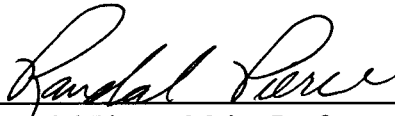
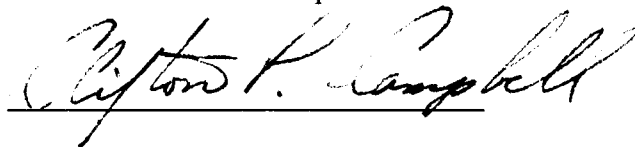


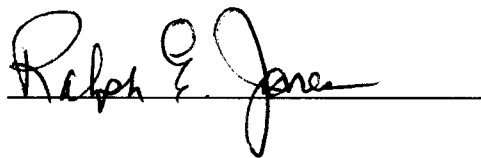
To the Graduate Council:

I am submitting herewith a thesis written by Frank G. Brewer, Jr. entitled "An Assessment of a College Wide Computer Applications Course." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Human Resource Development


Randal Pierce, Major Professor

We have read this thesis
and recommend its acceptance:


Clifton K. Campbell


Ralph E. Jones

Accepted for the Council:


Associate Vice Chancellor and
Dean of The Graduate School

**AN ASSESSMENT OF A COLLEGE WIDE
COMPUTER APPLICATIONS COURSE**

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Frank G. Brewer, Jr.

August 1997

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I agree with the statement that, **those with whom we come in contact enrich our lives**. That being the case, my life is truly enriched. I would like to thank all of those individuals. There are also those that deserve special recognition.

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ABSTRACT

Computers have become a pervasive tool in the life of American citizens as well as the citizens of many industrialized nations. Interaction with the computer is a daily activity, whether this is in the form of banking, information gathering, finding a job, or performing the job. At issue is the computer literacy of these individuals who find themselves interacting with computers. Until recently, the definition of computer literacy has primarily included computer programming. Today, the meaning has changed to refer to the use of computer applications. In acknowledgment of this situation, the University of Tennessee, College of Human Ecology has instituted a course covering microcomputer applications. This is a core course requirement for all of its undergraduates.

There is no base line information regarding what level of computer application knowledge the students bring to this class. Does the student's age or gender affect the entry knowledge level? Does the student's age or gender affect the post-course knowledge level? Through the use of mean (a) pre-test scores, (b) post-test scores, and (c) gain scores, this study attempts to measure entry-level knowledge and post-course-level knowledge. Additional analysis of the test is performed to establish reliability. The balance of particular test questions covering the course curriculum was tabulated. This is done to indicate if the test is addressing all phases of the course curriculum.

The results show there is no difference in the entry levels of computer literacy among traditional students and non-traditional students. Regardless of the class time (day or evening), there is no difference in the entry levels of computer literacy of the students.

There is a significant difference in the pre-test and post-test scores among the

sample population of HE 210 students. There is also a significant difference in the gain scores among the day class students and the evening class students of sample population. The two day classes were combined for the benefit of the testing.

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CHAPTER 1

INTRODUCTION

The microcomputer has become a common item among the equipment used by businesses. Evidence suggests that we are in the midst of a computer technology boom (Salerno, 1991). Computers are now being found in the office setting, manufacturing floor, shipping and receiving areas, the mechanics bay, as well as other work settings. Microcomputers, either in network connection or as stand-alone devices, are quickly becoming as pervasive as the telephone. Today's business sector would be hard pressed to perform as efficiently without this tool. Just as any tool requires training for its effective and efficient use, the microcomputer is no exception.

To prepare students for a work career is within the mission statements of institutions of higher learning. Now more than ever, careers include interactions with computers. This preparation entails providing them with hands-on experiences as well as an awareness of the computer's utility.

Traditionally, computer education has been primarily within the realm of computer programming. Baker (1985) points out that computer literacy today means more than computer programming. To be computer literate, an individual should be able to use computer applications. Applications, often referred to as software, are programs that perform specific functions. Many organizations use proprietary programs in their operations, yet several common applications are almost universal in their usage. Among the most popular applications are (a) word processors, for text document creation and editing; (b) spreadsheets or electronic worksheets, for accounting or other number

intensive projects; (c) presentation programs, to create transparencies or slide presentations; and (d) database programs, for information management (Berge, 1988). Additionally, computer literacy refers to being able to maneuver within the Internet.

"Do the computer training programmes provide the qualifications which enable the participants to use modern technology in their jobs?" (Hansen, Laursen, & Aarkrog 1993. p, 313). The prevailing thought of the day says "no." Employees need more than an awareness of a particular application software. Basic computer literacy should also include some demonstrable proficiency in popular business software. This is an ever-expanding need, as reported by the Bureau of Labor Statistics (1992-93). Knowledge of word processing, spreadsheet applications, and database management programs is becoming increasingly important. Computer-user education and training are a primary issue concerning educators and business trainers (Guimaeres & Ramanujam, 1986). Hansen et al., (1993) tell us the world of industry will need a workforce with a more complete and liberal education. Such a statement may be applied to the entire workforce (i.e., management, clerical, as well as blue collar).

In recognition of this need for knowledge computer applications, as reported by the Bureau of Labor Statistics (1992-93) and others, the University of Tennessee (UT), Knoxville, College of Human Ecology has included the course HE 210, Microcomputer Applications in its core curriculum.

HE 210, Microcomputer Applications represents a field of study that has undergone an evolution during the last 10 years. It began as a course, initiated in the mid-1980's, to meet the needs of the students of the industrial training program known as HRD 355. In the early 1990's, the Human Resource Development department joined the

College of Human Ecology. HRD 355 was merged with Human Ecology's core microcomputer course HE 210. The result of this merger became known as the current Human Resource Development course HE 210.

The curriculum of the course has also evolved. The early HE 210 course began teaching operating systems, BASIC programming, and word processing. Over the years, as technology evolved, so did the content of HE 210. New topics were included and others were eliminated. These new topics reflected the emphasis of using standardized software or applications to perform specific tasks, programming was de-emphasized. The topics included, (a) spreadsheets, (b) computer assisted drawing [CAD], (c) databases, and (d) presentation software.

While CAD is an extremely useful application, it is quite specialized in usage. For consideration of course manageability, the study of CAD became a course of its own. HE 210 concentrates on the applications most often used by those in the working world. Continuing its evolutionary process, the HE 210 curriculum has been expanded to include Internet navigation. The course is designed to give students hands-on experience as well as a familiarization of the above mentioned popular applications (Appendix A). All current undergraduate students in the UT College of Human Ecology must successfully complete this course (Pierce, [personal interview] 1997).

Nadler and Nadler (1989) point out that training skills gained without application (i.e., practical usage) are quickly lost. HE 210, which is designed to be taken during the second year of the student's undergraduate program, works within the concept of this learning theory. By placing the course at this relative point, the student is able to use and reinforce the skills gained. The gains in computer literacy aid students in their remaining

course work. Word processing and spreadsheet applications are especially valuable to the student. By the time a student graduates, computer application usage should be a comfortable task.

CHAPTER 2

PROBLEM

Due to technological advancements, today's college graduates should be computer literate. This is not the ability to program computers. It is being able to operate within given applications provided by the employer. The UT College of Human Ecology, in response to the need for computer literacy, has implemented HE 210, Microcomputer Applications, as a required course of all undergraduates majoring in any of its departments. Does HE 210, Microcomputer Applications, meet that need? How can the college measure the proficiency of its students in areas of microcomputer applications? Is there a means to measure whether a student needs to take HE 210, Microcomputer Applications?

The population of students in the UT College Human Ecology is a varied group. Some of these students are not traditional students. They are known as re-entry or non-traditional students. Non-traditional students are older and have different pre-college or pre-course experiences than traditional students. Due to these different life experiences, non-traditional students may not have had the exposure to computers that the 19- to 23-year old traditional students have.

Purpose

The purposes of this study are to:

1. Determine if HE 210, Microcomputer Applications, is accomplishing its objectives (Appendix A).

2. Identify the strengths and weaknesses of the HE 210 curriculum.
3. Measure the reliability of the pre-test and post-test used in HE 210.
4. Identify which students benefit the most or the least from taking HE 210.
5. Determine the future for HE 210, Microcomputer Applications, in its current form.

Is HE 210 a justified core requirement? Is the course meeting its goal of enhancing students' computer literacy? Are basic computer familiarization and the applications being covered within the class curriculum? Does the course prepare the students for their work careers? The test-out level for proficiency is currently 70%. Is that level sufficient to demonstrate proficiency?

Definition of Terms

There are a number of terms used in this study that require explanation.

Computer Application—(*software*) A computer program that performs pre-programmed functions. A task that can be performed by computer (Random House Webster's Electronic Dictionary, 1994).

Computer Literacy—

1. "Familiarity with computers and how they work, especially a non-technical understanding of microcomputers and of the role computers play in modern society" (*Introduced between 1975 and 1980*) (Random House, 1996, p. 421).

2. "Awareness of or knowledge about computers (their capabilities, applications, and limitations)—may include the ability to interact with computers to solve problems" (*Year introduced: 1982*) (ERIC Thesaurus, 1997).

3. "Awareness, knowledge of, and interaction with computers." (Capron, 1995a, p. G-1).

Non-traditional Student—(*Often called re-entry students*) Students who interrupt their formal education by virtue of military service, work, or for any other reason. They may have left school before completion or delayed entry. These students are likely to be employed full-time while attending classes part-time and are age 24 years or older (≥ 24).

Among the various definitions for the non-traditional student are:

1. "Adults beyond traditional school age (beyond the mid-twenties)" (*Year introduced: 1977*) (ERIC Thesaurus, 1997).

2. "... (a) person 25 years or older or a person who has not undertaken formal education for a minimum of 2 full years" (Noble, 1987, Abstract).

3. "... (t)hose [students] older than 18-22 years of age" (Nuver, 1981, Abstract).

For this study, non-traditional students are those age 24 years or older, designated ≥ 24 .

Traditional Student—A student who continues the formal education sequence with no major interruptions. This student's age will generally be less than 24 years (< 24). The average student graduates from high school at the age of 18 or 19. If this student stays on sequence with their formal education (baccalaureate—4 years), they normally graduate at age 22 or 23.

Objectives

The objectives of this study are to:

1. Determine an acceptable proficiency level for test-out procedures by using the given test (Appendix B).
2. Measure gain or loss between pre-test and post-test results from selected students enrolled in HE 210.
3. Determine if all topics of study (i.e., word processing, spreadsheets, spreadsheet database, presentations, and Internet) are covered.

Hypotheses

H₀₁. There is no significant difference in the entry levels of computer literacy between traditional students and non-traditional students.

H₀₂. There is no significant difference in the entry levels of computer literacy, as measured by pre-test scores, between students who attend the day classes or evening classes of HE 210, Microcomputer Applications.

H₀₃. There is no significant difference in pre-test and post-test scores among the students of HE 210, Microcomputer Applications.

H₀₄. There is no significant difference in the gain scores (post-test scores minus pre-test scores) among the HE 210, Microcomputer Applications, students who are in the day classes or in evening classes.

CHAPTER 3

REVIEW OF LITERATURE

Computer Usage

Computers and their usage have become quite common place, in both the business and home settings. It is estimated that there are computers and some form of at-home office in approximately 43% of the U.S. households (Telecommunications, 1996). With an office in the home available, there is a growing desire among workers to perform as much of the job from their home as possible (known as telecommuting). Predictions of U.S. telecommuting indicate an annual growth rate of 20% through 1997, resulting in more than 16 million telecommuters (Telecommunications, 1996). The percentage of home computer use compared to business or government usage in the U.S. changed from 27% in 1992 to 42% in 1996 (Pollock, 1995).

The use of computers by children is now quite common place (Flemming, 1997). The Nielsen Media Research Company (1997) conducted studies of personal computer ownership in 1995. Their findings show that in the U.S. approximately 40% (84 million) of persons 12 years or older reported that someone in the household had a personal computer at home (Nielsen, 1997). Of this number, 64% reported using their home computer during the previous week. Usage on these home machines is further subdivided. Table 1 gives an indication of the early exposure to computers that many children have. A higher usage within the Business/Work category was reported among college graduates (Nielsen, 1997). Research indicates that the under-30 age cohort of computer users makes up 34.6% of the total of users (Lazich, 1997).

Table 1

Usage Categories by Persons 12 years or older in Households with Home Computers

Usage	Percentage
Business/Work	22.0
Entertainment/Games	20.8
School	19.1
Home Finance/Budgeting	11.8
Internet	1.5
Children/Educational	0.8

Note: [Discrepancies in percentage totals not explained] Adapted from Nielsen Media Research. (1997). Personal computers. Nielsen Media Research -- Interactive Services. [On-line]. Available: <http://www.nielsenmedia.com/news/hotech-summary.html>, p. 2.

When computers were first introduced into schools in the early 1960's, it was envisioned that every student would have a computer at their disposal. "Between the years 1982-1985, the number of computers in schools went from 250,000 to well over 1 million . . . " (Salerno, 1991, p. 5). "In 1983 there was about one computer for each 125 students in the nation's public schools. By 1995, there was a (sic) computer for each nine students. In 1994, the nation's schools spent about \$3 billion on computer- and network-based technology" (Glennan & Melmed, 1996). Table 2 indicates how computers are being used in elementary and secondary education. Early awareness of computers and their applications, as mentioned above, may facilitate pre-entry computer literacy. A situation such as this may eliminate the need for a basic course covering computer applications. The needs and growth of computer literacy are understood. It is the type or depth of literacy that is in question. Literacy in the workplace is often defined as literacy in the **context** of the workplace (Odgers, 1989). This may be reading a job request,

Table 2

<u>Examples of the Use of Technology in Support of Elementary and Secondary Education</u>	
Type of Educational Activity	Examples of Technology Use
Support for individual learning	Stand-alone drill and practice units for activities requiring particular skills
	CD-ROM- or Internet-accessed resource bases
	Assistance in searching for information
	Communication with experts
	Computational and writing tools (word processors and spreadsheets)
Support for group learning	Simulations that help users to visualize systems or mathematical or scientific concepts
	E-mail supporting group communication learning activities
	Presentation software to allow group to collaborate on presentation
	Video to support presentation of community-based projects
Support for instruction	Communication allowing collaboration among schools for collection and analysis of data
	Integration of curriculum, standards, management, and assessments
	Management of student portfolios and exhibitions
Communications	Support for development of individual student instructional plans or contracts
	Communication for remote locations (such as rural schools) that permit access to expertise, resources, and improved learning environments
Administrative functions	Improved communication among students, teachers, and parents
	Support for attendance, accountability functions, and other administrative activities

Note. The data in Table 2 are from Fostering the use of educational technology: Elements of a national strategy. [On-line]. Glennan, T. K. & Melmed, A. (1996). Available: http://www.rand.org/publications/MR/MR682/ed_ch1.html. Published by Rand. Copyright Rand 1996. Reprinted with permission.

reading a schematic drawing, or preparing reports and presentations. Such a definition will change over time as technology, jobs, and ambitions evolve. As jobs are created, eliminated, or modified by technology, training will have to keep pace (Alexander, 1993).

Automation has given over many tasks to the computer.

Computer-assisted drawing, automated assemblies (robot-assisted), or programmed weaving are examples of computers providing a skill. With the changes brought about by technology, employees may find that they must access a computer to get job instructions.

Although some basic computer operating system skills are necessary to become computer literate, one can speculate that many computer users never find it necessary to do any computer programming (Szajna & Mackay, 1995). Literacy in applications such as word-processing and spreadsheets are more important to most computer users (Berge, 1988; Bureau of Labor Statistics, 1992-93). Kelley and Charness (1995) point out that, in the workplace, computers have practically become a universal fixture. Research indicated that in 1993, more than 51 million workers, 18 years and older, were using computers on the job (Department of Commerce, 1996). Primarily these jobs require using word processing, communications, spreadsheets, databases, and sales or telemarketing applications. Personal computer sales are expected to reach 46 million units in 1996 with 58% going to government and business use, while 42% go to home use (Pollock, 1995). Not only are these machines being seen in the workplace, private citizens are also interacting with computers in many of their day-to-day activities as shown in Table 1 (page 10). Actions such as surfing the Internet, sending E-mail, making bank transactions (automated teller machines), or attempting to contact someone by telephone (automated

phone menus).

Universities are strongly considering following the "Virginia Tech Initiative" for Master's theses and Doctoral dissertations (Lacava, [personal interview] 1997). Virginia Polytechnic Institute and State University, Blacksburg, has begun accepting these documents in electronic formats. As of January, 1997, it is mandatory that all theses and dissertations be up-loadable to the World Wide Web. They will be held in a digital Electronic Thesis and Dissertation (ETD) library. The ETD library may be accessed through the Internet at <http://etd.vt.edu/etd/>. Details for submissions are currently available on-line (ETD Initiative home page, 1997). The University of Tennessee, Knoxville, is an official member of the Networked Digital Library of Theses and Dissertations (NDLTD) program (NDLTD project, 1997). UT will pilot test ETDs during the fall semester of 1997 and spring semester of 1998 (Lacava, 1997).

Those seeking jobs are being ushered into the computer age. On January 1, 1996, Tennessee was among the 23 states that received grants from the U.S. Department of Labor. These grants were intended to fund one-stop systems to service unemployment needs (Employment and Training Administration, 1996), allowing the job seeker to find all pertinent employment information in one location. The award of \$200,000 is to help set up a plan to monitor specific labor market needs. The "(o)ne-stop centers also provide labor market information through computerized data bank systems that house localized information on job vacancies and worker availability, salary and wage rates (sic)" (1996, p. 2).

Computer skill has become more of a necessary skill than an elective capability. Many computer users already have basic computing skills, but those skills need

upgrading to allow the user to function in an ever increasingly sophisticated computer environment (Szajna & Mackay, 1995). Computer technology is an extremely dynamic arena. "(R)etraining on new software is likely to be a more important issue than training absolute beginners, " (Kelley & Charness, 1995, p. 108).

Many trainers argue that computer applications can and should be self-taught. This is not a panacea for education or training. Considerable research has shown computer-assisted instruction (CAI) to be effective in achieving significant differences or gain scores (Becker, 1987; Kulik, 1984; Salerno, 1991). CAI may be self-paced, but should not be self-governed. Students can be overwhelmed by the technology (Shayo, 1995). Individual learning styles may be overlooked (Bracey, 1989). Chamberland (1988) points out that although the findings are inconclusive when CAI is compared to teacher instruction, CAI should remain a significant teaching tool. It is the teacher's ability that makes the difference. An instructor needs to be available to answer questions and explain best practices.

Knowles (1970) tells us that adults should be allowed to learn at their own pace. Personal factors are motivators for adults. Crux (1991) points out that contrary to the tenets of andragogy, not all adults are prepared to perform the functions of learning. Although adult learners may need both direction and support, they should still be involved in designing and directing their learning (Imel, 1994). It is through assisted goal-setting that students can achieve mastery (Brewer, 1997; Shayo, 1995).

Lombardo (1989) tells us that in 1988 American companies spent more than \$210 billion for formal and informal training programs. Admittedly, this is an old statistic and is all-inclusive to training issues. Yet, it does indicate American companies' commitment

to preparing their employees. During the 1990's, more than one-third of the private sector's investment in equipment was in computers and information technology (Generating productivity growth, 1996).

Rapid technology advancements are requiring many workers to obtain additional training in computer usage. These advancements are generating many well-paid jobs and raising productivity (Generating productivity . . . , 1996). Kruger (1993) reports that, on average, workers who use computers on the job are paid 15% higher than similar workers who do not use computers. Incumbent employees as well as new hires need to be computer literate and up-to-date on a variety of software packages (Alexander, 1993). Employees who can bring relevant knowledge to their job are more of an asset to the business. This can be realized in the form of a savings to the business due to training not needed. Additionally, it is shown that persons familiar with computers are more efficient in their use of the machines and are less likely to create problems through ignorance (Odgers, 1989).

Gain Score Analysis

Pre-test and post-test design schemes are often used to measure achievement (Baker, 1985; Becker, 1987; Berge, 1988; Kulik, 1984; Odgers, 1989; Salerno, 1991; Shayo, 1995). The sample group is given a pre-test. This test should cover the material to be presented during the treatment. Following the treatment, the same test or one covering the same material is given. Gain scores are then calculated by subtracting the pre-test scores from the post-test scores. These gain scores theoretically indicate the effect of the treatment (Corder-Bolz, 1978) and measures the knowledge gained. Occasionally, the calculated score may be a negative number. This would cause reviewers to question the

validity of the test or the sincerity of the individuals tested. Huck and McLean (1975) point out that, similarity in pre-test mean scores would be expected among those tested. This would indicate a common entry level among those tested. The nature of the pre-test insures that an intended treatment has not taken place. A wide variation of scores would indicate that those who scored high might not require the treatment. "However, one would be ill-advised to disregard pre-test data because it can and should be used to measure initial differences between the treatment groups and increase the power of the analysis by reducing the within-group variability"(1975 p. 513). This pre-test and post-test design allows the measurement of both entry level and advancement (or lack of advancement) following a class or training session (treatment) (Berge, 1988; Corder-Bolz, 1978; Odgers, 1989).

The pre-test and post-test design is generally accompanied by a control group from whom treatment is withheld. DiTomasso and McDermott (1981) feel this can be an impractical and possibly unethical practice. Their response to this theory is that all groups should receive the treatment. The principal method of delivery within this scenario would be to present the treatment to the separate groups at different times. Using the multiple pre-test and post-test group design may offer a special perspective in analysis. The inferential statistical measures can be determined by using analysis of covariance with the gain scores used as the concomitant variable. Gain scores can also be subjected to a simple one-way analysis of variance (ANOVA). Either of these methods will provide less-confusing information than repeated ANOVAs, as cited by Huck and McLean (1975).

DiTomasso and McDermott (1981) state:

In the preferred method a two-way analysis of covariance is performed with the dependent variable being the subjects' post-test scores and the pre-test scores being held as the covariant. The second approach would employ gain scores as the dependent variable derived by subtracting pre-test from post-test scores for a conventional two-way analysis of variance (p. 826).

DiTomasso and McDermott (1981) also strongly hold the results of gain score analysis to be reliable; ". . . [*gain scores*] utility as indices for group comparisons and as evidence of group change as opposed to measures of individual differences and variations seems unchallenged" (p. 826). The two-way analysis of covariance mentioned by DiTomasso and McDermott is also recommended by Klockers (1992) as a test for treatment effect.

One argument against the use of simple gain score measurement is that it is too base dependent (Rich & Williams, 1990). Due to randomness, the sample groups are not equal. Therefore, the base information may be suspect. Serlin and Lapsley (1985) point out that the *ceteris paribus* clause is often invoked. "The *ceteris paribus* clause states that, for the sake of a particular experiment, all things are equal" (p. 75). This caveat levels the entry playing field, therefore allowing for suspicion of the results. An analysis of covariance using the pre-test as a covariant (Huck & McLean, 1975; Klockers, 1992) can take these variations into consideration. This method can be applied to any other quantifiable differences. Jamieson (1995) concurs with the belief that analysis of covariance is a more accurate measure.

There is much argument about the use of gain scores. Do they infer any

predictability? Are they reliable? These are very valid arguments. "If, however, a difference or gain score is used to answer questions such as 'Did Johnny change more than Mary?' then the reliability of the difference score is of the utmost importance" (Nicewander & Price, 1978, p. 408).

Testing and Scoring

Many discussions have taken place over (a) testing, (b) types of testing, and (c) scoring of the test. Ebel and Frisbie (1991) state that testing without definition is useless. Should we test a group and say that the best scores pass (Campbell, [personal interview] 1995). Just having the best scores by rank has no meaning, since the best in the group may be 35% of the total. Given a valid test, 35% will not demonstrate mastery. Knowing that James and Evelyn are the best swimmers in their class is of no value. Knowing that they can swim a distance of 100 yards begins to indicate mastery.

For pencil-and-paper forms, multiple-choice items produce less chance errors due to guessing than does true-false items (Ebel & Frisbie, 1991; Haskell, [personal interview] 1995). There should be a method to objectively measure educational achievement. Multiple-choice tests do this, if carefully planned (Ebel & Frisbie, 1991). Open-ended questions and essay questions leave area for subjective interpretation. To get hard results, the objectivity of the multiple-choice test should be considered.

Reliability is essential to testing (Haskell, 1995). Reliability can be enhanced in a number of ways, one of which is by increasing the test length. This is problematic, since a test that is too long may bring about boredom and loss of engagement [interest] (Van Cleave, 1995). Reduction of length, whenever a test becomes excessively long is a consideration. A time scale of one multiple-choice question per minute is often indicated.

This is not an official consideration but is considered by many test developers (Ebel & Frisbie, 1991). Using this time scale to measure test length, attention should be given to maintaining the student's engagement.

Review of Related Literature

The literature presented provides much in the expectation of growth within computer literacy. It is agreed that training in this area is needed. Whether this takes place in the compulsory school arena, post-compulsory school arena, beyond the workplace, or within the workplace does not matter. To be able to use a computer is by far more important than being able to program one (Berge, 1988). Businesses that have computers in place are utilizing software applications to perform needed tasks. As Odgers (1989) points out, literacy in the workplace is defined by that workplace. The home computer industry is the epitome of a growth industry (Flemming, 1997; Lazich, 1997; Nielsen, 1997; Pollock, 1995). There is no question that formal training in software applications is needed.

For measuring achievement, gain score analysis is widely held as a standard. The theory is that the gain score will indicate the effect of the treatment in terms of knowledge gained (Corder-Bolz, 1978). For this study, entry-level and advancement or lack of advancement were considered. This method of evaluating gain score differences has been recommended (Berge, 1988; Corder-Bolz, 1978; McLean, 1975; Odgers, 1989).

There are several researchers who doubt the use of gain scores for predictability (Rich & Williams, 1990). This study was not to predict the effectiveness of future classes. Rather it was conducted to measure the effectiveness of current classes. Therefore, doubts over the use of gain scores do not apply to this study.

The method of gain score analysis used did not employ a control group. This is in keeping with the beliefs of DiTomaso and McDermott (1981). Through analysis of independent variables, accuracy of findings can be accepted.

CHAPTER 4

METHODS AND RESEARCH PROCEDURES

Population and Sample

Subjects

The population consisted of the seven sections of HE 210 offered during the spring semester 1997 at the UT College of Human Ecology. Each section contained approximately 18 students. From this cohort, an intact sample of three sections was chosen, including the lone evening section. From the remaining six sections, two were randomly chosen. Each student was be screened for demographic information. A parallel pre-test/post-test design was used to gather data. This data served to establish (a) entry-level knowledge and skill of the course content, (b) overall effectiveness of the course, (c) any age differences between the two groups, and (d) any gender differences between the two groups.

Instrumentation

A 95-question test (Appendix B) was administered as a pre-test. Following the course, the same test was administered as a post-test. The test consists of questions designed to ascertain knowledge of selected applications and computer operation. These were (a) WordPerfect® v. 6.0 -- word processing, (b) MS Excel® v. 5.0 -- spreadsheet and database, (c) Netscape Navigator® -- Internet access, and (d) MS PowerPoint® v. 5.0 -- presentations. Dr. Pierce (1997) of the University of Tennessee Human Resource Development faculty created the test from two sources. Sixty-seven questions were from the test bank provided by the publisher of one of the course textbooks (Capron, 1995b).

Dr. Pierce (1997) provided the remaining 28 questions. The make-up of this test was as follows.

1. The personal computer operating system is covered by 46 questions.
2. Word processing is represented by eight questions.
3. 20 questions were on spreadsheet usage.
4. An additional five questions concerned spreadsheet and data base application.
5. Presentation applications was represented with 10 questions.
6. Internet and E-mail usage was tested with six questions.
7. Word processing and presentations shared one question.

The test, having been given to one of the sample sections (as a pre-test), demonstrated a rationale equivalence reliability of 0.869 using the Kuder-Richardson 21 (KR-21) formula. A split-halves correlation was also calculated, using the Spearman-Brown prophecy formula. The test demonstrated a correlation reliability of 0.932. This same test was re-evaluated following post-test delivery for the sample population (N=46). The resulting reliability coefficient of 0.9594 was obtained using the Kuder-Richardson 20 (KR-20) formula. There is a variation shown in the reliability ratings given above. The explanation of this is that the KR-21 and the split halves formulas produce conservative results. The KR-20, more aggressively evaluates the test, returning a more robust result similar to the split halves formula (Ebel & Frisbie, 1991; Gay, 1996).

Procedure

All sections met in a computer lab that offered each student a computer station (486sx IBM-compatible) with printer and Internet access. Applications available to the students were (a) WordPerfect® v. 6.0 - word processing, (b) MS Excel® v. 5.0 -

spreadsheet and database, (c) MS PowerPoint® v. 5.0 - presentations, and (d) Netscape Navigator® v. 3.0. Each class section met for fifteen weeks. The day classes met twice a week for 70 minutes per meeting. The evening class met one night per week for 140 minutes. Each student was tested at the beginning and at the end of the course semester to determine gain scores.

A prepared test was given the first time each class section met. The same test was given at the end of the semester. The scores were compared to determine gain scores. Subjects were asked if they were enrolled in any other computer courses while taking HE 210. The gain scores were subjected to an analysis of variation evaluation to determine the value of the course. Additional analysis of variance evaluations of the scores obtained will determine variances by age, gender, and between classes (day vs. evening). An analysis of each subject area was taken to determine if proper attention was given to its instruction.

For evaluation purposes, the age cohort was divided into age 23 or younger (traditional students) and age 24 or older (non-traditional students). Their mean pre-test scores were compared to determine any significant differences of entry-level knowledge. The age groups were also subjected to gain score evaluation to determine differences in learning ability.

Limitations

There was no control group. Subjects were chosen as intact class section groups. By using intact treatment groups, internal bias during the selection process was eliminated. Each section grouping received the same course materials (i.e. treatment). There were five different instructors. Therefore, individual randomness was maintained

through the students decision on which of the seven sections to register for. The researcher was an instructor for one of the sample groups. Additionally, unknown confounding variables may have reacted on the results of the testing. Factors such as time of day that the class met or instructor's style of teaching were beyond control of this study.

One possible threat to external validity in a pre-test/post-test design is that of pre-test-treatment interaction. As the duration between pre-test and post-test was fifteen weeks, it is believed that pre-test-treatment interaction would be negligible. Of the original sample group, six students did not complete the course.

Based on a post-hoc comparison of post-test results and final grade results, it appeared that several of the students did not take the post-test seriously. A review of the post-test ScanTron answer sheets revealed an obvious repetitive pattern of answers on two forms. These results and their corresponding pre-test results were removed from the sample group.

Data Collection

The data collected came from the pre-test and post-test scores of the sample population. The names of the sample population were removed from the data to ensure anonymity. Data was sorted by evening or day class and collated by social security numbers. Demographic data gathered along with the post-test scores allowed additional evaluation of the test data.

Treatment of Data

MS Excel[®] v. 5, on a personal computer, was used to perform initial tabulations of the data. This included the KR-21 test and split-halves test for test reliability. The

statistical program SPSS[®] v. 7.5, also on a personal computer, was used to calculate (a) mean, (b) standard deviation, and (c) independent *t*-tests. This application was also used to calculate the KR-20 instrument reliability test.

Summary

From the population of the combined classes of HE 210, Microcomputer Applications, an intact sample population was chosen. The 95-question test, designed to address the topics outlined in the course syllabus (Appendix A), was administered as a pre-test. The topics of the course, (a) word processing, (b) spreadsheets, (c) database management, (e) Internet navigation, and (f) computer operating systems, were chosen to increase the computer literacy as needed for entry into the private sector employment or government service (Alexander, 1993; Berge, 1988; Kelly & Charness, 1995; Lombardo, 1989; Kruger, 1993).

Following the 15-week semester, the same test was administered as a post-test. This test was evaluated by three proven tests for reliability and was confirmed to be reliable. The pre-test post design was chosen to evaluate initial computer literacy and to measure the effect of the treatment (gain or loss) (Baker, 1985; Becker, 1987; Berge, 1988; Kulik, 1984; Odgers, 1989; Salerno, 1991; Shayo, 1995).

As suggested by DiTomasso and McDermont (1981), no control group was used in this study. The treatment was presented to the group at different times. The evaluations of the gain scores indicated if one portion of the sample population performed better or worse than the rest (Nicewander & Price, 1978).

Pre-test scores were evaluated to determine entry-level computer literacy. This gave an indication of whether the course was necessary. Did students possess sufficient

computer literacy in the context of the course? Post-test score evaluation indicated the effectiveness of the course. Subset evaluations (gender, traditional or non-traditional, or class selection) indicated differences within the sample population. Analysis of the test determined its reliability. It also indicated whether all topics covered in the syllabus were addressed.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Results

Preliminary statistical analysis was performed using MS Excel® software.

Additional analysis was performed by SPSS® v. 7.5 software. The types of analyses included:

- (1) Pre-test and post-test scores
 - (a) Mean / Standard Deviation
 - (b) Difference (gain or loss)
 - (c) Subset
- (2) Independent *t*-test pre-test by age
- (3) Independent *t*-test pre-test by class (day vs. evening)
- (4) Independent *t*-test by difference (Post-test minus Pre-test)
 - (a) Evening class vs. Day class
 - (b) Gender
 - (c) Age
 - (d) Evening class
 - (i) Evening class by gender
- (5) Item analysis of the pre-test/post-test

Mean/Standard Deviation and Subsets

To determine an entry level of the students of HE 210, the statistical mean and standard deviation were calculated. This analysis was performed for the population

sample as a whole ($N_s = 41$) and subdivided by the two day classes combined ($N_d = 25$) and the evening class ($N_e = 16$). For N_s , the (a) pre-test mean equaled 51.8049 and standard deviation equaled 11.9441, (b) post-test mean equaled 60.5610 and standard deviation equaled 19.7168, and (c) difference mean equaled 8.7561 and standard deviation equaled 21.8641 (Table 3).

Table 3

Mean Testing of Sample Population

	Minimum Score	Maximum Score	Mean	Std. Deviation
Pre-test	24.00	85.00	51.8049	11.9441
Post-test	22.00	86.00	60.5610	19.7168
Difference	-37.00	53.00	8.7561	21.8641

Note. N = 41. Result of mean testing of sample population.

The day class cohort recorded a loss instead of the expected gain, this is due in part to the lack of sincerity displayed while taking the post-test. The day cohort did not take the post-test in the form of a final exam. Other unknown factors may also been involved. The subset for class results is as follows. For day classes, (a) the pre-test mean equaled 51.6000 and standard deviation equaled 10.7277, (b) the post-test mean equaled 49.0400 and standard deviation equaled 16.0506, and (c) difference mean equaled -2.5600 and standard deviation equaled 19.0505. For evening classes, (a) the pre-test mean equaled 52.1250 and standard deviation equaled 14.0042, (b) post-test mean equaled 78.5625 and standard deviation equaled 7.5892, and (c) difference mean equaled 26.4375 and standard deviation equaled 12.1324 (Table 4).

Table 4

Sample Population by Class Subset

CLASS		Minimum	Maximum	Mean	Std. Deviation
Day class $N_d=25$	Pre-test	32.00	75.00	51.6000	10.7277
	Post-test	22.00	78.00	49.0400	16.0506
	Difference	-37.00	46.00	-2.5600	19.0505
Evening class $N_e=16$	Pre-test	24.00	85.00	52.1250	14.0042
	Post-test	57.00	86.00	78.5625	7.5892
	Difference	-1.00	53.00	26.4375	12.1324

Note. Result of mean testing of Sample Population by Class subset.

The subset of age was divided at the 24th year. The results of this analysis were as follows. For age cohort <24 , $N_{<24} = 22$, (a) the pre-test mean equaled 51.2273 and the standard deviation equaled 9.4915, (b) the post-test mean equaled 50.6364 and standard deviation equaled 19.8531, and (c) difference mean equaled -0.5909 and standard deviation equaled 23.4798. For the age cohort ≥ 24 , $N_{\geq 24}$ equaled 19, (a) pre-test mean equaled 52.4737 and standard deviation equaled 14.5272, (b) post-test mean equaled 72.0526 and standard deviation equaled 15.7325, and (c) difference mean equaled 19.5789 and standard deviation equaled 13.7369 (Table 5). The testing by age cohort (<24 vs. ≥ 24), revealed a loss for the <24 group. This is consistent with the previous findings. As indicated by the age-class cross tabulation (page 32), The majority of <24 year olds are in the day classes.

The results for the subset of gender are as follows. Males $N_m = 10$, (a) pre-test mean equaled 56.7000 and standard deviation equaled 14.9000, (b) post-test mean equaled 72.2000 and standard deviation equaled 15.7325, and (c) difference mean

Table 5

Sample Population by Age Subset

AGE		Minimum	Maximum	Mean	Std. Deviation
<24 N _{<24} =22	Pre-test	32.00	68.00	51.2273	9.4915
	Post-test	22.00	86.00	50.6364	19.8531
	Difference	-37.00	53.00	-.5909	23.4798
≥24 N _{≥24} =19	Pre-test	24.00	85.00	52.4737	14.5272
	Post-test	41.00	84.00	72.0526	12.0114
	Difference	-2.00	46.00	19.5789	13.7369

Note. Result of mean testing of Sample Population by Age subset.

equaled 15.000 and standard deviation equaled 15.7639. Females $N_f = 31$, (a) pre-test mean equaled 50.225 and standard deviation equaled 10.6324, (b) post-test mean equaled 56.8065 and standard deviation equaled 19.6051, and (c) difference mean equaled 6.5806 and standard deviation equaled 23.2977 (Table 6). The expected gain was revealed.

Cross tabulations were computed to determine the interaction among the subsets within the sample population. For age/gender combination, <24 -- 4 males and 18 females; ≥24 -- 6 males and 13 females (Table 7). There was a larger proportion of females in both age groups. For age/class [day vs. evening] (Table 8), <24 -- 18 day and 4 evening; ≥24 -- 7 day and 12 evening. The students classified as non-traditional were concentrated in the evening cohort. The gender/class (day vs. evening) tabulation is represented by Table 9.

Table 6
Sample Population by Gender Subset

Gender		Minimum	Maximum	Mean	Std. Deviation
Male N _m =10	Pre-test	35.00	85.00	56.7000	14.9000
	Post-test	36.00	86.00	72.2000	15.7325
	Difference	-14.00	35.00	15.5000	15.7639
Female N _f =31	Pre-test	24.00	68.00	50.2258	10.6324
	Post-test	22.00	85.00	56.8065	19.6051
	Difference	-37.00	53.00	6.5806	23.2977

Note. Result of mean test on Sample Population by Gender subset.

Table 7
AGE * GENDER Cross tabulation

		GENDER		Total
		Male	Female	
AGE	<24	Count	4	18
		% within AGE	18.2%	81.8%
		% within GENDER	40.0%	58.1%
	>=24	Count	6	13
		% within AGE	31.6%	68.4%
		% within GENDER	60.0%	41.9%
Total		Count	10	31
		% within AGE	24.4%	75.6%
		% within GENDER	100.0%	100.0%

Note. Cross tabulation of Sample Population by Age and Gender.

Table 8

AGE * CLASS Cross tabulation

		CLASS			
		Day	Evening	Total	
AGE	<24	Count	18	4	22
		% within Age	81.8%	18.2%	100.0%
		% within Class	72.0%	25.0%	53.7%
	>=24	Count	7	12	19
		% within Age	36.8%	63.2%	100.0%
		% within Class	28.0%	75.0%	46.3%
Total	Count	25	16	41	
	% within Age	61.0%	39.0%	100.0%	
	% within Class	100.0%	100.0%	100.0%	

Note. Cross tabulation of Sample Population by Age and Class.

Table 9

GENDER * CLASS Cross tabulation

		CLASS		
		Day	Evening	Total
Male	Count	3	7	10
	% within Gender	30.0%	70.0%	100.0%
	% within Class	12.0%	43.8%	24.4%
Female	Count	22	9	31
	% within Gender	71.0%	29.0%	100.0%
	% within Class	88.0%	56.3%	75.6%
Total	Count	25	16	41
	% within Gender	61.0%	39.0%	100.0%
	% within Class	100.0%	100.0%	100.0%

Note. Cross tabulation of Sample Population by Gender and Class.

Independent *t*-tests

To determine any significant difference among the subsets, independent *t*-tests on the mean differences of the sample population pre-test and the evening cohort pre-test were computed. An alpha of 0.05 was used to determine statistical significance.

For total sample population by age, equal variances are not assumed; *t* equaled -3.287 at 39 degrees of freedom (df). Significance (2-tailed) equaled 0.002 (Table 10). This is well below the designated alpha. There is a significant difference between the age groups of the sample population.

Table 10

t-Test of Sample Population Gain Score Difference by Age

	Age	N	Mean	Std. Deviation	Std. Error Mean
GAIN	<24	22	-.5909	23.4798	5.0059
SCORE DIFF	>=24	19	19.5789	13.7369	3.1515

Dependent variables		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
GAIN SCORE DIFF BY AGE	Equal variances assumed	4.287	.045	-3.287	39	.002	-20.1699
	Equal variances not assumed			-3.410	34.603	.002	-20.1699

Note. t-Test of gain score difference of Sample Population by Age.

For sample population by class, equal variances not assumed, t equaled -5.954 at 39 df, significance (2-tailed) equaled 0.000 (Table 11). This also below the alpha, therefore there is a significant difference between the classes (day vs. evening).

For sample population by gender, equal variances are assumed; t equaled 1.125 at 39 df. The significance (2-tailed) equaled 0.267 (Table 12). The significance is above the alpha. There is no difference indicated by gender.

To determine any significant difference among the subsets, independent t -tests on the means of the pre-test scores were computed by age division and class division only.

Table 11

t-Test for Sample Population Gain Score Difference by Class

	Class	N	Mean	Std. Deviation	Std. Error Mean
GAIN SCORE DIFF	Day class	25	-2.5600	19.0505	3.8101
	Evening class	16	26.4375	12.1324	3.0331

Dependent variables		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
GAIN SCORE DIFF BY CLASS	Equal variances assumed	3.137	.084	-5.413	39	.000	-28.9975	5.3568
	Equal variances not assumed			-5.954	38.998	.000	-28.9975	4.8700

Note. t-Test for gain score difference of Sample Population by Class.

Table 12

t-TEST for Sample Population Gain Score Difference by Gender

	Gender	N	Mean	Std. Deviation	Std. Error Mean
GAIN SCORE DIFF	Male	10	15.5000	15.7639	4.9850
	Female	31	6.5806	23.2977	4.1844

Dependent variables		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
GAIN SCORE DIFF BY GENDER	Equal variances assumed	1.444	.237	1.125	39	.267	8.9194	7.9250
	Equal variances not assumed			1.370	22.761	.184	8.9194	6.5084

Note. t-Test of gain score difference for Sample Population by Gender.

For subset of age, equal variances assumed, t equaled -0.329 at 39 df. The significance (2-tailed) equaled 0.744 (Table 13). There was no significant difference.

For the subset of class, equal variances assumed, t equaled -0.136 at 39 df. The significance (2-tailed) equaled .893 (Table 14). There was no significant difference.

A separate t -test was computed for the evening class to determine a difference between gender. This subset was chosen due to its near balance between genders. Table 9, (page 32), which demonstrates a cross tabulation between gender and class, confirms this presumption. For the subset of gender and evening class, equal variances are assumed, t equaled -1.518 at 14 df. The significance (2-tailed) equaled 0.151 (Table 15).

For all t -Tests, the alpha level of 0.05 has been used. When the significance level is greater than alpha, there is no significant difference. Should the significance level be less than alpha, a statistically significant difference is noted.

Table 13

<u>t-Test for Evening Gain Score Difference by Gender</u>								
		Gender	N	Mean	Std. Deviation	Std. Error Mean		
GAIN SCORE DIFF		Male	7	21.4286	11.7453	4.4393		
		Female	9	30.3333	11.5542	3.8514		

Levene's Test for Equality of Variances t-test for Equality of Means								
Dependent variables		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
EVENING GAIN SCORE DIFF BY GENDER	Equal variances assumed	.003	.954	-1.518	14	.151	-8.9048	5.8642
	Equal variances not assumed			-1.515	12.935	.154	-8.9048	5.8771

Note. t-Test of gain score difference for Evening by Gender.

Table 14

<u>t-Test for Sample Population Pretest by Age</u>								
		Age	N	Mean	Std. Deviation	Std. Error Mean		
PRETEST BY AGE		<24	22	51.2273	9.4915	2.0236		
		>=24	19	52.4737	14.5272	3.3328		

Levene's Test for Equality of Variances t-test for Equality of Means								
Dependent variables		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
SAMPLE POPULATION PRETEST GAIN SCORES BY AGE	Equal variances assumed	1.686	.202	-.329	39	.744	-1.2464	3.7831
	Equal variances not assumed			-.320	30.200	.751	-1.2464	3.8990

Note. t-Test of pre-test of sample population by Age.

Table 15

t-Test for Sample Population Pretest by Class

	Class	N	Mean	Std. Deviation	Std. Error Mean
PRETEST BY CLASS	Day	25	51.6000	10.7277	2.1455
	Evening	16	52.1250	14.0042	3.5010

Dependent variables	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
SAMPLE POPULATION PRETEST GAIN SCORES BY CLASS	.373	.545	-.136	39	.893	-.5250	3.8718
			-.128	26.083	.899	-.5250	4.1062

Note. t-Test of pre-test for Sample Population by class.

Item Analysis

The test (Appendix B) covered the six unique areas within the class curriculum (Appendix A). An analysis of the post-test determined the following regarding mean and standard deviation for correct answers for each area. Database (DB) application was represented by 5 questions (5.26% of the 95 questions), the mean equaled 47.2727 and a standard deviation equaled 27.6493. Spreadsheet (XL) was represented by 20 questions (21.05% of the total 95), the mean equaled 62.9545 and the standard deviation equaled 22.7043. The Internet (INT) was represented by 6 questions (6.31%), the mean equaled 61.3636 and the standard deviation equaled 22.6685. Operating systems (OS) were represented by 46 questions (48.42%), the mean equaled 63.0929 and the standard deviation equaled 48.4211. Word processing (WP) was represented by 8 questions (8.42%), the mean equaled 71.8750 and the standard deviation equaled 28.4182. Presentation (PP) software was represented by 10 questions (10.53%), the mean equaled 62.5000 and standard deviation equaled 22.7043 (Figure 1).

Interpretations

Hypotheses

Hypothesis H_{01} states that there is no significant difference in the entry levels of computer literacy among traditional and non-traditional students. Table 13 (page 37) shows the results of the t -test on pre-test scores between age cohorts. The significance 0.151 is well above the alpha level of 0.05. From these results, H_{01} **will fail** to be rejected.

H_{02} . There is no significant difference in the entry levels of computer literacy between students who attend the day classes or evening classes. The alpha level is 0.05.

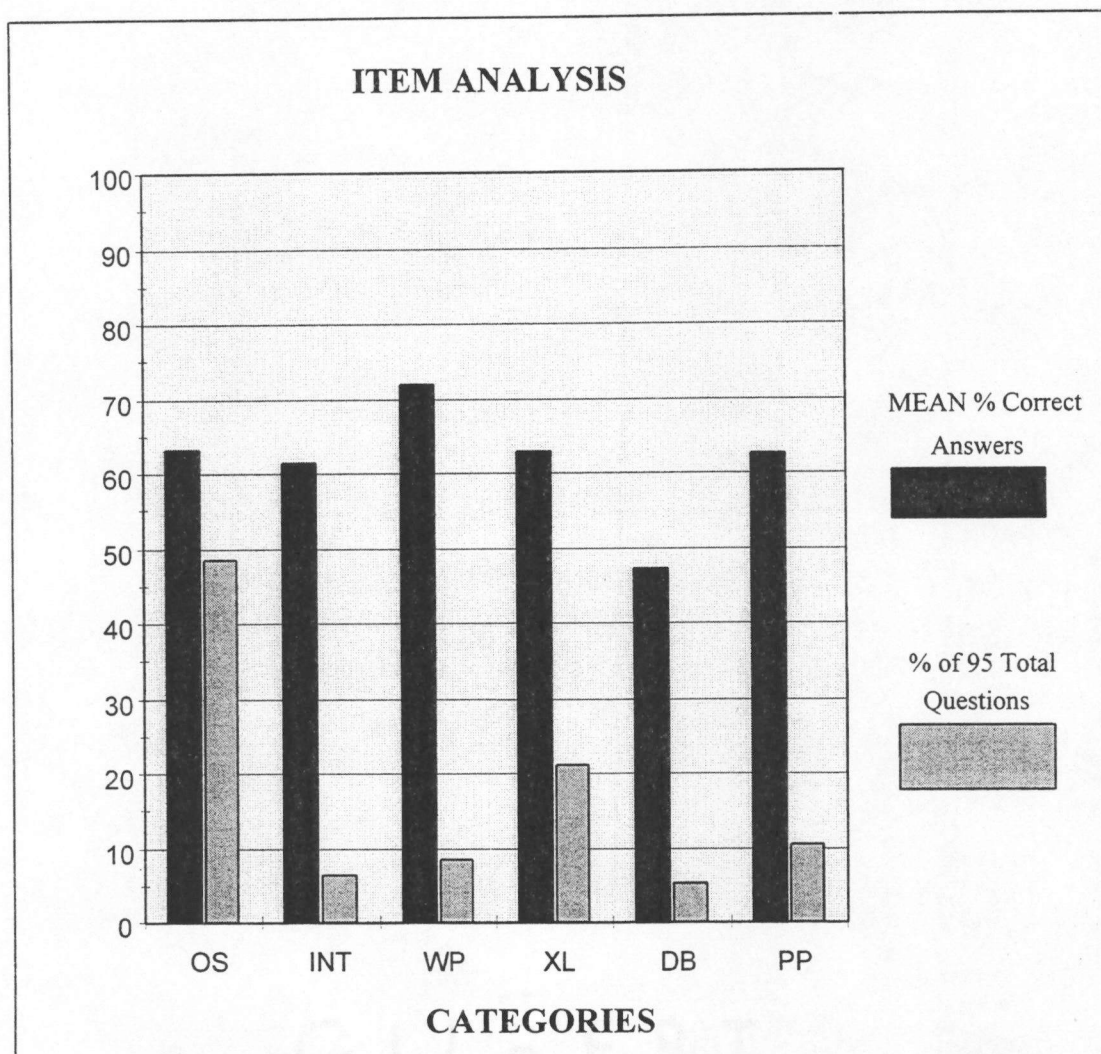


Figure 1. Relationships among test categories and total test questions. Percent of correct answers within categories. OS = Operating Systems. INT = Internet and E-mail. WP = Word Processing. XL = Spreadsheets. DB = Database. PP = presentations.

The results of this test are shown in Table 14 (page 37). At a significant level of 0.893, this hypothesis **will fail** to be rejected.

H₀₃. There is no significant difference in the pre-test and post-test scores among the sample population of HE 210 students. The results of the *t*-Test (Table 16) shows a significant level of 0.0172. This is below the 0.05 level; therefore, there is a significant difference. The hypothesis **will** be rejected.

H₀₄. There is no significant difference in the gain scores among the day class students and the evening class students within the sample population. The two day classes were combined for the benefit of the testing. Table 11 (page 35) addresses the difference between the day class and the evening class. The resulting value of significance is 0.000. This value is below the 0.05 level. H₀₄ **will** be rejected.

Table 16

t-Test for Sample Population Mean Difference

t	df	Sig.	Mean
		(2 tailed)	Diff
	39	.0172	8.7561

Note. t-Test for mean difference of Sample Population.

Test Analysis

The test proved to be a reliable instrument. Figure 1 demonstrates the balance of the categories. They were not equally distributed. Operating systems made up 48.42% of the total 95 questions; Spreadsheets, 21.05%; Presentations, 10.53%; Word processing, 8.42%; Internet and E-mail, 6.31%; and Database is 5.26%.

The mean correct answers for the categories were relatively balanced. The following information regarding the standard deviations of these categories are quite wide spread. This indicates a great variance among the answers given within each category.

1. OS -- 28.4182.
2. XL -- 22.7043.
3. PP -- 22.7043.
4. WP -- 28.4182.
5. INT -- 22.6685.
6. DB -- 27.6493.

Recommendations

Instrument

The test instrument does cover all areas addressed within the class curriculum. Although the test instrument is quite reliable, the balance of the categories should be re-structured. A reduction of the coverage of operating systems is suggested as well as increasing the numbers of questions within the categories of (a) the Internet, (b) word processing, (c) database, and (d) presentations.

Testing and Scoring

Administration of this 95 multiple-choice-question test was a lengthy process. When the two tests are combined, the time spent equaled approximately 1/15 of the class contact time. The test should be shortened if reliability can be maintained.

Some problems were discovered during the scoring of both the pre-test and the post-test. The pre-test was performed as a pencil-and-paper test. Test takers were

instructed to mark the corresponding letter (e.g., **a**, **b**, **c**, **d**, or **e**) in the space given.

Scoring was difficult because of lack of conformity in how the instrument was marked.

Due to haste, confusion, fatigue, or some other unknown factor on the part of the test takers, it became difficult to determine if the answer marked was an **a** or **d**. Was a **c** marked or was it an **e**?

To combat this situation and to ease scoring, the post-test was given on a ScanTron form. This alternative brought its own limitations. Confusion over the answer when transferring from one document to the next, haste, or other unknown factors may have influenced the results. As mentioned previously, some of the students exhibited a lack of sincerity while taking the post-test by using repetitive patterns to complete the test, or marking answers on the ScanTron form that were not being used for this instrument.

As a means to prevent either situation, it is recommended that the student be allowed to (a) circle, (b) mark with an X, (c) or darken the corresponding answer letter directly on the test form. This would avoid ambiguous letter formation, illegibility of letter marked, or confusion in moving from one document to the other. The instructor could use a template overlay to score the test. After marking the answers, the instructor should review the answers without the template to reveal questions marked with more than one answer.

Another alternative would be to have the test taken electronically. This in itself would serve as a performance test, when given as the pre-test. The student would be instructed to open the appropriate application, open the proper file, complete the test, and

then save the results. Being able to perform this task could indicate what entry-level of computer literacy each student possesses.

Class Need

The pre-test scores demonstrated that students tested are not bringing a great degree of computer literacy to this course. This observation was all-inclusive. Age, gender, or class time proved to have no effect on pre-test knowledge. There was a demonstrated significant difference among gain scores from pre-test to post-test, therefore the class should be maintained.

The findings did raise some questions regarding the class cohorts and the age cohorts. As indicated in the cross tabulation tables (Tables 7 – 9, pages 31 through 33), the evening class included a majority of the non-traditional students. Table 11 (page 35) shows a significant difference between the two groups. Did the evening class improve at a greater rate? Testing was performed to answer this question. The respective instructors were interviewed for comments regarding their students' performance. The test ScanTron forms were also studied. There appeared to be a difference between classes. Based on the interviews with the instructors and the review of the test forms, this difference is suspect.

Test Taker Sincerity

Both instructors of the two day classes included in the sample independently stated that they felt that their students did not take the post-test seriously. The review of the ScanTron forms uncovered two forms with repetitive pattern answers. The pre-test and post-test scores of these two students were removed from the sample. The day class students took the post-test after they had taken their final exam. It is conceivable that the day class students were less interested when they took post-test. This lack of sincerity

apparently caused the day class cohort scores to be less than robust. In fact, the day class cohort achieved a negative mean difference score. A result of this type would indicate no learning took place. The evening class took the post-test as part of their grading procedure. Consequently, they were quite serious in their performance. After grading of all the tests, it was discovered that **all** students who completed the course did receive a passing grade. As previously mentioned, this lack of engagement is a possible explanation in the variation of mean post-test scores. Conflicting results, such as these, cast a shadow on the results. In light of this observation, the post-test should be a requirement for all classes and the study repeated.

Applications

The curriculum included word processing as an area of study. WordPerfect® software was used. All other applications, except Netscape Navigator®, were Microsoft® products. There are basic operations among all word processing and spreadsheet applications. These were covered during the class. The students should not have problem applying the skills acquired to their application of choice. There are advantages to using similar products. To benefit from these advantages, it is recommended that all applications be within the same manufacturer's suite (i.e., Lotus® or Microsoft®).

Hardware

All machines used in the classroom were adequate for the curriculum. However, the computers used at other labs throughout the campus are operating Windows 95®. Many of the machines that the students own are also running Windows 95®. Some students would have the software applications for the class yet they would be using a Macintosh® platform. Students would often bring in assignments that had been prepared

on these other machines. Without the ability to convert the data, the student would spend class time re-doing the data to continue the class assignment. It is recommended that there be at least one computer at the instructor's disposal that has the ability to convert the student's data.

Test-out Level

The current test-out level for HE 210 is 70% on the written test and a performance test. For comparison purposes, the evening class scores will be considered. As demonstrated by the test results, the evening class was more sincere in taking the post-test. The mean post-test score of the evening class was 78.5625. It is a reasonable expectation that those who wish to test-out of the class should score above the mean post-test score. To demonstrate mastery of the curriculum as compared to those who take the course, a test-out level of 80% on the written test and the performance test is recommended.

Laboratory

The space provided was not conducive to the needs of a classroom. There was no desk space to use textbooks while performing the hands-on exercises. Whenever the lights were turned off to allow presentations using the display viewer, students did not have sufficient light to use their terminals. It is recommended that these items be considered when developing a computer classroom/laboratory.

Future of Course

As indicated in Chapter 3, young people are being exposed to computers at an accelerating rate. Businesses are increasing their computer involvement. The average individual's interaction with computers is approaching an everyday occurrence. With this

in mind, it is advisable to repeat this study in the near future, at least within the next four to six years. By that time, students may be able to bring a higher degree of computer literacy to the class.

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APPENDIXES

Appendix A

Page 1 of 2

COURSE SYLLABUS FOR HE 210**Introduction to computers for Human Ecology Majors**

Spring Semester, 1997

Instructor: _____

Telephone: _____

E-Mail: _____

Office Hours: _____

Section #: _____

Meeting Time: _____

Course Description:

This is a required undergraduate Human Ecology course designed to provide a basic level of competence in using computers to communicate, acquire information, prepare documents using word processors, solve problems using spreadsheets, and utilize presentation graphics.

Requirements:

1. You must be in the College of Human Ecology.
2. **YOU MUST COME TO EVERY CLASS, YOU WILL FAIL THE COURSE WITH THREE UNEXCUSED ABSENCES.**
3. Attendance is mandatory. Attendance is 1/5 of your grade.
4. Because the course is fast-paced, it is best suited to students who are self motivated.
5. Each student is required to take a pre-test, prior to beginning HE 210 coursework, covering the course topics: Personal Computer Operating System and Terminology, Keyboarding, Word Processing, Spreadsheets, Communications, and Presentation Graphics.
 - Part I of the pre-test consists of multiply choice questions.
 - Students scoring at least 70% on Part I will schedule time with their instructor to take Part II of the pre-test. Students must score at least 70% on Part II, a performance test, in order to test-out of the class.
 - Those students who pass both Parts I and II of the HE 210 pre-test have two options: (a) The College of Human Ecology can waive the course, and it will not appear on your transcript or (b) pay \$5.00 per undergraduate credit hour to receive an "S" grade on your transcript indicating satisfactory completion of HE 210.

Co-requisites: None
Prerequisite: None

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Textbook and Other Supplies Required for the Course:

1. Capron, H. L. (1995). Essentials of Computing. Redwood City, CA: Benjamin/Cummings (Book set includes *PowerPoint*, *WordPerfect*, and *Excel* projects).
2. Two 3½" Double-Sided, High Density diskettes. [Approximately \$1.00 per disk]. Double Density disks are not usable.

HE 210 STUDENT GOALS

1. Define basic computer terms, demonstrate operating system skills, *Microsoft Windows* graphic user interface (GUI) skills, and apply operating and GUI concepts.
2. Access information using *Internet* and use a World Wide Web (WWW) browser, *Netscape*.
3. Send E-mail.
4. Use presentation graphics software to create visual presentations.
5. Use basic word processing utilities.
6. Set up a spreadsheet to solve calculation and database problems.

EVALUATION OF INDIVIDUAL PERFORMANCE

1. Mandatory class attendance and participation (20% of class/laboratory grade). Class meeting will be divided into lecture, demonstration, and hands-on exercises.
2. Outside assignments (40% of class/laboratory grade). Reading text assignments and completing hands-on software use assignments.
3. Quizzes and tests (40% of class/laboratory grade). Performance and written assignments will be made regarding each stated goal. Final exam will given only during the final exam period listed in the timetable of classes, page 15.

Note. There will be no make-up of daily grades, quizzes, and assignments. You are responsible to: (a) attend every class, (b) arrive to class on time with the necessary tools (text and diskettes), and (c) be in a task-oriented mode that enables you to complete assignments during class/laboratory time.

Appendix B
Pre-test / Post-test

HE 210
Microcomputer Applications
Spring, 1997

Name _____

Section _____

Directions: Place the letter of the correct response in the blank to the left of the item.

- ____ 1. The address to a source of information on the internet or WWW, containing the protocol type, the machine name, the directory path, and the file name.
 - a. Browser.
 - b. URL.
 - c. HTML.
 - d. Server.
- ____ 2. The protocol, method of exchanging information, used by WWW servers:
 - a. HTTP.
 - b. URL.
 - c. HTML.
 - d. NCSA.
- ____ 3. The best description of the most common microcomputer platform is:
 - a. IBM standard.
 - b. IBM clone.
 - c. INTEL/MSDOS.
 - d. DOS based.
- ____ 4. Another name for a computer program is:
 - a. software.
 - b. data.
 - c. hardware.
 - d. storage.
- ____ 5. The computer converts raw data into:
 - a. documentation.
 - b. custom software.
 - c. applications software.
 - d. information.
- ____ 6. Another name for RAM memory is:
 - a. primary storage.
 - b. a wand.
 - c. a disk.
 - d. secondary storage.
- ____ 7. A "computer on a chip" is called:
 - a. graphics.
 - b. an optical disk.
 - c. a microprocessor.
 - d. primary storage.
- ____ 8. The underlying software found on all computers is:
 - a. word processing.
 - b. the operating system.
 - c. spreadsheets.
 - d. custom software.
- ____ 9. What manipulates input data into processed information?
 - a. disk drive.
 - b. screen.
 - c. memory.
 - d. CPU.
- ____ 10. The electronic circuitry that temporally stores the data and instructions is called the:
 - a. memory.
 - b. disk drive.
 - c. CPU.
 - d. keyboard.

- ___ 11. Raw material to be processed by the CPU is called:
- | | |
|-----------------|------------------|
| a. data. | c. instructions. |
| b. information. | d. programs. |
- ___ 12. The flat screen usually found on laptop computers is the:
- | | |
|---------|-------------|
| a. LCD. | c. CRT. |
| b. POS. | d. plotter. |
- ___ 13. A technology using laser beams store data on this medium:
- | | |
|--------------|------------------|
| a. diskette. | c. memory. |
| b. tape. | d. optical disk. |
- ___ 14. The general name for hardware devices attached to the computer is:
- | | |
|---------------------|----------------|
| a. microprocessors. | c. mainframes. |
| b. primaries. | d. peripherals |
- ___ 15. Packaged software usually includes an instruction manual, which is referred to as:
- | | |
|-------------------|-------------------------|
| a. documentation. | c. peripheral material. |
| b. programs. | d. custom software. |
- ___ 16. The most widely used task-oriented software is:
- | | |
|---------------------|-------------------------|
| a. spreadsheets. | c. database management. |
| b. word processing. | d. communications. |
- ___ 17. Software is
- | | |
|------------------|-------------|
| a. instructions. | c. the CPU. |
| b. diskettes. | d. memory. |
- ___ 18. A pen-based computer is often called a:
- | | |
|--------------------------------|------------------|
| a. personal digital assistant. | c. minicomputer. |
| b. supercomputer. | d. mainframe. |
- ___ 19. Keyboard, mouse, and wand reader are all examples of:
- | | |
|--------------------|-------------------|
| a. mainframes. | c. CPUs. |
| b. output devices. | d. input devices. |
- ___ 20. Printers and screens are examples of:
- | | |
|-----------------------|--------------------|
| a. input devices. | c. output devices. |
| b. secondary storage. | d. memory. |
- ___ 21. Magnetic tape, hard disk, and diskettes are al examples of:
- | | |
|-----------------------|--------------------|
| a. input devices. | c. output devices. |
| b. secondary storage. | d. memory. |
- ___ 22. Physically, if a bit is 1, then the electrical circuit is:
- | | |
|----------------------|-----------|
| a. off. | c. on. |
| b. either on or off. | d. empty. |
- ___ 23. Approximately one million bytes equals one
- | | |
|--------------|--------------|
| a. word. | c. kilobyte. |
| b. megabyte. | d. gigabyte. |

- ____ 24. Which number of bits is not a typical word size?
- | | |
|--------|--------|
| a. 16. | c. 40. |
| b. 32. | d. 64. |
- ____ 25. Fast memory that stores frequently used instructions and data is called
- | | |
|-----------|----------------------|
| a. cache. | c. ALU. |
| b. KB. | d. address register. |
- ____ 26. The electrical path that transports data is the:
- | | |
|--------------|---------------|
| a. flash. | c. megahertz. |
| b. bus line. | d. SIMM. |
- ____ 27. A plug-in board of memory chips
- | | |
|----------|-------------|
| a. MHz. | c. a cache. |
| b. SIMM. | d. PROM. |
- ____ 28. Which is primarily in design and manufacturing?
- | | |
|---------|-------------|
| a. OMR. | c. CAD/CAM. |
| b. OCR. | d. UPC. |
- ____ 29. The photoelectric scanner that reads the code representing the Universal Product Code is the:
- | | |
|--------------------------|---------------------|
| a. point-of-sale reader. | c. bar code reader. |
| b. laser reader. | d. wand reader. |
- ____ 30. The type of printer that uses physical contact with the paper to produce an image is:
- | | |
|-------------|----------------|
| a. ink-jet. | c. dot-matrix. |
| b. laser. | d. contact. |
- ____ 31. A type of printer that is distinguished as fast and quite, and makes an image on paper using a light beam is:
- | | |
|-------------|----------------|
| a. ink-jet. | c. dot-matrix. |
| b. impact. | d. laser. |
- ____ 32. The technology that produces spoken words from the computer is:
- | | |
|-----------------------|------------------------|
| a. voice recognition. | c. speech synthesis. |
| b. video graphics. | d. speech recognition. |
- ____ 33. The dots that make up a screen display are:
- | | |
|------------|-------------|
| a. OMRs. | c. EGAs. |
| b. pixels. | d. cursors. |
- ____ 34. A byte of data represents a:
- | | |
|------------|---------------|
| a. record. | c. database. |
| b. field. | d. character. |
- ____ 35. All disk hardware in a sealed module is a/an:
- | | |
|------------------|-----------------|
| a. optical disk. | c. Winchester. |
| b. diskette. | d. floppy disk. |
- ____ 36. A link in a WWW document that points to another document or file:
- | | |
|---------------|---------------|
| a. Home Page. | c. Hyperlink. |
| b. Server. | d. Bookmark. |

- ___ 37. Computer software that allows a computer to make information and files available through the internet:
- a. Client.
 - b. Server.
 - c. Browser.
 - d. HTML.
- ___ 38. The single piece of information that keeps an E-mail account secure for the owner:
- a. address.
 - b. password.
 - c. log out.
 - d. network server.
- ___ 39. The feature that permits the document on the screen to look just as it will when printed is:
- a. justification.
 - b. leading.
 - c. WYSIWYG.
 - d. page layout.
- ___ 40. This part of a word processing program predetermines features automatically unless overridden by a user:
- a. default settings.
 - b. page justification.
 - c. wissy-wig.
 - d. headers and footers.
- ___ 41. The appearance of a document is called:
- a. style.
 - b. format.
 - c. font.
 - d. kerning.
- ___ 42. Characters printed in darker type than the surrounding characters are called:
- a. boldface.
 - b. italic.
 - c. hard fonts.
 - d. halftones.
- ___ 43. A complete set of characters in a particular size, typeface, weight, and style is a:
- a. font.
 - b. type design.
 - c. type category.
 - d. block.
- ___ 44. Making changes to a document to fix errors or improve its content is called:
- a. formatting.
 - b. creating.
 - c. editing.
 - d. retrieving.
- ___ 45. Aligning side margins evenly is called:
- a. leading.
 - b. word wrap.
 - c. justification.
 - d. composing.
- ___ 46. Which is not one of the three types of information that can be in a cell?
- a. label.
 - b. range.
 - c. value.
 - d. formula.
- ___ 47. Another name for a worksheet is:
- a. graph.
 - b. cell.
 - c. spreadsheet.
 - d. function.
- ___ 48. The combination of an intersecting column and a row is the:
- a. label.
 - b. function.
 - c. value.
 - d. cell address.
- ___ 49. A specified group of cells in a rectangular shape is called a:
- a. rectangle.
 - b. label.
 - c. range.
 - d. function.

- ___ 50. =SUM(B3:B10) is an example of a:
- a. function.
 - b. label.
 - c. border.
 - d. cell address.
- ___ 51. If a user wants to use a range of cells that include rows 3, 4, and 5 for columns B, C, and D, the range is specified:
- a. C4:D5.
 - b. B1:D5.
 - c. B3:C5.
 - d. B3:D5.
- ___ 52. The result of a formula in a cell is a:
- a. label.
 - b. range.
 - c. value.
 - d. displayed value.
- ___ 53. The active cell is the:
- a. current cell.
 - b. label cell.
 - c. range cell.
 - d. function cell.
- ___ 54. Test information in a cell is the:
- a. label.
 - b. formula.
 - c. value.
 - d. displayed value.
- ___ 55. The term that describes the changed calculated result of a formula if a value of one of the cells in the formula has changed is:
- a. analysis.
 - b. automatic recalculation.
 - c. electronic business.
 - d. functioning.
- ___ 56. A preprogrammed formula is called a:
- a. value.
 - b. procedure.
 - c. function.
 - d. label.
- ___ 57. An instruction to the spreadsheet program to calculate a number is called a:
- a. label.
 - b. formula.
 - c. value.
 - d. range.
- ___ 58. In Excel, what is the result of the formula =3+(4-2)*3?
- a. 15.
 - b. 1.
 - c. 3.
 - d. 9.
 - e. none of the above.
- ___ 59. The way information appears in a cell (such as its alignment, font, or numeric punctuation) is referred to as the cell's:
- a. style.
 - b. attributes.
 - c. display mode.
 - d. format.
 - e. AutoFormat.
- ___ 60. What tool can be used to quickly create SUM formulas?
- a. Summation.
 - b. =SUM.
 - c. AutoSum.
 - d. Sum-O-Matic.
- ___ 61. The quickest way to produce a presentation using PowerPoint is with the:
- a. Blank Presentation.
 - b. AutoContent Wizard.
 - c. Pick a Look Wizard.
 - d. template.

- ___ 62. The PowerPoint view most like a word processors:
- a. slide.
 - b. outline.
 - c. slide show.
 - d. slide sorter.
- ___ 63. When entering text in a presentation, you should use:
- a. all uppercase.
 - b. all lowercase.
 - c. upper and lower case.
 - d. any of the above.
- ___ 64. Which is the minimum font size for presentation text?
- a. 6.
 - b. 12.
 - c. 18.
 - d. 36.
- ___ 65. What is the maximum number of sentences recommended per slide:
- a. 6.
 - b. 4.
 - c. 7.
 - d. 12.
- ___ 66. Which of the following PowerPoint views shows more than one slide per screen?
- a. Slide.
 - b. Slide Sorter.
 - c. Slide Show.
 - d. Notes Page.
- ___ 67. In which of the following PowerPoint views does a slide occupy the entire screen?
- a. Slide.
 - b. Slide Sorter.
 - c. Slide Show.
 - d. Notes Page.
- ___ 68. If you do not have a color printer, you should always specify Black & White or Pure Black & White as a print setting unless the selected output form is:
- a. slide layout.
 - b. Notes Pages.
 - c. Handouts.
 - d. Outline View.
- ___ 69. Which of the following refers to the arrangement of objects on a slide?
- a. slide layout.
 - b. resize handle.
 - c. Autolayout.
 - d. AutoContent Wizard.
- ___ 70. Which of the following can be controlled by a template?
- a. background colors.
 - b. colors.
 - c. repeating text such as a company name or the date.
 - d. All of the above.
- ___ 71. What is the term used to describe digitized pictures stored on disk?
- a. WordArt.
 - b. clip art.
 - c. borders.
 - d. AutoShapes.
- ___ 72. The kind of a graph that is limited to just one value per variable is the:
- a. pie.
 - b. cluster-bar.
 - c. stacked-bar.
 - d. line.
- ___ 73. The area on a line graph to the right of the y-axis and above the x-axis is the:
- a. plot area.
 - b. label.
 - c. cluster-bar.
 - d. pie.
- ___ 74. A chart notation that explains the colors, shading, and the symbols used on the chart or graph is the:
- a. title.
 - b. variable.
 - c. value.
 - d. legend.

- ___ 75. Each dot or symbol on a line graph is a/an:
a. legend. c. plot area.
b. data point. d. axis.
- ___ 76. All information about one individual in a database is referred to as a:
a. field. c. record.
b. file. d. cell.
- ___ 77. Producing an organized summary of a database:
a. applications generator program. c. range search.
b. report. d. schema.
- ___ 78. The basic component of a database record:
a. file. c. field.
b. character. d. number.
- ___ 79. The field type in a database appropriate for use with text but not calculations:
a. date. d. character.
b. logic. e. all of these.
c. numeric.
- ___ 80. Among the problems created by database management systems:
a. Maintaining privacy. d. reduction of data redundancy.
b. preventing unauthorized access. e. a, b, & c.
c. vulnerability to sabotage and theft.
- ___ 81. The capability of a system to produce clear and sharp images especially graphics is called:
a. rasterization. c. resolution.
b. pixel. d. algorithm.
- ___ 82. The system of mapping the display screen into an X axis (usually horizontal) and a Y axis (usually vertical) for screen locations is called:
a. bench marking. c. digitizing.
b. Cartesian coordinates. d. configuration.
- ___ 83. The smallest dot which a display device uses to produce an image on the screen:
a. pixel. c. drawing entity.
b. raster display. d. CAD.
- ___ 84. Which of the following is not one of the three basic categories of computer crime?
a. theft of computer time. c. theft of hardware.
b. theft of programs. d. alteration of data.
- ___ 85. The weakest link in any computer security system is:
a. people. c. programs.
b. hardware. d. the communications system.
- ___ 86. A technique for protecting data sent over communications lines is called:
a. locking. c. licensing.
b. encryption. d. biometrics.
- ___ 87. The most important computer-related loss is of:
a. data. c. hardware.
b. programs. d. software.

- _____ 88. A program that transfers itself from computer to computer over a network and plants itself as a separate file is called a:
- | | |
|------------------|-----------|
| a. trapdoor. | c. virus. |
| b. Trojan horse. | d. worm. |
- _____ 89. A set of illicit instructions that passes itself on to other programs with which it comes in contact is called a:
- | | |
|------------------|-----------|
| a. trapdoor. | c. virus. |
| b. Trojan horse. | d. worm. |
- _____ 90. Software that costs money and must not be copied without permission from the manufacture is called:
- | | |
|----------------------|-----------------------|
| a. site license. | c. licensed software. |
| b. transfer license. | d. shareware. |
- _____ 91. Software that is given away free, although the maker hopes that satisfied users will voluntarily pay for it, is called:
- | | |
|------------------|-----------------------|
| a. site license. | c. licensed software. |
| b. freeware. | d. shareware. |
- _____ 92. Which license allows a customer to make multiple copies of a given piece of software?
- | | |
|--------------|--------------|
| a. site. | c. copy. |
| b. transfer. | d. matching. |
- _____ 93. A secret word or number used to gain access to a computer system is a/an:
- | | |
|-------------------|------------------|
| a. password. | c. license. |
| b. active number. | d. code numbers. |
- _____ 94. Unauthorized software copying is known as
- | | |
|-------------|---------------|
| a. hacking. | c. zapping. |
| b. piracy. | d. licensing. |
- _____ 95. A software or hardware roadblock to make it difficult or impossible to make extra copies of software is called:
- | | |
|--------------------------|--------------------|
| a. copy protection. | c. copy lock. |
| b. concurrent licensing. | d. site licensing. |

VITA

Frank G. Brewer, Jr., was born in Cleveland, Tennessee on December 16, 1950. He attended schools in the public school systems of Bradley County and the City of Cleveland. In 1969, he graduated from Cleveland High School. Immediately following high school he attended Cleveland State Community College to complete the first 2 years of non-compulsory education. During the fall of 1971, he enrolled in the College of Business at The University of Tennessee in Knoxville. Before completing the Banking program, he left the University to begin his work career. He remained in the private sector until 1995. As a non-traditional student, he returned to The University of Tennessee to continue his formal education. He entered the College of Human Ecology, Human Resource Department's Human Resource Development program. In May of 1996, he received his Bachelor of Science degree in Education, major field of study was Human Resource Development, Industrial Training. Immediately following graduation he enrolled in the College of Human Ecology graduate program of Human Resource Development. In August of 1997, he received his Master of Science degree in Human Resource Development, Industrial Training.