 1995). Although computer-based instruction has been shown to be very effective and efficient in a variety of other fields (i.e., engineering, science, and medicine), only limited research has been focused on agriculture. A study involving horticultural education found computer-based instruction to be just as effective as traditional instruction (Corbett, 1992) and an agricultural economics study noted similar effectiveness (Marrison, Tao, and Frick, 1993).

Purpose and Objectives

The purpose of this study was to determine the effectiveness of computer-based instruction to deliver a cross-cultural module to undergraduate agricultural students enrolled in a university. The objectives developed to guide the study were as follows:

(1) Determine the cross-cultural knowledge baseline of students prior to exposure to a cross-cultural module.
(2) Determine the cross-cultural knowledge level of students following exposure to a cross-cultural module delivered via traditional classroom instruction.
(3) Determine the cross-cultural knowledge level of students following exposure to a cross-cultural module delivered via computer-based instruction.
(4) Compare and contrast the cross-cultural knowledge level of students exposed to the computer-based instruction with students exposed to the traditional classroom instruction and to each of their respective baselines.
(5) Determine the cross-cultural knowledge level of all students after a two to four-week lapse in time from their initial exposure to the cross-cultural module.
(6) Determine the perceptions of students concerning the appropriateness of computer programs as educational tools.
(7) Determine if there is a relationship between selected personal characteristics and the cross-cultural knowledge level of students in both the control and treatment groups.

Null Hypothesis

The null hypothesis for this study stated that no significant difference would exist between the knowledge level of students exposed to a cross-cultural educational module via traditional classroom instruction and those exposed to a cross-cultural educational module via computer-based instruction.

Significance of Study

Globalization is impacting the way in which American citizens and agricultural professionals conduct business. "As American workplaces become more culturally diverse and more globally dependent, conflicts between different cultures have become more frequent" (York, 1995, p. 424). As the world becomes increasingly interconnected, it is important that agriculturalists understand cross-cultural issues.

Computer-based instruction is an effective educational tool in engineering, microbiology, anatomy, and medical education programs (Fasce, Ramirez, & Ibanez, 1995; Inglis, Fu, & Kwokchan, 1995; Jones & Kane, 1994; Tothcohen, 1995). Determining the effectiveness of computer-based instruction to deliver cross-cultural education will provide reliable information that agricultural educators can use to decide whether or not to include computer-based instruction in their strategies for delivering cross-cultural educational programs. If computer-based instruction proves to be effective, cross-cultural education can be provided in a timely manner, at a reduced cost, to an increased number of students.

Theoretical Base

The following statements summarize the theoretical base for the study that was developed following a review of the literature. The theoretical base affected the development of the hypothesis and objectives.

1. Increasing globalization has created a need for cross-cultural education for agriculturalists.
2. There is a need to increase sensitivity to diversity in international settings for agriculturalists.
3. Effective cross-cultural training methods can be developed that include factual, analytical, and experiential training.
4. Computer-based instruction has been shown to be effective in fields such as engineering, science, and medicine.
5. Computer-based instruction has been developed to permit individuals to learn facts and analyze decisions in areas such as farm safety, landscape design, and construction.
6. It can be theorized that such computer-based instruction can be developed to deliver cross-cultural education for agriculturalists.

Definition of Terms

For the purpose of this study, the following terms are defined operationally as follows:

Computer-based instruction - Self-paced instruction that learners access from computers.
Cross-Cultural - Cultural interaction among individuals from different countries or with different cultural backgrounds.
Globalization - A process of acquiring the skills, knowledge, and attitudes to allow one to function more effectively in the economic, political, and cultural environment inside and outside one's geographic borders.
Multimedia - The use of computer-based programs that incorporate sound, text, graphics, and motion into computer-based instruction.
Traditional Classroom Instruction - Instruction provided by a teacher to a class of students using Powerpoint® to present information and encourage student/teacher interaction.

Assumptions

The major assumption of this study was that the sample of students in the study was representative of undergraduate agricultural students enrolled in similar courses. It was also assumed that all students involved in the study were familiar with computers as they were required to complete assignments using the World Wide Web before the cross-cultural module was taught. In addition, it was assumed that the researcher did not inject bias into the study by serving as the instructor for the control group.

Limitations

Limitations existed that should be considered in appraising the findings. It is recognized that the effectiveness of the computer-based instruction could have been limited by the degree to which the researcher was able to create and format the computer-based instruction that was used. It is also recognized that the cross-cultural knowledge test was limited to measuring a change in cross-cultural knowledge and does not indicate whether or not there was a change in student's cross-cultural behavior. In addition, it was not known if "academically successful" students were concentrated in either the control group or the treatment group on the basis of overall grade point average.

Delimitations

This study was delimited to the sixty-eight students enrolled in the non-honors section of the undergraduate course, Agricultural Education (AGED) 440, "Principles of Technological Change," during the fall semester of 1996 at Texas A&M University in College Station, Texas. The study was delimited further to those twenty-six students who completed the pretest, posttest, and post posttest instruments, properly and completely.

METHODOLOGY

Research Design

The research design used in this study was a quasi-experimental research method known as a nonequivalent control-group design (Borg & Gall, 1989). The nonequivalent control group research design was selected because this study involved the testing of intact groups and did not allow for random assignment of subjects to the groups. The primary strength of this design is that baseline data are collected at the outset of the experiment. The establishment of baseline data is an important tool in making meaningful comparisons (Isaac & Michael, 1981).

The primary weakness of the nonequivalent control-group design is that a threat to internal validity exists because subjects are not randomly assigned to groups; however, the researcher reduced the possibility of violating internal validity by conducting an analysis of covariance and by describing the characteristics of each group at the outset of the experiment. The steps of the research method involved the following:

(1) Assigned each class to one of two groups -- a control group (traditional classroom instruction) and a treatment group (computer-based instruction).
(2) Administered a pretest to all students in both groups.
(3) Administered a treatment (computer-based instruction) to the treatment group.
(4) Administered traditional classroom instruction to the control group.
(5) Administered a posttest to both the control group (traditional classroom instruction) and the treatment group (computer-based instruction).
(6) Administered a post posttest to both the control group (traditional classroom instruction) and the treatment group (computer-based instruction) five weeks following the administration of the posttest.

Population

The population of the study consisted of sixty-eight students enrolled in the non-honors sections of the undergraduate course, Agricultural Education (AGED) 440, "Principles of Technological Change," during the Fall 1996 semester at Texas A&M University in College Station, Texas. Participation was voluntary and each subject was required to sign an informed consent form prior to their participation. The course, AGED 440, consisted of four non-honors sections to which two teaching assistants had been assigned. To ensure that the teaching assistant was not a variable in the experiment, one of each of the teaching assistant's sections was assigned to each group.

Of the sixty-eight students enrolled in the class, sixty students (88%) participated in one or more parts of the study. Fifty-one students (75%) completed the pretest. Forty-three students (63%) completed the posttest. Forty-five students (66%) completed the post posttest. Fifty-three students (78%) were exposed to the cross-cultural module. Thirty-three students (49%) did not complete one or more parts of the study. Table 1 illustrates the level of student participation for each phase of the study. Of the twenty-seven students (40%) who completed all phases of the study, one student was identified who improperly completed the post posttest. Therefore, the population was limited to the twenty-six students (38%) who were exposed to the cross-cultural educational module and who completed all of the instruments, properly and completely.

Table 1. Level of Student Participation in Each Phase of the Study

	Phase of Study			
Number of Students:	Exposed to Module	Pretest	Posttest	Post Posttest
Traditional Classroom Instruction Group	25	23	18	18
Computer-Based Instruction Group	28	21	21	21
Students not exposed	7	7	4	6
Totals:	60	51	43	45

Development of the Cross-Cultural Module

The cross-cultural module was created by the researcher following an extensive literature review and in consultation with cross-cultural experts regarding accuracy and appropriateness to ensure content validity of the materials. The module was developed in such a way as to enlighten students with respect to cultural diversity and also to provide information to assist them in dealing more effectively in the global environment. The content of the module consisted of five areas: 1) the "global village" concept, 2) an overview of American culture, 3) the importance of understanding one's own culture, 4) evaluating the cultural, political, and economic environment of a country, and 5) an introduction to culture shock.

The cross-cultural module was developed for delivery by two different instructional methods: traditional classroom instruction and computer-based instruction. The traditional classroom instructional approach consisted of lecture and teacher/student interaction. The computer-based instruction was developed using Authorware®, an authoring software program, and included the use of multimedia (sound, motion, text, and graphics). Identical information was presented in both the traditional classroom instructional setting and the computer-based instructional setting. Both methods of instruction lasted approximately fifty minutes.

The traditional classroom instruction was developed using the most up-to-date technology available for classroom instruction. A Powerpoint® presentation consisting of fifty-seven screens of information was developed to be used in presenting the cross-cultural material. Questions were prepared to ask the students throughout the traditional classroom instruction period to encourage student/teacher interaction. A "handout" of the Powerpoint® slides and a worksheet regarding cultural orientations was prepared for distribution to the students prior to the instruction. The traditional classroom instruction was organized in such a way as to allow and encourage students to share their ideas with the class.

The computer-based instructional module was developed by the researcher in consultation with curriculum development specialists. The researcher had no prior training in the use of computer programs to author computer-based instruction. The researcher evaluated various computer programs and selected the computer program, Authorware®, based on the needs of the study. Text was used to deliver specific content to the student. Graphics and sounds were collected and imported into the computer-based instruction to engage the student in the module. Motion was also incorporated into the computer-based instruction to illustrate various concepts. Instructions were developed to be provided on the computer screen to assist the student in using the program. Figure 1 displays an instruction to "Read 1st." The instructions were written in such a way as to accommodate a student with limited computer experience.

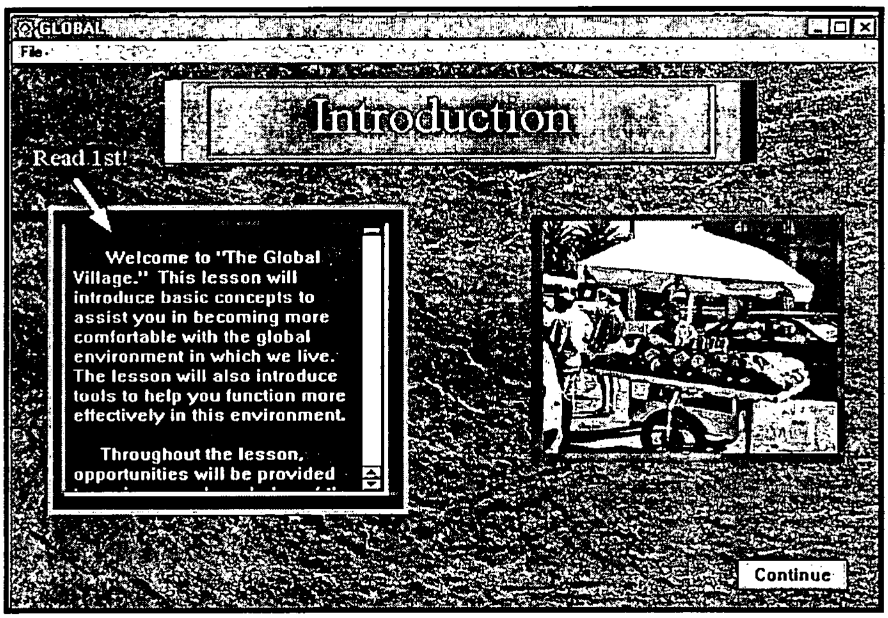

Figure 1. Example of the Instructions Provided to the Students During the Computer-Based Instructional Approach.

In addition, interactive items within the computer-based instruction were outlined in red to indicate that the items were interactive. Instructions were provided to encourage the students to "click" on the items outlined in red to receive additional information.

Fill-in-the-blank questions were developed to be displayed following the presentation of informational material to allow the students to test their comprehension of the subject matter. The computer-based instruction consisted of one set of fill-in-the-blank questions for each of the five parts within the module. Feedback was incorporated into the computer-based instruction to be provided to the student based on whether he/she answered questions correctly or incorrectly. The computer-based instruction was developed in such a way as to allow the student control over movement through the lesson. Interactive buttons were developed to allow the student to advance to the next screen as desired. Throughout the development of the computer-based instruction, effort was made to keep the student engaged in the lesson.

Delivery of the Cross-Cultural Module

The traditional classroom instruction and the computer-based instruction were delivered four weeks following the administration of the pretest. Students were required to sign an attendance record and provide their student identification number so that the researcher would know who had been exposed to the traditional classroom instruction and who had been exposed to the computer-based instruction.

The classroom instruction was administered by the researcher and took place during the regularly scheduled meeting time and in the normally scheduled location. The computer-based instruction took place during the regularly scheduled meeting time in a university computer lab designated by the researcher. A facilitator was available during the computer-based instruction to ensure that computers were operational and to assist students in the operation of the computer if necessary. No assistance in regard to cross-cultural content was provided by the facilitator during the computer-based instruction. Identical handouts were provided to the computer-based instruction group as were provided to the traditional classroom instruction group.

Instrumentation

Three instruments were used to collect data: the pretest, the posttest, and the post posttest. The pretest consisted of fifty multiple choice questions designed to assess the cross-cultural knowledge of the students and sixteen multiple choice questions pertaining to individual student information designed to describe the population such as gender, age, race, computer experience, and international experience. The posttest consisted of the identical multiple choice questions designed to assess cross-cultural knowledge of the students that were used in the pretest, except that the questions were rearranged into a different order. The second part of the posttest consisted of twenty-four statements regarding the students' perceptions concerning the appropriateness of computer programs as educational tools. Students were asked to respond to a series of statements using a Likert-type scale by marking Strongly Agree, Agree, Unsure/No Opinion, Disagree, or Strongly Disagree. These statements included three categories:

perceptions of computer-based instruction; perceptions of technology; and statements to describe the population. The post posttest consisted of the identical multiple choice questions, designed to assess the cross-cultural knowledge of the students, that were used in the previous pretest and posttest. The questions were once again rearranged into a different order. At no time did the researcher give feedback to the students as to what were the "correct" answers to the questions. This was done to ensure that the readability and interpretation of the questions were identical for each instrument. This was the rationale for not changing the wording of the questions.

Each instrument was developed by the researcher in consultation with experts in test development and cross-cultural knowledge. Faculty and graduate students in the Department of Agricultural Education at Texas A&M University examined the questionnaires and provided suggestions for improvements. In addition, the pretest, posttest, and post posttest were each evaluated by the researcher for reliability. One question (number four on the pretest) was deleted from the cross-cultural knowledge test due to an error in the development of the instrument. Therefore, the pretest, posttest, and post posttest knowledge scores of the students were calculated based on forty-nine questions.

Cronbach's coefficient alpha was used to quantify internal consistency for each instrument. Evaluation of the forty-nine knowledge questions used in each instrument resulted in the following coefficient alphas: Pretest = .61; Posttest = .80; and Post posttest = .77. Nunnally (1967) suggested that in the early stages of research a modest reliability of .60 or .50 will suffice. Thus, no additional questions were eliminated from the study.

The second part of the posttest consisted of statements regarding the students' perceptions concerning the appropriateness of computer programs as educational tools. These statements were divided into three categories: perceptions of computer-based instruction; perceptions of technology; and statements to describe the population. Cronbach's coefficient alpha was again used to quantify internal consistency for the statements relating to computer-based instruction and those relating to technology. Evaluation of the eleven statements relating to the perceptions of computer-based instruction resulted in a coefficient alpha of .87. Evaluation of the seven statements relating to the perceptions of technology resulted in a coefficient alpha of .78. Thus, no statements were eliminated from the study.

Pilot Tests

The instruments, the traditional classroom instructional content, and the computer-based instructional content were each pilot tested prior to being used with the students in the study.

The instruments were pilot tested in the summer of 1996 with students enrolled at Texas A&M University in AGED 440, "Principles of Technological Change." The three parts of the instruments (the cross-cultural knowledge section, the demographic section, and the perception section) were completed by the students. Students were requested to mark any questions that they did not understand. Statistical analysis was used to conduct an item analysis and to determine the discriminating level of the instrument.

The traditional classroom instruction was pilot tested in the summer of 1996 with students enrolled at Texas A&M University in AGED 440, "Principles of Technological Change." Following instruction, students were asked to respond as to whether or not they understood the material which was presented.

The computer-based instruction was reviewed by curriculum development specialists regarding the presentation of the material and pilot tested by a panel of eight undergraduate students in the summer of 1996 who made recommendations for improvement. The computer-based instructional techniques were revised in regard to content based on recommendations made by cross-cultural experts for the traditional classroom instruction.

Data Collection

The pretest, posttest, and post posttest served as the data collection instruments. Each instrument was administered during a class in which all students (both the control group and the treatment group) were expected to attend. Participation was voluntary and each student was required to sign an informed consent form prior to their participation. The students were not instructed to "study" for an exam regarding the topic as the study was not intended to measure "studying capability." The instruments were administered in the following order: 1) pretest, 2) posttest, and 3) post posttest.

Scantrons and questionnaires were distributed to the entire class. Students marked their nine-digit student identification number on the completed instrument to allow proper identification and coding of data. Upon completion, all scantrons and questionnaires were collected. All information obtained remained confidential. Students required approximately forty minutes to complete the pretest and posttest and required approximately thirty minutes to complete the post posttest.

FINDINGS AND DISCUSSION

Profile of the Population

The population of the study consisted of students enrolled in the non-honors sections of the undergraduate course, Agricultural Education (AGED) 440, "Principles of Technological Change," during the Fall 1996 semester at Texas A&M University in College Station, Texas. The profile of the population is based on sixteen questions that were included with the pretest instrument related to personal characteristics. A second attempt to obtain this information was conducted during the administration of the post posttest from those students who had not provided the information previously.

The total group of students (n = 56) who provided this information was compared, based on personal characteristics, to the twenty-six students who completed all phases of the study. Based on the comparison of the two groups, it is believed that the twenty-six students who completed all phases of the study are representative of the entire population in the study.

The twenty-six students who completed all phases of the study were identified based on the group to which they were assigned: the control group (traditional classroom instruction) and the treatment group (computer-based instruction). The control group (n=13) and the treatment group (n=13) were then compared based on personal characteristics using chi square statistics. Chi square statistics revealed that while the demographic characteristics of the students differed, the two groups did not vary significantly from one another.

The control group and the treatment group reported similar levels of computer experience; however, the two groups did differ regarding the ownership of a computer. The control group contained a higher number of students than the treatment group who reported that they did own a computer and the chi square statistic showed the difference to be significant. Based on the percentages, it was decided that this difference would not bias the study in the direction of the experimental group and its use of computer-based instruction as the control group contained the larger number of students who owned computers. The control group and the treatment group were not significantly different in any characteristic other than the ownership of computers, thus the description of the sample which will follow has been reported collectively and is based on the responses of the twenty-six students who completed all phases of the study.

The majority of the participants (92.3%) were enrolled in the College of Agriculture. The participants consisted of 50% males and 50% females and were predominately white (92.3%) with the remainder of the population (7.7%) being hispanic. Enrollment records for the College of Agriculture and Life Sciences at Texas A&M University for the Fall 1996 semester revealed the following racial distribution: 82% White, 6.7% Hispanic, 7% international and less than 2% Black, American Indian, and Asian ("Summary of," 1996). While there were no international students in the population, the percentages of white students and hispanic students were representative of the enrollment in the College of Agriculture and Life Sciences at Texas A&M University. In addition, the male/female percentages noted above were also representative of the enrollment in the College of Agriculture and Life Sciences as the enrollment report indicated that there were 55% males and 45% females in the college during the Fall 1996 semester ("Summary of," 1996).

Over 50% of the students were twenty-one years of age. Only a small percentage (19.2%) of the students were 20 years of age. The remaining students (26.9%) were twenty-two years of age or older. The level of computer experience varied among students. More than half (65.4%) of the students reported having had moderate computer experience. No students reported having "no" computer experience. Slightly more than half of the participants (53.8%) reported that they did not own a computer. In regard to international experience, slightly less than half (46.2%) of the participants reported never traveling outside the United States, even two days or less. An even higher percentage of participants (61.5%) reported not having traveled outside the United States for three days or more. More than half (58%) of the students believed that they will be involved in international activities in their future jobs. However, an even greater percentage of the students (75%) did not believe that cross-cultural training should be required of all students, which makes one wonder how realistic the students were.

Findings Related to Objective 1

Objective 1 was to determine the cross-cultural knowledge baseline of the students in both the control group and the treatment group prior to exposure to the cross-cultural module. The pretest instrument was used to obtain this information. Figure 2 displays the summary distribution statistics for both the control group (traditional classroom instruction) and the treatment group (computer-based instruction). As noted by the horizontal line within the box, the median for the control group was 47 and the median for the treatment group was 51. Scores attained by the control group ranged from 41 to 65 out of a possible score of 100. Scores attained by the treatment group ranged from 39 to 67 out of a possible score of 100. The control group attained a pretest mean score of 49 while the treatment group attained a mean score of 53. As revealed in Figure 2, the treatment group contained more variability, reflecting a positive skew. A review of the demographic information regarding the outlier, case #13 in Figure 2, reveals that this student had previous international experience. Thus, it is not surprising that this student scored higher than the other students on the pretest.

A *t*-test was conducted to determine if there were statistical differences between the control group and the treatment group on their pretest scores. No significant difference was found between the two groups ($t = -1.302$, $p = .205$). Although the treatment group (mean score of 53.06) scored slightly higher on the pretest than the control group (mean score of 49.15), the groups were not significantly different from one another.

Findings Related to Objective 2

Objective 2 was to determine the cross-cultural knowledge level of students following exposure to a cross-cultural module delivered via traditional classroom instruction. The posttest instrument served as the means to obtain this information. The posttest scores for the students exposed to the traditional classroom instruction ranged from 47 to 86 out of a possible score of 100. Comparison of the posttest mean (64.05) to the pretest mean (49.15) reveals that the students did gain knowledge from the traditional classroom instruction. The results of a *t*-test ($t = 6.459$, $p < .001$) reveal that the students scored significantly higher on the posttest than the pretest.

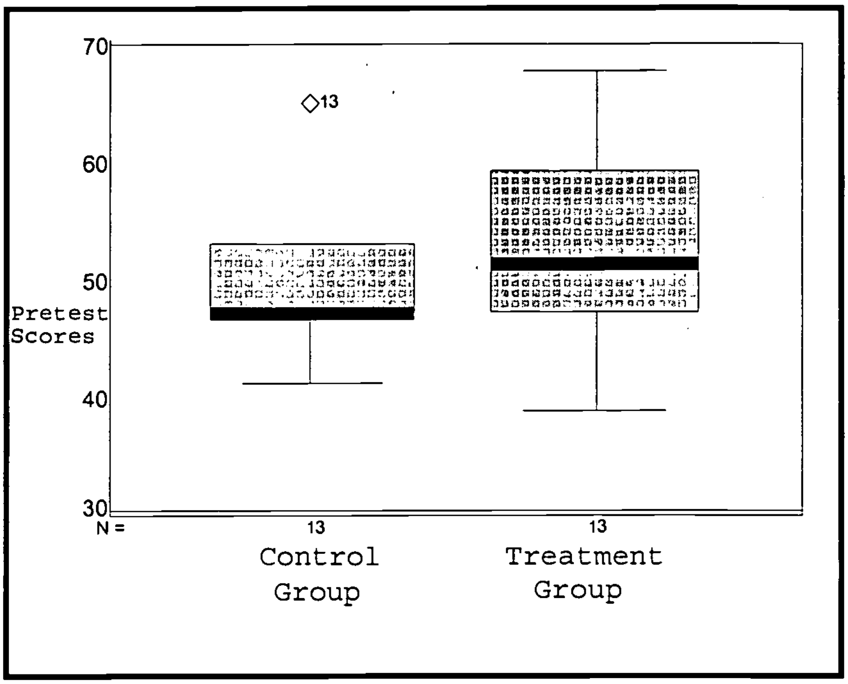

Figure 2. Comparison of Pretest Scores Between the Control Group (Traditional Classroom Instruction, n=26) and the Treatment Group (Computer-Based Instruction, n=26), AGED 440, Texas A&M University, Fall 1996.

Findings Related to Objective 3

Objective 3 was to determine the cross-cultural knowledge level of students following exposure to the cross-cultural module delivered via computer-based instruction. The posttest instrument served as the means to obtain this information. The students' posttest scores ranged from 65 to 84 out of a possible score of 100. Comparison of the posttest mean (73.78) to the pretest mean (53.06) reveals that the students did gain knowledge from exposure to the computer-based instruction. The results of a *t*-test ($t = 10.507$, $p < .001$) reveal that the students scored significantly higher on the posttest than the pretest.

Findings Related to Objective 4

Objective 4 was to compare and contrast the cross-cultural knowledge level of students exposed to the computer-based instruction with students exposed to the traditional classroom instruction. Figure 3 displays the summary statistics for both the control group (traditional classroom instruction) distribution and the treatment group (computer-based instruction) distribution for the posttest scores. As noted by the horizontal line within the box, the median for the control group was 61 and the median for the treatment group was 73. Posttest scores attained by the control group ranged from 47 to 86 out of a possible score of 100. Posttest scores attained by the treatment group ranged from 65 to 84 out of a possible score of 100. The control group attained a posttest mean score of 64 while the treatment group attained a mean score of 74. Both the control group and the treatment group displayed an increase in mean scores attained on the posttest as compared to their respective pretest scores.

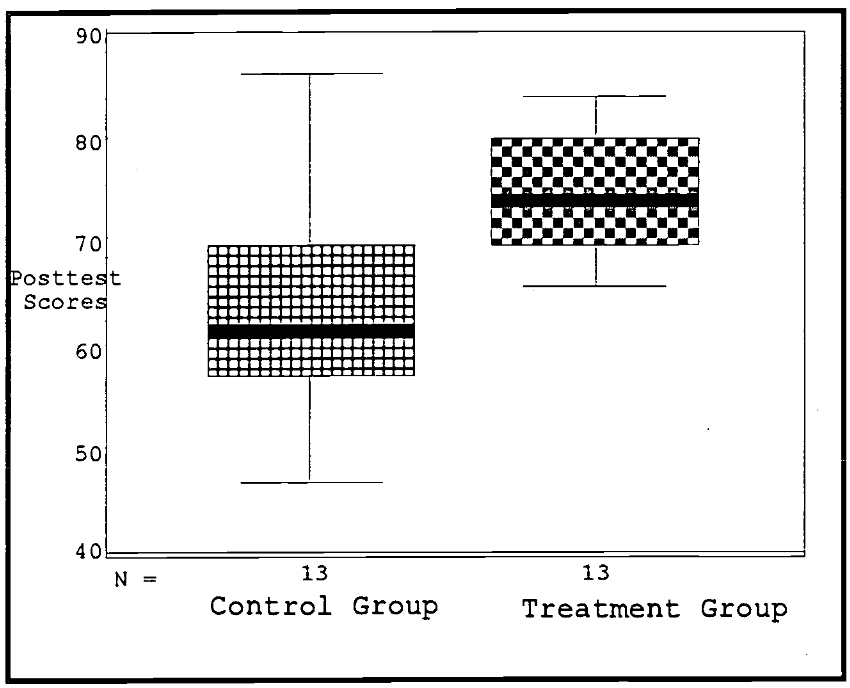

Figure 3. Comparison of Posttest Scores by Control Group (Traditional Classroom Instruction, n=13) and Treatment Group (Computer-Based Instruction, n=13), AGED 440, Texas A&M University, Fall 1996.

The statistical test analysis of variance was conducted with the pretest as a covariate to determine if a significant difference existed between the control group and treatment group posttest scores. Table 2 illustrates that a significant difference existed between the control group and the treatment group posttest scores. As indicated in Table 2, the significance of the pretest

(.004) verified that it was appropriate to include the pretest as a covariate in the analysis. As shown by the Test Group (significant at .021) the difference between the control group and the treatment group posttest scores was statistically significant, even when accounting for the pretest scores.

Table 2. Analysis of Variance of Pretest and Posttest Scores Using Group (Control and Treatment) and Pretest as Covariates and Posttest Results as the Dependent Variable, AGED 440, Texas A&M University, Fall 1996

Source	Sum of Squares	df	Mean Squared	F	Sig.
Pretest	532.73	1	532.73	9.98	.004
Test Group	325.97	1	325.97	6.11	.021
Model	1148.50	2	574.25	10.76	.001
Residual	1228.07	23	53.40		
Total	2376.57	25	95.06		

Findings Related to Objective 5

Objective 5 was to determine the cross-cultural knowledge level of all students following a two to four-week lapse in time from the students' initial exposure to the cross-cultural module. The administration of the post posttest served as the means to obtain this information. Figure 4 displays the summary statistics for both the control group (traditional classroom instruction) distribution and the treatment group (computer-based instruction) distribution for the post posttest scores. As noted by the horizontal line within the box, the median for the control group was 65 and the median for the treatment group was 71. Post posttest scores attained by the control group ranged from 53 to 76 out of a possible score of 100. Post posttest scores attained by the treatment group ranged from 63 to 90 out of a possible score of 100. The control group attained a post posttest mean score of 65 while the treatment group attained a mean score of 74. Figure 4 reveals that the treatment group attained a higher range of post posttest scores than did the control group.

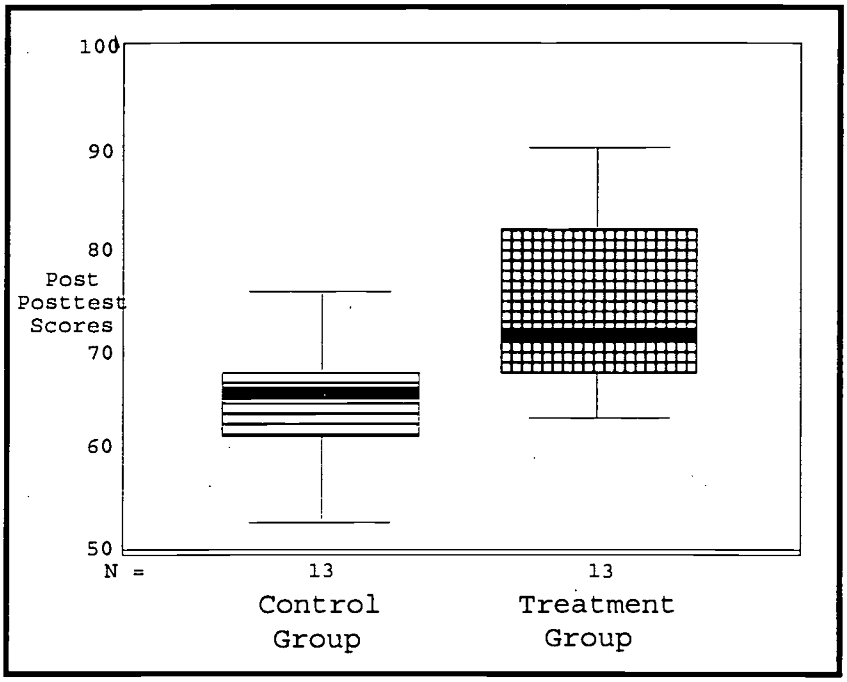

Figure 4. Comparison of Post Posttest Scores by Control Group (Traditional Classroom Instruction, n=13) and Treatment Group (Computer-Based Instruction, n=13), AGED 440, Texas A&M University, Fall 1996.

Table 3 provides a listing of the mean scores achieved by the control group and the treatment group for each instrument. Comparison of the pretest, posttest, and post posttest scores received by the control group and the treatment group revealed that both groups had similar posttest and post posttest scores. Comparison of each group's posttest score to their corresponding post posttest score revealed that the control group (traditional classroom instruction) achieved only a slightly higher score on the post posttest while the treatment group (computer-based instruction) attained a much higher score on their post posttest than their posttest. The statistical test of analysis of variance was conducted with the pretest as a covariate to determine if a significant difference existed between the post posttest scores of the control group and the treatment group. As shown by the Test Group (significant at .008) in Table 4, there was a statistically significant difference between the post posttest scores attained by the control group and those attained by the treatment group.

Table 3. Mean and Standard Deviations for the Control Group (Traditional Classroom Instruction, n=13) and the Treatment Group (Computer-Based Instruction, n=13), AGED 440, Texas A&M University, Fall 1996

	Control		Treatment	
	Mean	Std. Dev.	Mean	Std. Dev.
Pretest	49.15	6.52	53.06	8.66
Posttest	64.05	2.92	73.78	6.00
Post Posttest	64.68	6.20	74.41	8.96

Table 4. Analysis of Variance of Pretest and Post Posttest Scores Using Group (Control and Treatment) and Pretest as Covariates and Posttest Results as the Dependent Variable, AGED 440, Texas A&M University, Fall 1996

Source	Sum of Squares	df	Mean Squared	F	Sig.
Pretest	509.04	1	509.04	12.79	.002
Test Group	330.80	1	330.80	8.31	.008
Model	1124.81	2	562.40	14.13	.000
Residual	915.37	23	39.80		
Total	2040.17	25	81.61		

Findings Related to the Null Hypothesis

To test the null hypothesis that computer-based instruction elicits the same learning in regard to cross-cultural issues as traditional classroom instruction, pretest and posttest measures at two points in time were analyzed via a 2x2 analysis of variance (ANOVA). Instruction was provided to two groups of students using two methods (traditional classroom instruction and computer-based instruction) and the pretest was used as a covariate while stability of knowledge was the "within subject" variable. As revealed in Table 5, the two groups' (the control group and the treatment group) average of the posttest and post posttest scores were statistically significantly different (.005) from one another. The Eta Squared value of .291 revealed that the treatment accounts for much of the variability between the groups. In addition, the significance

(.985) noted within subjects reveals that there was not a significant difference within subjects. Figure 5 provides a profile plot of the mean scores attained by the control group and the treatment group. As can be seen from the profile plot, the treatment group attained higher scores than the control group on the pretest, posttest, and post posttest. However, the increase in the posttest and post posttest scores of the treatment group are significantly higher than the scores attained by the control group, even when accounting for the difference in the pretest scores.

Table 5. Repeated Measures Analysis of Variance for the Effects of Instruction Using an Average of the Two Posttest Scores Attained by the Control Group (Traditional Classroom Instruction, n=13) and the Treatment Group (Computer-Based Instruction, n=13), AGED 440, Texas A&M University, Fall 1996

Source	SS	df	MS	F	p	Eta Squared	Observed Power
Between Subjects							
Pretest Scores	1041.64	1	1041.64	14.98	.001	.394	.959
Group	656.75	1	656.75	9.45	.005	.291	.837
Error	1598.93	23	69.52				
Within Subjects							
Time	.471	1	.471	.020	.889	.001	.052
Time * Pretest Scores	.135	1	.135	.006	.941	.000	.051
Time * Group	8.9E-03	1	8.9E-03	.000	.985	.000	.050
Error	544.510	23	23.674				

Group = Type of Instruction

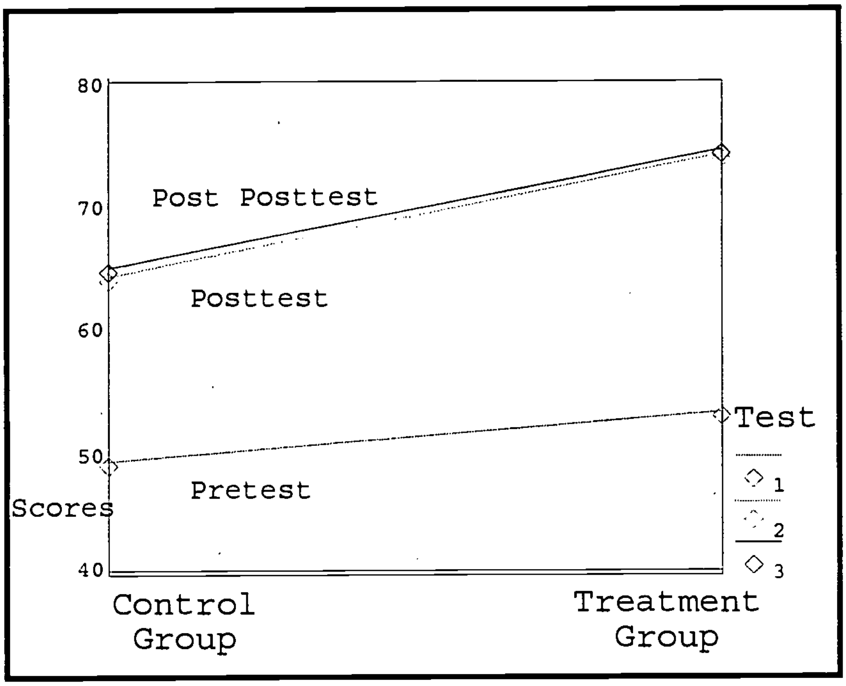

Figure 5. Profile Plot of Estimated Marginal Means for the Pretest, Posttest, and Post Posttest for Control Group (Traditional Classroom Instruction, n=13) and Treatment Group (Computer-Based Instruction, n=13), AGED 440, Texas A&M University, Fall 1996.

Findings Related to Objective 6

Objective 6 was to determine the perceptions of students concerning the appropriateness of computer programs as educational tools. This information was obtained through questions included on the posttest. Students were requested to respond to statements using a Likert-type scale by marking Strongly Agree, Agree, Unsure/No Opinion, Disagree, or Strongly Disagree. The statements were divided into three categories: perceptions of computer-based instruction, perceptions of technology, and statements to describe the population. All students who had been exposed to either the traditional classroom instruction or to the computer-based instruction and had completed the posttest were included in the comparison.

Evaluation of t-values reveal that there was no significant difference between the control group and the treatment group. Table 6 presents the mean responses for each of the statements relating to perceptions of computer-based instruction for the entire group of students (n=44). Students disagreed (mean score of 2.57 on the Likert scale) with the statement that computers could be used successfully without the presence of an instructor. The students did, however, express strong support (mean score of 4.11 on the Likert scale) in agreement with using computers as a teaching tool in the classroom. Students also expressed support (mean score of 4.14 on the Likert scale) that computers could enhance learning, but they disagreed (mean score of 2.02 and 2.00 on the Likert scale, respectively) with the idea that computers could provide more effective feedback than traditional classroom instruction or that computer-based instruction was just as interactive as traditional classroom instruction.

Table 6. Means for Perceptions Related to Computer-Based Instruction for the Entire Group of Students (n = 44), AGED 440, Texas A&M University, Fall 1996

Statement	Mean [a]
Computer-based instruction is a good method to use for learning at home.	3.50
Computer-based instruction in a good method to use for learning in the classroom	3.25
If given the choice, I would select computer-based instruction over traditional classroom lectures.	2.27
If given the opportunity, I would choose to take my classes away from campus.	1.86
Computer-based instruction is just as interactive as classroom instruction.	2.00
Computer-based instruction provides more effective feedback than traditional classroom instruction.	2.02
I believe computer-based instruction can be used successfully without the presence of an instructor for college classes when appropriate.	2.57
I believe computers can enhance learning.	4.14
I enjoy using the computer to learn about new topics.	3.80
Learning with computers is more comfortable than traditional classroom instruction.	2.20
I believe computers can be used as a teaching tool in the classroom for appropriate college classes.	4.11

[a] A value approaching 5 indicates agreement with the statement;
A value approaching 1 indicates disagreement with the statement.

Evaluation of the student responses to statements relating to the students' perceptions of technology revealed also that there was no significant difference between the control group and the treatment group. Table 7 presents the mean responses for each of the statements relating to technology for the entire group of students (n=44). Students expressed strong agreement (mean score of 4.39 and 4.52 on the Likert scale, respectively) that they use technology such as the world wide web and electronic mail. They also expressed strong agreement (mean score of 4.73 on the Likert scale) with the idea of using a computer instead of a typewriter for writing papers.

Table 7. Means for Perceptions Related to Technology for the Control Group and the Treatment Group Combined, AGED 440, Texas A&M University, Fall 1996

Statement	N	Mean[a]
I have used the WWW (World Wide Web) to locate information.	44	4.39
I have sent and received messages by electronic mail (e-mail).	44	4.52
I have taken classes requiring me to get information using a computer link.	44	4.59
I prefer to use a typewriter rather than a computer when writing papers.[b]	44	4.73
Computer technology is advancing at a rapid rate.	43	4.81
Computer usage will be an integral part of my future job.	44	3.98
I enjoy working with computers.	43	3.70

[a] A value approaching 5 indicates agreement with the statement;
A value approaching 1 indicates disagreement with the statement.

[b] Statement was recoded to indicate 5 as favorable and 1 as unfavorable. Thus, a score of 5 indicates disagreement and 1 indicates agreement. Agreement is unfavorable.

Based on the responses collected, students preferred a variety of instructional methods. As shown in Figure 6, when asked which instructional method the students preferred, over fifty percent of the students responded that they would prefer a combination of traditional classroom instruction and "stand alone" computer-based instruction while 20.5% of the students preferred traditional classroom instruction and 22.7% of the students preferred computer-based instruction in a lab setting with an instructor present. Only two percent (2.3%) of the students preferred computer-based instruction at home.

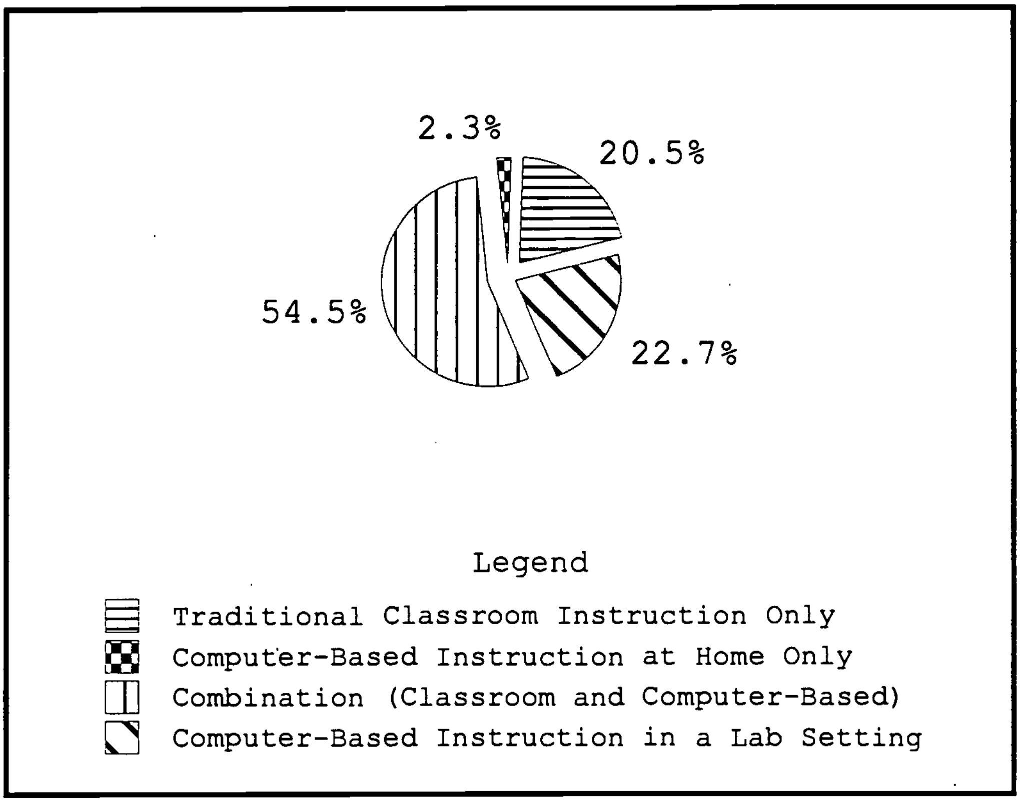

Figure 6. Instructional Method Preferred by Students (n=44), AGED 440, Texas A&M University, Fall 1996.

Findings Related to Objective 7

Objective 7 was to determine if a relationship existed between selected personal characteristics and the cross-cultural knowledge level of students in both the control group and the treatment group. Due to the fact that the population was predominately white (92.3%), race was not a viable characteristic to analyze statistically. However, it should be noted that the two hispanic individuals in the study scored similar to the other members within their assigned group on both the posttest and the post posttest.

The statistical test of analysis of variance was conducted to determine if a significant difference in the pretest scores existed between members of the two groups (control group and treatment group) based on gender and age. No significant difference existed between students within either group. In addition, no significant difference existed between the posttest scores of the two groups (control group and treatment group) based on age or gender.

The statistical test of analysis of variance was conducted to determine if a significant difference in the pretest scores existed between students in the two groups (control group and treatment group) based on international experience. Analysis revealed that in the control group there was a significant difference ($F = 8.750$, sig. = .013) between the students reporting to have a working knowledge of more than one language and those who did not. It is important to note, however, that the students reporting to have knowledge of more than one language scored lower (43) than those who did not (52). There was no significant difference in the treatment group based on international experience. There was no significant difference in the posttest scores of students in either the control group or the treatment group.

Analysis of variance was also used to determine if a significant difference in the scores existed between members of the two groups (control group and treatment group) based on computer experience. No significant difference was revealed in either group based on pretest scores or posttest scores.

A review of analysis of variance findings related to objective 7 revealed that no relationship existed between demographic characteristics, international exposure, or computer experience and the cross-cultural knowledge level of students in either the control group or the treatment group. This finding lends further support to the previous finding that exposure to the cross-cultural module increased the students' cross-cultural knowledge.

Conclusions

The conclusions of this study are based on the major findings from the data collected and analyzed. Each conclusion is followed by the major finding that supports it.

Objective 1 was to determine the cross-cultural knowledge baseline of students prior to exposure to a cross-cultural module. Based on the cross-cultural knowledge scores obtained through pretesting, it was found that the students in the control group had a lower cross-cultural knowledge level (pretest mean score of 49) than the treatment group (pretest mean score of 53) with a difference of four points between the two groups' scores. Because of the low mean scores obtained by the population and because the population was representative of students enrolled in college, it was concluded that there is a need to teach cross-cultural concepts to agricultural students.

Objective 2 was to determine the cross-cultural knowledge level of students following exposure to a cross-cultural module delivered via traditional classroom instruction. Based on the scores obtained from the posttest administered to the group receiving traditional classroom instruction (mean score of 64), it was concluded that regular classroom instruction provided by the teacher was effective in increasing the cross-cultural knowledge level of the students. As noted in the *t*-test ($t = 6.459$, $p < .001$), there was a statistically significant increase in the cross-cultural knowledge scores of the students as compared to their pretest scores.

Objective 3 was to determine the cross-cultural knowledge level of students following exposure to a cross-cultural module delivered via computer-based instruction. Based on the scores obtained from the posttest administered to the group receiving computer-based instruction (mean score of 74), it was concluded that computer-based instruction was effective in increasing the cross-cultural knowledge level of students. As noted in the *t*-test ($t = 10.507$, $p < .001$), there was a statistically significant increase in the cross-cultural knowledge scores of the students as compared to their pretest scores.

Objective 4 was to compare and contrast the cross-cultural knowledge level of students exposed to computer-based instruction with students exposed to traditional classroom instruction and to each of their respective baselines. As revealed through the analysis of variance, it was concluded that computer-based instruction was a more effective means of delivering cross-cultural education than traditional classroom instruction to the population. This conclusion is based on the finding that when one accounts for the pretest, the groups were significantly different ($F = 6.11$, $p = .021$) above and beyond the effect of the pretest.

Objective 5 was to determine the cross-cultural knowledge level of all students after a two to four-week lapse in time from their initial exposure to the cross-cultural module. It was concluded, based on mean scores of the post posttest, that both the control group and treatment group maintained a slightly higher, but not significantly higher, level of cross-cultural knowledge when compared to their respective posttest scores. Computer-based instruction remained more effective in facilitating learning regarding cross-cultural concepts than traditional classroom instruction. This conclusion is based on the finding that the group exposed to computer-based instruction had statistically significantly different ($F = 8.31$, $p = .008$) and higher scores than the group exposed to traditional classroom instruction. In addition, the cross-cultural knowledge scores obtained by the group exposed to computer-based instruction had a higher total value on the post posttest (mean score of 74.41) than on the posttest (mean score of 73.78).

Objective 6 was to determine the perceptions of students concerning the appropriateness of computer programs as educational tools. Based on the finding that the control group's and the treatment group's perceptions regarding computer-based instruction did not differ significantly, it was concluded that exposure to computer-based instruction did not influence the students' perceptions as to the appropriateness of computer programs as educational tools.

Based on the findings that students disagreed (mean score of 2.57 on the five-point Likert Scale) with the statement that computers could be used successfully without the presence of an instructor and that the students expressed strong support (mean score of 4.11 on the Likert Scale) in agreement with using computers as a teaching tool in the classroom, it was concluded that students supported the use of computers as an educational tool so long as the instructor is involved in the instruction.

Also, a majority (54.5%) of the students reported that they preferred a combination of classroom instruction and computer-based instruction. An additional 22.7% reported that they preferred computer-based instruction in a lab setting with an instructor present. Thus, it was concluded that students perceived computer-based instruction to be a valuable teaching tool when used in association with traditional classroom instruction. In essence, the students are saying, "We like computer-based instruction --- but don't take away our instructor!"

Objective 7 was to determine if there is a relationship between selected personal characteristics and the cross-cultural knowledge level of students in the control group and treatment group. The finding that no significant difference existed between students within the control group and students within the treatment group based on demographic characteristics (gender and age), international exposure, or computer experience supports the conclusion that the effect of instruction is independent of the characteristics of the population.

Based on the findings and conclusions related to objectives 4, 5, and 7, it was concluded that the null hypothesis, "no significant difference would exist between the knowledge level of students exposed to a cross-cultural educational module via traditional classroom instruction and those exposed to a cross-cultural educational module via computer-based instruction," was rejected.

Implications

Based on the conclusions previously stated, certain implications emerge. The conclusion that there exists a low level of cross-cultural knowledge and that a large number of students do not have international experience implies that there is a need for cross-cultural education. If college-level students in general have the level of cross-cultural knowledge and international experience as exhibited by the students in this study, an implication exists that agricultural students in college need cross-cultural training. Because this exists, the following question also could be raised, "Is there a need for cross-cultural training for non-college individuals engaged in agriculture?"

It was shown in this study that both traditional classroom instruction and computer-based instruction were effective in teaching the cross-cultural educational module, and it is known that traditional classroom instruction can be and is used effectively in educational programs. However, traditional classroom instruction does not address the need to provide "just-in-time training" (e. g., students taking advantage of a last minute opportunity to participate in a study abroad tour) or "just-in-place training," (e. g., students requiring training in different locations). Thus, the implication exists that computer-based instruction could be effective in meeting "just-in-time" and "just-in-place" needs.

Because computer-based instruction was shown to be effective in this study, the implication exists for computer-based instruction to be used to teach those basic skills necessary to be used in understanding more complex processes. Retention of knowledge is the first level of Bloom's hierarchy of learning (knowledge, comprehension, application, analysis, synthesis, and evaluation)(Bloom, 1956). Computer-based instruction could be used as a preparation stage for traditional classroom instruction to assist the students to enter classroom discussion at a more advanced level so that time spent in the classroom could be used in facilitating comprehension and application, instead of serving as a time to present information.

Because students expressed support for computer-based instruction with the presence of an instructor, an implication exists that if instructors do not develop user-friendly programs, the students may not use the programs as expected and thus may not reflect the same level of effectiveness as demonstrated in this study. Care should be taken to ensure that students know where they can obtain assistance.

Because the researcher had no prior training on the use of Authorware® and because it was possible to develop useable and effective material in a reasonable amount of time (three months), an implication exists that other instructors can use computer-authoring programs such as Authorware® to develop effective materials.

Recommendations

The following recommendations for action and future research are presented based on the major findings and conclusions of this study.

Recommendations for Action

1. Cross-cultural education should be provided to students enrolled in college programs of study.
2. Computer-based instruction and traditional classroom instruction should be used together to provide cross-cultural education to students enrolled in college programs of study.
3. Computer-based instruction should be used to teach basic concepts that are required to be retained in order to understand more complicated processes and concepts in cross-cultural education.
4. Computer-based instruction should be developed in a user-friendly manner with clear, systematic instructions.
5. Effort should be made to incorporate additional technologies (e. g., Internet resources, electronic mail) into cross-cultural educational programs.

Recommendations for Further Research

1. Considering the small population used for this study, it is recommended that the study be repeated using a larger and more diverse population.
2. Further research should be conducted to determine the exact combination of technologies that are most effective for delivering cross-cultural educational programs. For example, a study should be conducted to determine the effectiveness of combining computer-based instruction with technology which allows person-to-person video conferencing (i.e., CU-SeeMe® technology); this would allow students to interact with cultures different from their own without leaving the classroom.
3. Further research should be conducted which compares computer-based instruction to teaching approaches other than traditional classroom instruction (e. g., simulations, case studies).
4. Further research regarding the effectiveness of computer-based instruction to teach cross-cultural concepts should be conducted with populations such as: non-college adults, post-college adults, and high school students involved within the agricultural sector.

5. Further research should be conducted regarding the effectiveness of using computer-based instruction to teach cross-cultural concepts that correlate student learning styles with the effectiveness of computer-based instruction.
6. Further research should be conducted regarding the effectiveness of using computer-based instruction to teach cross-cultural concepts that correlate student academic performance with the effectiveness of computer-based instruction.
7. Further research should be conducted to determine the effectiveness of providing computer-based instructional support resources to students via electronic means (e. g., the Internet and the World Wide Web) instead of providing printed materials, as has been done traditionally.

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