AN ANALYSIS OF ACHIEVEMENT TESTS FOR SELECTED VIRGINIA HIGH SCHOOL BUSINESS COMPUTER APPLICATONS STUDENTS

by

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(ABSTRACT)

The purpose of this study was to analyze the reliability and validity of three achievement tests, with emphasis given to instructional validity. The tests were used to assess the performance of Business Computer Applications (BCA) students on their achievement of knowledge of computer application software concepts and vocabulary for word processing, spreadsheet, and database.

Five concepts and vocabulary categories addressed included: vocabulary, access software, data/text entry, editing, and formatting. Data were also collected from BCA teachers of the students. Teachers were asked to rate each item for the three software types of the achievement test as to whether the concepts and vocabulary corresponding to that item had been taught.

A selected sample was used in the study. Classes were divided into three approximately even student groups. Each group completed one of the tests for each

software type. Percentage of items correct for the three software types were 53%-word processing, 46%-spreadsheet, and 36%-database. The Kuder-Richardson 20 (KR-20) estimates for the software types were .92--word processing, .92--spreadsheet, and .76--database. Due to a wide dispersion of KR-20 values for items within the 5 concepts and vocabulary categories by software, the items are useful only for group measures.

Most of the 8 teachers did not teach a substantial part of the concepts and vocabulary included in the validated test items. This outcome indicates the curriculum related to the items needs to be examined and revised so that teachers can emphasize the most important concepts and vocabulary with their students.

Analyses outcomes indicated that 59 of 60 word processing items, 51 of the 59 spreadsheet items, and 45 of the 59 database items were instructionally valid. Teachers selecting items for purposes of examining the achievement of their students related to software concepts and vocabulary cam effectively use items determined to be instructionally valid in this study.

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CHAPTER I

INTRODUCTION

The invention, implementation, and broad-based use of computers have rendered them one of the most important technologies affecting the world today and into the next century. The United States of America is rapidly becoming less of an industrial society; and like much of the rest of the world is firmly enmeshed in becoming an information and service based society. Carter (1988) noted the role computers have had as one of the most important change agents of the past few decades, if not the entire twentieth century. Today business, industry, and government organizations find computers essential to the conduct of all types of activity--from the duties of administrative support personnel to the functions of chief executive officers.

Business education's mission has been and still is to educate <u>for</u> and <u>about</u> business as noted by a Subcommittee of the National Business Education Association Public Relations Committee (Staff, 1984) and others (Lutz, 1989; D'Onofrio, Maxam, Frany, Wuller, Blockus, & Graf, 1990). Since computers are an integral part of business information processing and communication, business educators must teach competencies related to efficient use of them. In turn, business educators must continually examine the

computer tasks they teach, striving to assure that those taught are ones actually needed in the workplace. For example, business educators need to know what computer tasks students should be able to perform for today's workplace; and what tasks will be needed in the future. Further, they need to identify instructional needs that will facilitate preparation of students for the workplace in the year 2000 and beyond.

The increasing use of computers in business has created a demand for people who can demonstrate an ability to function in a computer-oriented environment (D'Onofrio & Slama, 1983). This means an ability to perform tasks that demonstrate that one understands, applies, and decides how to create and edit information using computers. For previous generations of computer users, information was manipulated and processed with huge mainframe computers. The 1980s, with the introduction of the microcomputer, required workers to interface with much smaller, quicker processing computers.

The microcomputer has continued to increase the number of individuals who use computers. In 1982, 380,000 microcomputer systems were being installed by companies of more than 100 employees (Panagoplos, 1983). Kroger (1986) projected annual computer sales would reach the $124 billion mark by 1994. He further

predicted that computer knowledge would be essential for as many as 75% of all jobs in the U.S. by 1990.

Lambrecht (1989) proposed that using microcomputers in today's workplace calls for tasks and competencies associated with problem solving. This means students should be "computer literate" beyond minimal interfacing with computers and have a knowledge base (concepts, rules, and procedures) both about computers and the business tasks to be completed. Further, Wiggs (1992) wrote that present day students need the knowledge and competencies related to handling information. It is her contention that this "handling" requires: using electronic mail, composing at the computer, and using sophisticated computer application software.

Issues Related to Computer Use

To determine whether instructional needs can be identified that will facilitate preparing students for computer use, examination of some key issues related to computer use is necessary. These issues include: (a) the influence of technology on education, (b) needed computer application software knowledge and skills, and (c) computer applications instruction.

The Influence of Technology on Education

A number of individuals have addressed changes throughout the years occurring in business education (Mathews, 1980; Pogrow, 1982; Hunter & Aiken, 1987). The most influential change in the workplace environment and high school business education curricula has been the computer, particularly the microcomputer. Some scholars have noted that computers will soon be more important in our educational process than books. According to Bork (1985), computers may entirely replace the book medium for many purposes.

Once computers were used for more than manipulating numbers and the direction of their use expanded to the manipulation of text, what Hills (1987) called the electronic revolution took on an accelerated pace. Most often, the introduction of this technology in education was to teach keyboarding skills, computer concepts, and simple programming. Hassan (1985) noted vocational educators, including business educators, needed to acknowledge the impact of technology.

Needed Computer Application Software Knowledge and Skills

Collins (1986) wrote that as computer use continues to increase in the workplace, the use of accompanying software, including word processing, spreadsheet, and database applications, also will

continue to expand. New employees in information handling occupations need to know the basics of commonly used software, including knowledge of concepts and vocabulary. The responsibility for teaching software concepts and vocabulary has become an accepted part of education. Business education serves as the primary course content area where students learn these things. Therefore, to prepare present and future workers in the use of computers, business educators need to establish a solid foundation of information related to computer use in the workplace. The software concepts and vocabulary examined for this study were taken from word processing, spreadsheets, and databases. Achievement tests were validated with a panel of experts and used with high school students to establish their validity and reliability.

Computer Applications Instruction

Educators provide instruction in computer application software concepts and vocabulary to improve students' personal and workplace competence. For example, part of the Virginia high school course, Business Computer Applications (BCA) especially addresses teaching knowledge of software concepts and vocabulary. BCA is a one-year, single-period course widely offered throughout Virginia. It is designed to

introduce students at the tenth, eleventh, and twelfth grades to microcomputer software concepts and business applications using word processing, spreadsheets, databases, and graphics. Further, the course contains an introduction to the BASIC programming language and some focus is placed on telecommunications. Students participating in this course may also participate in cooperative office education. The suggested grade level for the course is tenth through twelfth and the only prerequisite is eighteen weeks of prior course work in keyboarding (Business Education Suggested Course Competencies And Performance Objectives, 1993). There are 41 competencies associated with the BCA course, as listed in Appendix A. This course was used in this study because of the computer application software concepts and vocabulary elements contained within the curriculum.

Instructional Validity

This study is concerned with student knowledge of computer application software concepts and vocabulary. However, there is also a construct of major interest, instructional validity. During a trial that took place in the late 1970s and early 1980s, the appellate court ruled (*Debra P. vs Turlington,* 1981), among other things, that test scores should contain "curricular

validity." In particular, the court indicated that an estimate of this type of validity was crucial when scores were used to make decisions about graduation, placement, pass/fail, and/or remediation. Plaintiffs in the case argued that the test in question, the Florida State Student Assessment Test (SSAT), contained information, within items, not taught during school experiences of students tested. Schmidt, Porter, Schwille, Floden, and Freeman (1983) define content validity as encompassing a set of instructional objectives as "the desired performance domain." The authors define a curricularly valid instrument as one established as valid with respect to three elements. The first is the domain of objectives, second is extent of agreement with the curricular materials/resources used in the school system. The third element of this trio, and of interest for examination in this study, is defined as content validity with respect to the instructional content actually delivered by teachers in school settings, or what is actually taught. This element is referred to as instructional validity (Schmidt et al., 1983).

Background of the Problem

According to Erekson and Barr (1985), "Today's changing technology is having a dramatic impact on the workplace..." (p. 88). No longer is any firm exempt from utilizing the computer--particularly the microcomputer. Other innovations have been embraced by business and education--radio, film, television, and so forth. However, the computer and its use dwarfs these technologies by comparison. Educators need to know what knowledge of computers students learn in their classes. Instruments need to be developed that will validly measure the performance of students as it relates to computers. And, educators are interested in learning how effective is the computer instruction they deliver.

Computer Literacy

Differing opinions exist as to what should or should not be included in high school computer literacy education programs. As early as 1978, Stair indicated that an understanding of computer application software is critical. Bork (1985), defined the rudiments of computer literacy as lying in knowledge of vocabulary. However, he insisted that by no means does knowledge of vocabulary itself represent literacy. He did indicate that knowledge of certain computer application

software, including **word processing**, **spreadsheets**, and **databases**, was common to a good computer literacy background. Knowledge of concepts and vocabulary play an important role in the use of these software. Further, employers expectations of new employees is that they at least have a grasp of computer concepts and vocabulary (Nellermore, 1992).

Business Education

D'Abrosca and Sink (1982, p. 47), noted as early as 1982 that computer literacy was the latest basic skill; one that should be added to reading, writing, and arithmetic. These authors outlined the responsibility for business educators to integrate computer software concepts into the curricula. Further D'Abrosca and Sink identified a major goal for business education to be "computer literacy" instruction, which they defined simply as emphasizing how to use computer application software. Wood (1983), in discussing business education course content related to computers, included the teaching of vocabulary.

Lutz (1989) wrote that regardless of how one defined the construct of computer literacy, secondary business education was being called upon as a major teaching entity for it. This author advocated the teaching of computer literacy, based on the 1984

definition of the Diebold Group (1984), and the Policies Commission for Business and Economic Education (1984). He determined criteria and advocated a model, developed by the Data Processing Management Association (Staff, 1984), for a high school business education computer literacy curriculum.

Ruby and Corder (1991), asked, "How do we avoid losing our students [from business education] in the explosion of terms that accompany computer literacy instruction" (p. 15)? They wanted to produce usefulness of practice in instruction. That is practice that incorporated real-life application of computer software concepts and vocabulary. This practice, the authors indicated, would motivate students to attain knowledge of application software concepts and vocabulary. Students then would be able to comprehend and apply what they learned. The authors recognized the plethora of computer application software vocabulary closely aligned with information technology. They conjectured, if computer application software concepts and vocabulary are taught by a practical means, in association with a tool, students will gain a concrete base from which to facilitate learning.

National Business Education Association

A statement prepared by a National Business Education (NBEA) Task Force in 1983 and adopted by the NBEA Executive Board on April 6, 1984, included a long list of what computer literacy courses and programs should provide. Although not directly defining the term itself, the Task Force indicated early in its list of criteria that courses and programs teach definitions of vocabulary. That same year, the Policies Commission for Business and Economic Education issued the benchmark statement: **"This We Believe About Computer Literacy"** as noted in the Business Education Forum (Staff, 1984). To quote from the statement on the construct of computer literacy:

> High-quality, affordable computers affect information processing tasks at home, school, and work. It is imperative, therefore, that all students be computer literate (p. 9).

This study assessed how well a selected group of high school students performed on an instrument previously developed to measure attained knowledge of computer application software concepts and vocabulary. Then it examined the self-reports of the students' teachers as to what computer application software concepts and vocabulary were taught. Last, the study examined the instructional validity of the student

instrument.

Knowledge of Computer Application Software Concepts and Vocabulary

Irrespective of how one perceives the construct of computer literacy on the continuum of simple or rudimentary to complex or advanced, at some point knowledge of computer application software concepts and vocabulary must be attained. Attainment of this knowledge in itself is not equivalent to being computer literate. However, the case can be made, based on the literature, of a necessity to instruct business education students in computer application software concepts and vocabulary as an essential part of computer literacy. This study addressed, specifically, the knowledge of concepts and vocabulary associated with word processing, spreadsheet, and database software because of their widespread use in the workplace. Further, extent of instructional validity, based on teacher self-reports of concepts and vocabulary taught matched with student performance, was examined.

Statement of the Problem

The problem identified in this study is the need for reliable and valid instruments to measure student

knowledge of computer application software concepts and vocabulary. This study focussed on analysis of previously developed achievement tests for three software types: word processing, spreadsheet, and database. Specifically, the instructional validity of the tests were examined. This problem was identified when literature reviews failed to produce research concerning student knowledge in computer application software concepts and vocabulary measured by instructionally validated instruments.

Purpose of the Study

Business educators, as well as other educators, often are not sure of what knowledge students have attained in their classes. There is a need to know what computer related information is taught in the Business Computer Applications (BCA) course in Virginia and a need for a reliable and valid instrument to measure student achievement of concepts and vocabulary.

One of the objectives of public high school education is to provide a competent workforce. Toffler (1990) said that the world of work will require informational, or computer skills. These skills include the ability to perform computer application software tasks. Early in the development of microcomputers, Roach (1983) perceived them as becoming

an essential tool for information processing. Computer use for this purpose has evolved as an essential part of business education instruction at the high school level. Specifically, computer application software concepts and vocabulary are taught. One course, offered throughout Virginia and identified with this instruction, is Business Computer Applications (BCA). One outcome of this study was analysis of the reliability and validity of three tests with an emphasis specifically placed on instructional validity. It can be used to test the performance of BCA students on their knowledge of computer concepts and vocabulary related to three widely used software types: word processing, spreadsheet, and database. The research questions below were answered through testing of a group of selected high school students enrolled in the BCA course and through input from their teachers.

1. What is the performance of high school BCA students on achievement tests for computer application software concepts and vocabulary for three types of software: word processing, spreadsheet, and database?

2. What computer application software concepts and vocabulary included on the achievement tests were taught by the teachers?

3. What is the instructional validity of the achievement tests based on student performance on items

3. What is the instructional validity of the achievement tests based on student performance on items indicated as having been taught by the teachers?

Significance and Need

This study presented an objective view of how well selected high school students performed on an instrument developed specifically to measure their knowledge of computer application software concepts and vocabulary. Test items used in the instrument were developed from test items prepared through a curriculum project funded by the Virginia Department of Education (Business Computer Software Curriculum Series Part 2, 1993). The self-reports of teachers were examined in order to determine what concepts and vocabulary had been taught, by item. Finally, the degree of instructional validity of the instrument was examined. Thus, decision makers at the schools participating in the study, and decision makers at similar high schools, will have information regarding the strengths and weaknesses of the instrument. Moreover, decision makers, teachers, and developers of curricula will have access to the extent of instructional validity the instrument has.

The globally interactive nature of business, industry, and government today makes it necessary that

employees have knowledge of computer application software concepts and vocabulary. According to a subcommittee of the NBEA Public Relations Committee (Staff, 1984), if business is the engine that powers the U.S., education is one of the primary fuels of that engine (p. 3). Business education is the formal presentation of information for and about the business world.

In 1986, the National Assessment of Educational Progress began testing students to measure their computer competence. The title of a section of their effort: *Computer Competence: A New Educational Goal*, outlines the fact that expectations exist for students to be able to perform tasks on and be competent in the use of computers. Research findings of Cheney and Nelson (1988), demonstrated that business needs computer competent employees. To substantiate this finding, these investigators administered an instrument to measure computer-related abilities to 100 computer users at 20 different organizations. The extent of computer use in real-world applications necessitates that students learn computer concepts and vocabulary. This knowledge is no longer a "luxury" but rather a must for students.

High school business education teachers strive to provide instruction so their students will attain

needed knowledge related to their future work and personal lives. This study examined, empirically, how computer instruction students receive relates to performance on achievement tests of computer application software concepts and vocabulary. Decision makers, teachers, and developers of curricula need to know whether there is a reliable and valid instrument they can incorporate into their programs. As the 21st century approaches, much of the information of the world will be exchanged through microcomputers (Toffler, 1990). This exchange will take place through use of an array of computer application software. Because of the importance of being able to measure student performance in computer application software concepts and vocabulary, a useable instrument that serves this purpose would be of significant help to business educators, as well as other educators involved in teaching computer software applications.

Delimitations

The following delimitations pertain to this study:

1. The population of the study was restricted to students completing the Business Computer Applications (BCA) course in selected high schools in the Commonwealth of Virginia.

2. The sample was selected to get a group representative of students enrolled in the BCA course in the Commonwealth of Virginia.

3. Although BCA contains content other than word processing, spreadsheet, and database software applications, only these content areas were included in this study.

Limitations of the Study

The following are limitations of the study:

1. The collection of data was limited to those BCA students who were present on the day of test administration. Twelfth grade students contribute to the composition of the BCA course student population. Therefore, the time of the school year devoted to test administration (late spring) precluded capturing results of many seniors who were absent from class that day.

2. Rating of items as taught was obtained by teachers' self-reports. Teacher bias was imputed in their selections and could not be accurately measured. Therefore, selection of items, or not, was limited to their opinion.

3. The three computer application software tests that were included were administered by means of paper-pencil tests. Therefore, the research was limited to

that test environment and does not purport to infer hands-on computer use.

4. Individual classes had a restricted range (see #1). Therefore, statistical calculations were limited to weighted measures to answer research question three.

5. Number of items, per concept, per test were limited such that administration could be completed in one class period for any one student in the sample.

Operational Definitions

Computer application software are programs that tell the computer how to do specific jobs for the user(s) (Bitter, 1986). Used interchangeably with the terms: applications, software, and computer programs.

Competency is a task developed to a required standard (Popham, Schrag, & Blockhus, 1975).

Computer competence is proficiency in the use of general-purpose application programs (software) written by others (such as word processing and database programs). Ability to use the computer to solve significant and interesting problems and the ability to accomplish useful tasks with a computer (Staff, National Assessment of Educational Progress, 1986).

Computer literacy is basic familiarity with computers and their applications to the extent of knowing when and how to use them to good effect (Ellington, 1987).

Computer software concepts represent a general idea or understanding of computer use, especially one derived from a specific activity with the computer. The natural or proper action for which the computer is fitted or employed (Business Computer Software Curriculum Series, 1991). Synonymous with computer software function.

Computer software vocabulary includes the identification of terms, concepts, and commands useful to computer operation and task performance (Business Computer Software Curriculum Series, 1991).

Database, for this study, means software programs for keeping and retrieving large quantities of information in a file (Business Computer Software Curriculum Series, 1991)

Electronic spreadsheet has rows and columns which intersect at cells and is often used for accounting functions. Electronic spreadsheet packages facilitate the creation, use, and storage of large amounts of

information (McLeod, 1988). Electronic spreadsheet is used interchangeably with the term spreadsheet.

Hardware is a term that refers to the equipment comprising the computer system (McLeod, 1988). For example, CRT display screen, hard drive, CPU, and keyboard are all hardware.

Microcomputer is a term used to distinguish smaller computers from minicomputers and mainframes (McLeod, 1988). Synonymous with personal computer.

Objective represents a task or knowledge to be mastered or acquired (The American Heritage Dictionary, Morris, Ed., 1982).

Software is a set of instructions telling the computer which functions to perform to solve a problem (Weatherwax and Weatherwax, 1991). Used interchangeably with the terms computer applications and computer programs.

Spreadsheet is a large sheet of rows and columns intersecting to form cells that is primarily used in manual accounting systems (McLeod, 1988).

Word processing is an office automation application that uses a combination of computer hardware and software to perform typing operations. The main feature is the computer storage, which enables a document to be revised easily and used many times (McLeod, 1988).

Study Organization

This chapter provided an overview of the study. Chapter II discusses the literature. Chapter III details the Business Computer Software Curriculum Series and its use in the study. Chapter IV details the research methodology, data collection procedures, and data analyses. Chapter V details the findings, while Chapter VI includes a summary, conclusions, and the recommendations.

CHAPTER II

REVIEW OF THE LITERATURE

The topics discussed in the review of the literature are (a) uses of microcomputers, (b) computer applications software--word processing, spreadsheets, and databases, (c) studies in computer literacy, (d) studies in instructional validity, and (e) summary.

Uses of Microcomputers

In 1977, the first generation of microcomputers was developed. Wolverton (1984) calls the microcomputer perhaps the most significant technological innovation in modern times. Early microcomputers were not readily accepted by society, because they were not user-friendly. Characteristics of them most complained about included:

difficult to operate,

slow in processing instructions,

costly,

limited memory,

limited productivity,

not readily portable, and

restrictive software.

Computers were thought of initially as counting machines or as powerful calculators. The early

calculators, but still their use was restricted to manipulating numbers, symbols, and other mathematical calculations. This type of usage could be traced directly from the abacus to Babbage's "mechanical computer" to pocket calculators (Hills, 1987, p.11). The direction and use of the microcomputer changed as it began to be used to process and manipulate text and data. Hills (1987) calls this the beginning of the electronic revolution.

Computer Applications Software

Germane to text and data manipulation is knowledge of computer application software concepts and vocabulary. The concepts and vocabulary included in this study are word processing, spreadsheet, and database computer application software.

Word Processing

In 1985, Bork noted that word processing is essential for today's business education students. He viewed the ability to edit documents in an efficient manner as a basic notion of word processing. Since then, the workplace community has continued to increase its use of word processing computer application software. Hunter and Aiken (1987) noted that administrative support personnel in today's offices

typically use several word processing programs.

Kizzier, Pollard, and Ford (1991) researched instruction related to computer application software in six Mountain-plains states. Interviews were conducted with 66 high school business educators. Of those responding, 100% chose word processing as a software that should be taught in high school. A subcommittee of the NBEA Public Relations Committee, in the October 1984 issue of the Business Education Forum noted many work sites--small businesses in particular--cannot conduct their own training programs but expect students to enter their employ with basic knowledge of word processing computer application software.

Casady (1988) conducted a study of 45 companies to determine the status of word processing in these selected firms. Surveyed were executives, managers, and administrative support personnel. Of the computer application software used by administrative support personnel as well as word processing specialists, word processing ranked number one. The uses of word processing software in today's workplace include all manner of text creation (Johnston, 1985). For example, memoranda, form letters, mailing labels and envelopes, different reports and statements are some of the document types created using word processing. Also, authors utilize word processing software in manuscript

development. Researchers document their studies and findings using word processing software. Further, personnel generate other types of letters in the workplace using this kind of software, for example, letters to customers and/or vendors. Casady (1988) found word processing software to be used by managers to write office manuals, train end-users, and document evaluations.

Spreadsheets

Electronic spreadsheets have rows and columns which intersect at cells and are often used for accounting functions. Because business, industry, and government organizations are dependent on keeping track of financial transactions, the employable business student needs to know the concepts and vocabulary of this software. Bork (1985) was an advocate of students having this knowledge as an essential ingredient of computer literacy.

A subcommittee of the NBEA (1984) stated that spreadsheet software are an accepted fact in the workplace and throughout society. The Association indicated the teaching of them is a must because of their widespread use. Moreover, Johnston (1985) believed students need to know about concepts and vocabulary associated with spreadsheet software for the

same reason--prevalence of their use throughout the workplace and society. Johnston explained, their use is typical in the workplace, which is where students go upon completing their education.

Casady's research (1988) further demonstrated the wide use of spreadsheet software by administrative support personnel and word processing specialists. These employees ranked spreadsheet software as the second most used type of computer application software. Managers used the software even more than this group. Casady found spreadsheet software to be most often integrated with word processing. Spreadsheet software were taught in over 90% of the respondents' high schools in the Kizzier, Pollard, and Ford study (1991). Moreover, in their survey of business educators in six mountain-plains states, when the respondents were asked what software should be taught, 96.9% indicated spreadsheet software.

Spreadsheet software are used in the workplace for several important functions. Financial planning is one service industry that has made the use of spreadsheet software legendary (Woolls, 1986; Rowinsky, 1986; Pearlman, 1987; Bryan 1987; Connolly, 1989; O'Reilly, 1990). The capability to perform "What If..." scenarios makes the software particularly attractive to financial counselors, planners, and investment brokers.

Davis (1985) wrote that many accounting functions are performed using the spreadsheet software and numerous accounting forms and reports are generated using it. Namely, journal entries from accounts payable/receivable, payroll, inventory transactions, sales, and income are recorded using spreadsheet software. Many accounting reports, including balance sheets, income and expense statements, and bank reconciliation statements are created using the spreadsheet software. Another prominent use is in the preparation of the periodic budget reports essential to the workplace environment.

Database

Powell (1988, p.168) named database software as the "most powerful of the productive tools in the information age." Government, business, science, and education retrieve information for decision making from databases world-wide. This data, when organized into comprehensible formats, e.g., reports, has great utility. Powell (1988) indicated that almost every work site using computers also uses database software. Ruby (1983, p.8) asked, "Should we [business education] be attempting to teach our students the highly sophisticated software packages designed for...database management?" This author thought that database

software was not designed as courseware, which should be, according to him, less complicated or more simplistic.

Cheney and Nelson (1988) surveyed educators and businesses in an attempt to answer whether schools were meeting the needs of the workplace community. They found computers being used in the workplace; and schools were offering computer-related courses using a variety of software, including database programs. Kizzier et al. (1991) found a present day increase in the workplace of database software use. When they surveyed business educators, they found that an overwhelming majority (97%) were teaching database software. Casady (1988) found that in the workplace, after spreadsheet software, the next most integrated program with word processing was database software. Educational literature, customer information, inventories, census demographic data, personnel records, and student databases are just a few uses of this software.

Studies in Computer Literacy

The following section is devoted to studies of computer literacy. The section contains research on computer use in the home and at school. Some information on experiences and attitudes toward

computers is included and conclusions based on results of instrument development of other investigators are part of this section. A summary of the section is its final part.

Carey and Gall (1986) investigated the use of computers at home and at school of a stratified random sample (N=983) of high school students. These students attended high school in the Eugene, Oregon school district. The researchers found that of these students who used a computer at home (n=299), almost 60% engaged in word processing tasks, about 30% engaged in database tasks, and approximately 17% engaged in spreadsheet tasks. The number of students who used a computer at school was larger (n=328). Of these students, approximately 60% performed word processing tasks, about 55% performed database tasks, and about 42% performed spreadsheet tasks. Overall more than 50% of the total sample used computers in the home, at school, or both. Carey and Gall reported that computers are being used extensively by high school students. This computer use occurs at home and at school.

In a study to examine the effects of home environment on achievement and attitudes toward computer literacy, Shoffner (1990) surveyed 193 fifth- through tenth-grade students. The sample came from eight public schools in the eastern portion of North

Carolina. The findings showed 90% of the students reported having some type of computer in their home. Shoffner found in the analysis that home environment was a better predictor of attitudes toward computer learning than student achievement. The author further reported that the findings show having a computer in the home positively affects interest in the computer.

Sparks (1986) studied the relationship between microcomputers in the home and measures achieved on a standardized test. This test, the Northwest Regional Educational Laboratory Computer Literacy Test Grade Seven (CLTGS), contained 50 questions. It was administered to 693 seventh grade students at a Missouri junior high school. Considering the increased use of computers in the home, noted the author, is important to educators, designers of curricula, and administrators. Of these students, 36% had microcomputers in the home. A significant difference on the CLTGS was found to exist between the group with computers in the home and those without microcomputers in the home.

D'Onofrio and Slama (1983) were interested in investigating the extent to which computer literacy resulted from the use of microcomputers in high school accounting classes. Ninety-two students from a midwestern high school were pre- and post-tested

utilizing the quasi-experimental non-equivalent group design (Campbell & Stanley, 1963). The study found that students exposed to microcomputers performed better on a test of computer literacy than students not exposed to microcomputers. Students exposed to microcomputers became more knowledgeable about the use of computers in society and more confident about their own ability to interface with computers. Moreover, the authors determined that they supported the notion of computer use in curricula unrelated to computer science.

Gabriel (1985) reported on three years of test development and validation research in computer literacy. The researcher tested over 3,000 students in 115 schools in grades ranging from four, to seven, to eleven. The objective was the construction of an assessment instrument. Gabriel found a consistent increase in the use of computers as students advanced from grade four, to seven, to eleven. He indicated that there is much work to be done in developing curricula that include computer literacy. He asked, "If students are not being exposed to the curriculum in a uniform, articulated way, how can they be expected to acquire the skills and concepts [of computer literacy]" (p.423)?

Computer experience and its relationship to attitudes about computers was studied by Lloyd and Gressard (1984). A total of 354 students participated in the study, 186 were high school students from a large school district. One goal of the study was to explore the possible effects of computer experience on computer attitudes. Experience with computers was found to be an important factor concerning student attitudes; with more computer experience corresponding to more positive computer attitudes. The authors, based on the results, favored providing interaction between students and computers as early as possible in their educational careers. Further, they supported the notion of giving students increased experiences so that they may become more familiar with computers from grade to grade.

Cheney and Nelson (1988) reported that there is a need of an instrument to measure computer user abilities. Their research centered around the development and evaluation of such an instrument. The construct validation process of the instrument included a principle components factor analysis. One of three factors that the items loaded on was application abilities. Of its components, the ability to use packaged software, i.e. word processing, spreadsheet, and database, loaded heavily (0.67623) in the

contribution to this factor. The authors concluded that computer users need to learn computer concepts and vocabulary, in order to be productive in the use of these three application software types. Simonson, Maurer, Montag-Torardi, and Whitaker (1987) performed an extensive process in constructing and validating a standardized test of computer literacy and computer anxiety. They determined that a computer literate person, among other things, can perform tasks in computer application software. This conclusion was reached after a review of the literature was undertaken in an attempt to define computer literacy. The authors took an eclectic approach and defined the term as "an understanding of computer characteristics, capabilities, and applications, as well as an ability to implement this knowledge in the skillful, productive use of computer applications... (p. 233). Cheng, Plake, and Stevens (1985) noted the role of valid, reliable instruments is to serve as a priori tools for assessing students on the notion of computer literacy.

To summarize this section, the literature review included here shows some major findings in relation to performance on instruments when students are exposed to computers in the home and at school. These findings suggest that more and more students are interacting with computers at home. Their interest and attitude is

increased and more positive with increased experiences with computers. The need for instruments to measure computer user abilities is an ongoing concern; with the ability to use application software a major factor in the construct of computer literacy. Although estimates of validity were reported for some curricular materials, the studies did not empirically estimate the instructional validity of the instruments developed.

Studies in Estimating Instructional Validity

Instruction and assessment are integral components that must have a high positive relationship if effective education is to take place. The classroom teacher has the responsibility of testing what was taught. As Calfee (1983) points out, this system is seldom brought into question and if so, students who feel that items on tests are not part of instruction are quickly dismissed.

As a result of the landmark court case, *Debra P. vs Turlington* (1981), education and testing professionals are held accountable for instructional validity in a variety of incidents. Instructional validity, as defined by Schmidt, Porter, Schwille, Floden, and Freeman (1983) samples the instructional content actually taught to the students. It is content validity with the domain of interest being the

instruction delivered by classroom teachers. This section of the literature review outlines some studies conducted to determine estimates of instructional validity.

Prototype Measurement of Instructional Validity

Working with elementary school mathematics teachers and students, the following techniques were created by Schmidt et al. (1983) for measuring instructional validity. Their study provides the prototype for measurement of instructional validity. The authors initially created a taxonomy that enables one to map the items of a test into instructional domains. Schmidt et al. concede that obtaining data on instruction delivered and detailing it is a difficult task (p. 145). Their research conducted in the 1979-1980 school year used seven teachers in three different districts. Weekly interviews of the teachers were performed, observations of their classroom instruction were made and teachers made recordings in daily logs. The above mentioned taxonomy had the form of a three-dimensional matrix. General intent of the lesson, the nature of the material presented, and student operations performed were the three dimensions. Each item on a test was placed/mapped according to the dimensions chosen for the taxonomy. The result is a

visual representation of the areas of instruction covered by the test (Schmidt et al. 1983, p. 141). By mapping the number of items that were covered for any given topic into cells, within cells, across cells, and columnar totals of cells may be generated. Another result of mapping, percentages can be calculated involving subsets of instruction of the entire test. An example of the mapping might result in the following: three items of a fifty item test received instruction from teachers in the area (dimension) of skill (intent) attainment in adding columns of numbers of multiple digits (nature of material and operation to perform).

Test Analysis: Item Search

Leinhardt (1983) developed a technique for estimating instructional validity which he described in The Courts, Validity, and Minimum Competency Testing. Items on a test were cut and pasted to index cards, then textbooks used in a class were searched for each item. If a match was located, the text location was written next to the test item along with identifying information about it. Test items that matched located text were said to have been taught.

Instructional Analysis: Teacher Interview

Another strategy developed by Leinhardt (1983) involved interviewing teachers. The interviewer asked teachers to estimate how much of a test was covered by instruction. The author noted that experienced teachers with a minimum of three to four years of instructing are accurate about material utilized in tests and their instructional practices. Leinhardt (1983) asked one of three forms of the following questions of teachers:

1. Did you teach that info this year? or;
2. Has [Mary] been taught enough info to answer this item correctly? or;
3. Can [Mary] get this item right? (p. 158)

In order to establish instructional validity, Leinhardt (1983, p. 158) suggested the following procedures. A blank test is made up for each student and the teacher is asked to answer for each item for each child, "Has X [student] been taught the information required to pass this item?" The percentage of overlap between the test and instruction, or instructional validity, is calculated by taking the number of items perceived taught by the teacher divided by the total number of test items.

Alabama High School Graduation Examination

Hardy, (1984) of the Educational Testing Service, estimated the instructional validity of the Alabama High School Graduation Examination (AHSGE), prior to its initial administration. A questionnaire was developed and administered to a representative sample of the state's total high school faculty at the seventh- through tenth-grades. The results indicated that of 63 competencies included in the questionnaire, students have a greater than 95% chance of receiving instruction in 44 of the competencies. Nineteen competencies with values of less than 95% taught were in the content areas of reading and mathematics. Language Arts were found to be uniformly taught to 60-80% of all students in the sample grades. Interestingly, the initial format of the questionnaire simply listed each of the competencies required for the AHSGE and asked the teachers to indicate a yes or no response to the question "Do you teach this competency in your classroom?" Subsequent interviews with classroom teachers showed this design to be lacking and inadequate for several reasons. Namely, in some instances students were homogeneously grouped and teachers may find themselves teaching groups of different ability levels during the school day. The teachers responded that in these cases a particular

competency might be taught only to some students. In yet another instance, a particular competency was said by the teachers to be too difficult for particular groups of students. In these cases, a particular competency was thought to be taught at a higher grade level after students had received instruction in less difficult prerequisites which they first needed to master. Moreover, in the judgment of the teachers, if students had already mastered a particular competency in a lower grade, instruction in that competency was not given. Because of these enlightening interviews, the researchers were able to revise their instrument to be more instructionally valid. Further, merely asking "yes" or "no" dichotomously appeared to provide less useful data for a true estimate of instructional validity.

Validity In Test Development

A research project conducted by Rose, Ryan, and Birdseye (1984) analyzed instructional validity from a "during-test-development" point of view. That is, most studies of instructional validity are post hoc. Their estimates were based on administration of instruments developed after instruction has taken place. Rose et al. contended that the examination of test item-instruction congruence prior to the finalization of a

test has certain advantages. First, certain problems can be avoided if data on the adequacy of instruction in skills assessed by test items are collected concurrently with the piloting of those items. Second, understanding the relationship between test items and instruction is more powerful in terms of psychometric analyses. Last, there is the advantage of helping to re-establish teachers as part of the assessment process if instructional validity issues are addressed in the test item-development stage. Rose et al. used the Charleston County School District in the development of a district-wide General Mathematics I (GMI) final exam for ninth graders. The authors' research design included teacher self-report of instruction, which contained data on teachers' estimates of students' opportunity to learn and evaluation of students' level of mastery.

The sample was composed of fifty-one teachers who were requested to answer questionnaire items detailing descriptions of instruction and mastery levels as it applied to all students in their classes. Pearson Product Moment correlations were generated for two test descriptors, (a) item difficulty and the percentage of fitting items per objective, and (b) the percentage of teachers selecting each instructional code for each objective. Results confirmed the implied hypothesis

that a positive relationship existed between students' mastery and item easiness. The authors speculated in interpreting other results that over the course of the school year, because fewer teachers entered data, that (a) the objectives were not taught and teachers did not want central staff to know, or (b) teachers were under pressure at the end of the school year and had too much paperwork to complete their records.

When discussing the beneficial outcomes, Rose et al. indicated that their study demonstrated a true relationship between instruction in the classroom and field test data. They noted, if given some variability in the quality of items field tested, items not passing their criteria will tend to be those designated by teachers as having received less instruction/emphasis. Further, the authors noted the benefit that instructional data contributes to the test development process. In conclusion, the authors stated that results would be more valid if student level data could be included in an instructional validity study.

Teacher's Estimates of Test Content

Methodology used by Winfield (1987) included teachers' self-reports to estimate instructional validity. The study's purpose was to investigate the relation between Chapter 1 and other classroom

teachers' estimates of test content taught and reading achievement of first-grade students enrolled in Chapter 1 reading instruction. The primary goal of the federally funded Chapter 1 program is to improve the educational opportunities of educationally deprived children. The program attempts to help children: (1) succeed in the regular program, (2) attain grade-level proficiency, and (3) improve in the basic and more advanced skills that all children are expected to master (Davis, 1992). The researcher surveyed 14 first-grade teachers and five Chapter 1 teachers who taught the same students within a school. The study used the Comprehensive Test of Basic Skills (CTBS), Form U as its testing instrument. The treatment of teachers' self-reports matched to items showed a significant difference between Chapter 1 teachers' ratings and other classroom (first-grade) teachers' ratings. It was determined that Chapter 1 teachers cover CTBS items slightly more than other teachers. In obtaining estimates of how well or poorly test scores of students related to teachers' estimates, comparisons were made of teachers' ratings and students' percentage-correct scores obtained on particular items.

Results show that Chapter 1 teachers may have provided slightly better estimates of student performance as compared to other teachers' and may have

provided more instruction for students to learn particular skills. Winfield summarized that instructional validity could be viewed similarly to the Schmidt et al. (1983) notion of providing students with the opportunity to learn test content. One limitation noted by the author centered around instruction practices of the Chapter 1 teachers. They often tailor instruction to individual student needs. This facilitates variability in content taught.

In summary, procedures developed as a result of the *Debra P. vs Turlington* court case and delineated by Schmidt et al. (1983), Leinhardt (1983), and Leinhardt and Seewald (1981) are effective methods of establishing instructional validity. The exclusion of instructional validity studies in testing and instruction of computer application software concepts and vocabulary is conspicuous. No studies addressing this construct were found in the literature. Therefore, this study was undertaken to establish instructional validity for three tests of computer application software concepts and vocabulary.

Summary

Word processing, spreadsheet, and database computer application software programs are widely used in the workplace. High school business education

teachers include the instruction of these packages in their curricula more than any other types of software. Further, it has been established that students should be learning the knowledge of the concepts and vocabulary of these computer application software, making them appropriate for this study. As more and more students experience computer use in their homes and schools, these experiences improve and enhance their achievement in computer related tasks and their attitude toward computers. The issue of test-instruction congruence has been linked to a number of disciplines and curricula. However, little attention has been given, according to the literature, to instructional validity related to performance on, and use of, computer application software. This study addressed examination of what teachers have taught and how students' perform to establish instructional validity for three paper and pencil tests of vocabulary and concepts related to computer application software.

CHAPTER III

DEVELOPMENT OF THE BUSINESS COMPUTER SOFTWARE CURRICULUM SERIES

Part I

The achievement tests, or the student instrument for this study, was developed using the Business Computer Software Curriculum Series 1991: Part 1: Business Applications Software (1991). Part 1 of this series was designed to assist business teachers, in Virginia, plan their instruction. The publication takes into account that there are a large number of computer operations that occur in the workplace. Business teachers, in creating organization of instruction of these computer operations, may use the Series, Part 1, to teach seven types of application software. Course competencies for these computer operations may be found in the Business Education Suggested Course Competencies and Performance Objectives, published by the Virginia Department of Education in 1989 and revised on an annual basis. Included in Appendix A is a list of suggested course competencies and performance objectives for the Business Computer Applications (BCA) course, the course of interest for this study.

Computer Tasks in Business

For the Computer Software Curriculum Series, Part 1: Business Applications Software, a team of curriculum specialists developed a taxonomy of computer tasks needed to achieve various software related competencies. They defined computer tasks as activities required to produce something useful at a computer. First the team conducted a survey of business educators in other states to ascertain if they had identified specific tasks for business applications software use. This survey located several curriculum guides and other teaching materials; however, a comprehensive list of business application software tasks was not found. The survey did uncover a concern on the part of other state officials and educators related to the need for such information. Respondents were having difficulties in developing computer related curricula as was the case in Virginia. Because of these concerns, the curriculum series developers sought to construct a list of tasks from other sources. This led to categorization of business application software into seven types (p. 2):

1. **DOS and fundamentals** category for internal and external disk operating system commands and terms, concepts, and procedures related to hardware and software use.

2. **Word processing** software for text production and printing.

3. **Spreadsheet** software for entering and organizing data into rows and columns for computation and analyses.

4. **Database** software for records management.

5. **Graphics and graphing** software for creation of pictures, designs, stylized text effects, and charts.

6. **Data communications** software for interaction between computers.

7. **Desktop publishing** software for integrated text and graphics and production that approaches the quality of commercial typeset.

Computer Application Software Concepts

Next, several types of publications were examined to extrapolate a list of computer tasks occurring in the world of work. The curriculum developers compiled some 1,200 individual tasks, which they placed within each of the above software types according to nine common concepts or functions:

1. **Vocabulary** includes the identification of terms, concepts, and commands useful to computer operation and task performance.

2. **Access software** tasks allow the student to get the software up and running.

3. **Data/text entry** tasks are keyboarding operations and include entry of letters and numbers, and operation of special function keys.

4. **Editing** tasks allow the student to add, delete, change, or reorganize data entered in the computer by key or mouse operation.

5. **Formatting** tasks enable the student to arrange text or graphic elements on the page or in a document.

6. **Printing** tasks are those related to printer access and operation.

7. **File management** tasks help the student store and access information at the computer.

8. **Production** includes assignments which apply a combination of tasks to realistic job activities.

9. **Troubleshooting** tasks require the student to solve problems commonly encountered by computer users.

The development team also placed the tasks within each concept by level of difficulty: beginning, intermediate, and advanced, respectively.

Validation Procedures

In order to determine the degree of validity of the list of tasks, a two-stage approach was used. First, experts in the use of each type of software examined each task for inclusion and placement in the final taxonomy. After the review by expert users, a business technical committee determined the degree of validity of the tasks strictly from the standpoint of business and industry requirements. Extensive revisions, deletions, and/or additions to the original list were made as a result of these validation

procedures. The result was a validated list of 1,100 computer tasks, each identified by software type, concept or function, and difficulty level.

During the next phase the team reviewed the courses and competencies in the Business Education Suggested Course Competencies and Performance Objectives and determined that 22 courses and 135 competencies required computer operation. The validated computer tasks were then assigned to the appropriate courses and competencies according to the competency statement and performance objective requirements as taken from the curriculum guide.

Part 2

The Business Computer Software Curriculum Series Part 2: Test items for business computer tasks (1993) was developed to provide test items applicable to the identified and validated task list. As a member of the item development team assigned to create test items for Part 2 of the Series, this researcher constructed test items for the software types of word processing, spreadsheet, and database. Creating test items, as shown from the literature, with reliability and validity is no simple matter. Therefore, guidelines for the construction of the test items were taken from the following achievement test developers:

1. Berk, 1984;
2. Crocker & Algina, 1986;
3. Childs, 1989;
4. Downing & Huladyna, 1989;
5. Johnson, 1989;
6. Gronlund & Linn, 1990;
7. Powell & Gellespie, 1990;
8. Shick, 1990; and
9. Wiersma & Jurs, 1990.

The items included in the achievement tests of the student instrument for this study, were written with attention to task-item congruence and are included in Appendix E of this research. Test items for concepts included in the study are: (a) **vocabulary**, (b) **access software**, (c) **data/text entry**, (d) **editing**, and (e) **formatting**. The other concepts had an under-representative sample of items written for the Series Part 2 and some concepts were completely devoid of items. Each of the computer tasks assigned to any of the included concepts has at least one item written specifically for it and some tasks have multiple items. Chapter IV discusses the development of the achievement tests in detail along with other issues related to the research design and methodology.

CHAPTER IV

RESEARCH DESIGN AND METHODOLOGY

This chapter describes the research methodology used to determine the degree of instructional validity of the test instrument. Teachers' self-reports were used as a measure of what concepts and vocabulary had been taught related to computer application software. Student performance was determined by number of items answered correctly and Kuder-Richardson 20 (KR-20) was used to establish the degree of reliability for the achievement tests. The study was conducted through procedures as follows: (a) developing the research questions, (b) designing the research, (c) establishing preliminary procedures, (d) identifying the study participants, (e) collecting the data, and (f) analyzing the data.

Research Questions

The purpose of this study was to analyze the reliability and validity of three achievement tests with an emphasis specifically on instructional validity. These instruments were designed to measure knowledge of computer concepts and vocabulary related to word processing, spreadsheet, and database software. This was accomplished by evaluating the performance of

selected high school BCA students on the achievement tests. Further, teachers' self-reports were used to determine what computer concepts and vocabulary, by item, by software type, were actually taught to the students. The following three research questions were addressed:

1. What is the performance of high school BCA students on achievement tests for computer application software concepts and vocabulary for three types of software: word processing, spreadsheet, and database?

2. What computer application software concepts and vocabulary included on the achievement tests were taught by the teachers?

3. What is the instructional validity of the achievement tests based on student performance on items indicated as having been taught by the teachers?

Research Design

This study was designed to demonstrate student achievement and the construct of instructional validity. A student instrument was developed to assess the performance of the BCA students. In addition, a separate instrument was used for teachers' self-reports. Teachers rated each test, by item, as to whether or not the corresponding computer application concepts and vocabulary had been taught. To answer

question one, descriptive statistics were generated. To answer question two, each item rating was analyzed. Last, to answer question three, analyses included statistics of weighted measures on test performance.

Preliminary Procedures

Certain activities were undertaken prior to the collection of data for the study. The researcher (a) identified the panel of expert practitioners to assist in content validation procedures of the test items of the student instrument, (b) undertook a process of test item content validation, (c) field tested the items and completed item analyses of the field test administration and, finally, (d) developed needed instruments.

Panel of Expert Practitioners

Nine expert practitioners were identified who are knowledgeable of either one, two, or all of the computer application software chosen for the study--word processing, spreadsheet, and/or database. A list of these nine expert practitioners is included in Appendix B of this study. The nine expert practitioners included four educators in business or vocational and technical education from four- and two-year colleges and universities. Two vocational

directors of public high school districts, and a chairperson from the Management Information Systems department of a major university were included in the group. In addition, two members of private industry, a senior programming analyst, and a staff specialist with a telecommunications corporation participated in the content validation process. To contact the expert practitioners, telephone calls were made to explain the purpose of the study. The expert practitioners were asked to participate in determining the degree of content validity present in the test item section of the instrument. Three expert practitioners received test items dealing with each area of the computer application software included in the study.

Test-Item Content Validation

The content validation procedures for the test items were driven by guidelines developed by the American Educational Research Association (AERA), the American Psychological Association (APA), and the National Council on Measurement in Education (NCME), (AERA/APA/NCME, Joint Committee, 1984). Content validity was established by the nine expert practitioners who are knowledgeable of either one, two, or all three of the computer application software types selected for the study. Procedures included providing

each practitioner with a rating section included next to each test item. The section contained a task, rating scale, and area for additional comments (Wiersma & Jurs, 1990). The expert practitioners were asked to rate the item-task congruence on a scale of 1 = poor to 4 = excellent. A copy of the content validation instrument for one of the software types, word processing, is included in Appendix C.

Three expert practitioners rated items for each of the computer application software types. The Likert type scale for rating the items was: 1 = poor to 4 = excellent. Items rated with an average of less than 2.67 (R.L. Frary, personal communication, April 1, 1993) were either revised per the suggestions of the expert practitioners or eliminated from the instrument. Items rated greater than 2.67 were retained and used in the achievement test item section of the student instrument. To complete the final version, items were chosen at random from each of the five concept areas with approximately an equal distribution across computer application software concepts.

Field Testing and Item Analysis

Field testing. The achievement test items were next field tested. To perform this task, a group of high school students (N=31) similar to the study participants were asked to complete the student instrument. This group was administered the items early during the spring semester, 1993. The class was divided into three groups of students approximately the same size. Each group of students completed those items related to one of the three types of software. A copy of the word processing instrument for field testing appears in Appendix D. The classroom teacher of the field test sample was also requested to complete the teacher instrument.

Item analyses. After field testing, analyses of the test items included the following estimates of item parameters identified as most relevant:

> Item difficulty equals proportion of examinees who answered the item correctly. The item difficulty levels acceptable were estimates between .5 and .75 (Lord, 1952a).
>
> Item discrimination equals an index of how effectively the item discriminates between examinees who were relatively high on the criterion of interest and those who were relatively low. Acceptable levels of the index of discrimination were estimates from .5 to .75 (Crocker & Algina, 1986).
>
> Point biserial correlation equals relationship between an item score and total test score (Berk, 1984).

Distractor response equals frequency of students responding to each distractor (Torardi, 1985).

The above item analyses were completed to determine which items were best suited for measuring knowledge of computer concepts and vocabulary for the three computer application software types. Two indices used in the study, index of discrimination and point biserial, have been found to be correlated high positive with one another in a number of studies including those conducted by Englehart, 1965; Oosterhof, 1976; and Beuchert & Mendoza, 1979. In most of these studies the greatest discrepancies occurred for items at extreme difficulty ranges. Therefore, the determination of item difficulty estimates of .5 to .75 were chosen for this study. Items were then eliminated or revised for those failing to meet acceptable estimate levels.

Instrument Development

Two instruments were developed for this study. A student test for each of the software types and a teacher instrument. The achievement tests, as outlined in Chapter III, were originally constructed for another project and published in the Business Computer Software Curriculum Series Part 2 (1993).

Student instrument. Following the field test and subsequent item analyses, the student instrument was ready for administration. An achievement test for each of the software types was developed for the high school BCA student sample. For each concept, there were approximately the same number of items. The computer application software concepts used, which were defined in Chapter III, were:

1. Vocabulary,
2. Access Software,
3. Data/Text Entry,
4. Editing, and
5. Formatting.

The achievement tests' format was multiple choice test items. Initially, several sections of matching items were to be included. These were converted to multiple choice to keep test administration time within one class period and to maintain homogeniety of item type (J.C. Fortune, personal communication, April 21, 1993). Corresponding items relating to each concept, by software type, were assigned numbers. These were written on small slips of paper and placed in a large bowl. Without replacement, the numbers were drawn after mixing for item order on each achievement test, according to software type. This randomization was

performed to prevent block grouping of items, by concept, by software type.

The word processing test contained 60 items, the spreadsheet test contained 59 items, and the database test contained 59 items. A slight descrepancy for the number of items among tests is due to several factors. First, only so many items qualified for final consideration. Second, as stated earlier, some concepts and vocabulary had a limited number of items originally developed and devoted to them. Third, the time constraints for administering the test items influenced the study such that an estimated number of items had to be decided. It was desired that no student would be unable to complete the test in a single class period. The objective of approximately 60 items per test was set, based on the information. This guideline was achieved on each of the three tests.

This student instrument was developed specifically to evaluate the performance of the high school BCA students in the sample. Each student completed an achievement test on one of the three software types. Classes were divided so that approximately one third of the students completed each software type test. The achievement test items were administered to each high school student in the sample completing the BCA course.

The three achievement tests, one each for word processing, spreadsheet, and database appear in Appendix E.

Teacher instrument. The teacher instrument contained all items, by software, that were included in each individual student instrument. The ordering was as follows: word processing, spreadsheet, and database, respectively. The numbering of items for each software remained as derived from the student instrument section. Teachers were not given information as to which items pertained to which concept.

The teacher instrument asked classroom teachers to rate each achievement test, by item, as to whether the computer application software concepts and vocabulary corresponding to that item had been taught. A dichotomous scale (Crocker & Algina, 1986; Gronlund & Linn, 1990) was used in the teacher instrument with ratings on the concepts taught = 0, or if not taught item ratings = 1.

Study Participants

This section identifies the population and sample of the study. A detailed description of why and how the sample was selected follows. The section includes

a table of information about the sample school settings and data on their characteristics.

Population and Selected Sample

High school students completing the BCA course in selected school divisions of Virginia were determined to be the population of the study.

A sample selected from these divisions was used in this study. It was decided, due to constraints of cost, time, and assistance needed to complete the study that this type of sample would be appropriate. Moreover, there was an attempt to include in the sample students from various school settings. Once the decision to use a selected sample was made, the next step involved contact with a number of Virginia high school administrators and business education teachers to secure information on their BCA programs. Specific administrators and business education teachers were contacted across the Commonwealth to seek their assistance with the study. If school personnel responsible for receiving a proposal were favorable to the informal requests for information and assistance, they were asked to supply guidelines, in writing, for proposal submission. During the interviews that were conducted, there was an attempt to select a homogeneous sample, in terms of similar BCA curriculum taught.

This was accomplished by referring to the curriculum guide when inquiring about BCA course content, length of class time, and methods used to instruct students in concepts and vocabulary. A request proposal was forwarded to seven school division administrators in the Commonwealth of Virginia. One large suburban school division administrator notified the researcher that because of time constraints, that division would not be able to grant the request to participate. One large urban school division administrator thought the students would be unable to recall any information taught during the Fall 1992 semester, and therefore declined to participate because of perceived poor student performance. Another large urban school division administrator never responded to the request proposal. Upon personal visit to this large urban school division, information was secured indicating the administrator had not returned any phone calls since the approval committee had not rendered a decision and she had no information to give.

Four school division administrators and their business education teachers agreed to participate. They were: a large urban school division, a suburban school division, a small urban school division, and a rural county school division. The students in the high schools of each of the above school divisions who were

completing the BCA course constituted the selected sample. Table 1 contains information about the four school division settings, including: total division enrollment, high school enrollment, grades inclusive of each high school, secondary pupil/teacher ratio, division per pupil yearly expenditure, and number of micro computers and the dominant brand of each division (Superintendent's Annual Report for Virginia, 1992-93; Virginia School Directory, 1992).

Data Collection

Instruments were mailed and hand delivered, in quantities specified by each school division, to a study facilitator at each test site, usually the business department chairperson at each high school within the division. The test items for the three computer application software types were administered to have as equal as possible distribution. Thus, every BCA class was divided into three approximately equal groups. Each group was tested on one of the three computer application software types, word processing, spreadsheet, or database. This procedure was adopted because a single test of all three parts was too lengthy for one student to complete in one classroom period. Along with student instruments, enclosures

Table 1

Description of the Four School Division Settings

	Division			
Category	Lg Urban[a]	Suburban	Sm Urban	Rl County
Total Enrollment	16,180	9,593	2,267	2,614
High School Enrollment	5,003	2,468	693	519
Grades	9-12	9-12	9-12	10-12
Pupil/Teacher Ratio[b]	10.5	13.4	12.5	12.8
Secondary Avg. Salary	$42,868	$34,478	$25,800	$27,648
Per Pupil Expenditure[c]	$8,592	$4,838	$3,826	$4,556
Micros/Brand[d]	100+/AICRO	75+/AGMRT	25+/A	25+/MRT

[a] Large Urban = 3 High Schools; 1 Vocational Center
Suburban = 2 High Schools
Small Urban = 1 High School
Rural County = 1 High School

[b] Secondary Only

[c] Expenditures made by the local school division on behalf of state operated education programs (hospitals, clinics, and detention homes) located within the local school division were not included.

[d] Micro Computers/Predominant Brand
A = Apple I = IBM
M = Macintosh R = Radio Shack
G = Apple IIGS T = Tandy
C = Commodore O = Other

provided included: (a) cover letter and instructions, (b) BCA teacher instruments, and (c) self-addressed stamped return envelope. A sample cover letter and instructions are presented in Appendix F of this study. Upon receipt of the materials, each facilitator distributed them as needed to the BCA teachers.

Each mailing or delivery to a particular high school was numbered for tracking purposes and as a secondary control, each BCA teacher self-report asked for identifying information, for example school name. There were no non-respondents in the study.

Data Analyses

This study used several strategies found in the review of the literature for determining the instructional validity of the achievement tests. First, teachers' self-reports as a measure of what concepts and vocabulary had been taught to the BCA students were used. Then, student performance on number of items taught that were answered correctly was used. Kuder-Richardson 20 (KR-20) values established the degree of reliability of the achievement tests. The research questions were answered from information obtained from the student instrument and the teacher instrument. The student instrument was composed of multiple choice test items divided into one of three

computer application software types, word processing, spreadsheet, or database. Further, the instrument contained items about five concepts and vocabulary: vocabulary, access software, data/text entry, editing, and formatting. The teacher instrument consisted of the multiple choice test items for all software types.

Research Question 1

What is the performance of high school BCA students on achievement tests for computer application software concepts and vocabulary for three types of software: word processing, spreadsheet, and database?

The total number of correctly answered items on the achievement test was calculated for each student, according to software type. Next, the following group statistics were calculated for each software type: mean items correct, mean percent correct, minimum and maximum items correct, standard deviation, Kuder Richardson 20 (KR-20), and standard error of the measurement. Finally, the same calculations were derived for the five concepts and vocabulary for each software type.

Research Question 2

What computer application software concepts and vocabulary included on the achievement tests were taught by the teachers?

In order to answer this research question, teachers' self-reports were used. Each item, by software type, was rated either 0 (taught the corresponding computer concepts and vocabulary for that item) or 1 (did not teach the corresponding computer concepts and vocabulary for that item). Items taught, by concept and vocabulary, by software, were then grouped for the purpose of answering the final research question.

Research Question 3

What is the instructional validity of the achievement tests based on student performance on items indicated as having been taught by the teachers?

To obtain a measure of the degree of instructional validity of each achievement test, the following steps were taken and statistics generated (R.L. Frary, personal communication, June 22, 1993):

1. The test items were grouped by concept and vocabulary, by software type.

2. Students whose teachers indicated an item as having been taught were matched for that

item, by concept and vocabulary, by software type.

3. Student performance was then evaluated by calculations which included: weighted average correct and weighted average discrimination coefficients for each item, by concept and vocabulary, by software type. The following formulas were utilized to generate the above:

weighted average correct =

$$\frac{(c_1 * n_1) + (c_2 * n_2) \ldots + (c_n * n_n)}{T}$$

c_1 = percentage correct of the student group

n_1 = number of students in that group

c_2 = percentage correct of the next student group

n_2 = number of students in that next group

T = total number of students whose teachers indicated the item as having been taught (summation of $[n_1 + n_2 \ldots + n_n]$)

weighted average discrimination coefficient =

$$\frac{(d_1 * n_1) + (d_2 * n_2) \ldots + (d_n * n_n)}{T}$$

d_1 = discrimination coefficient of the student group

n_1 = number of students in that group

d_2 = discrimination coefficient of the next student group

n_2 = number of students in that next group

T = total number of students whose teachers indicated the item as having been taught (summation of $[n_1 + n_2 \ldots + n_n]$)

Items, by concept and vocabulary, by software type, were then analyzed for degree of instructional validity. To accomplish this, each total response (n) size and weighted average discrimination coefficient per item were evaluated according to the following criteria/guidelines (R.L. Frary, personal communication, July 12, 1993):

1. Total sample (T) size for any item considered was equal to or greater than 10.

2. Item weighted average discrimination coefficient estimates which were greater than .20 but less than .80 were determined to have an acceptable degree of instructional validity.

3. Item weighted average discrimination coefficient estimates which were less than .20 or greater than .80 were deemed to need revision or were discarded from consideration as having an unacceptable degree of instructional validity. Those with less than .20 were answered incorrectly by most students; while those with greater than .80 were answered correctly by most students.

CHAPTER V

FINDINGS OF THE STUDY

The purpose of this study was to analyze the reliability and validity of three achievement tests with specific emphasis on their instructional validity. To answer the three research questions, tests were administered to a selected group of Virginia BCA high school students. Three achievement tests, one for each of the software types: word processing software, spreadsheet software, and database software, were used. A teacher instrument was administered to the BCA teachers of the students. For it, the items on the student instrument were rated by teachers as "taught the concepts and vocabulary associated with the item" or "did not teach the concepts and vocabulary associated with the item."

Question One

The first question is: What is the performance of high school BCA students on achievement tests for computer application software concepts and vocabulary for three types of software: word processing, spreadsheet, and database?

Outcomes for Total Tests by Software Type

Seventy-seven students completed the word processing achievement test. Their group statistics, including mean items correct, mean percent correct, minimum and maximum items correct, standard deviation, KR-20, and standard error of the measurement are presented in Table 2. For the 60 items, the mean items correct was 32; the mean percent correct was 53%, with a KR-20 value of .92. The standard deviation was 11.89 and the standard error was 3.37.

Seventy-one students completed the spreadsheet software achievement test. Group statistics for spreadsheet software also appear in Table 2. The total number of items was 59, one fewer than for word processing. The mean items correct was 27. This group had a KR-20 reliability estimate of .92. The standard deviation was 11.77, with a standard error of 3.34.

Seventy-three students completed the database software test. As shown in Table 2, total number of items for the database test was 59. The mean number of items correct was 21, the lowest of means among the three software types. This group also achieved the lowest mean percent correct of 36% and KR-20 value, 0.76. The standard deviation was 7.09; while the standard error for the group was 3.46.

Table 2

Performance of BCA Students by Software Type

	Word Processing	Spreadsheet	Database
Total Students	77	71	73
Total Items	60	59	59
Mean Items Correct	32	27	21
Mean Percent Correct	53%	46%	36%
Minimum Items Correct	11	9	6
Maximum Items Correct	54	55	36
Standard Deviation	11.89	11.77	7.09
Kuder Richardson 20	0.92	0.92	0.76
Standard Error	3.37	3.34	3.46

Outcomes for Total Tests by Software and Concept

Finally, to answer research question one, the performance of the students who completed the three software tests was evaluated on the 5 concepts. Table 3 contains outcomes for the 77 BCA students for word processing, by concepts of vocabulary, access software, data/text entry, editing, and formatting. Statistics provided include minimum items correct, maximum items correct, mean, mean percent correct, standard deviation, Kuder-Richardson 20, and the standard error of the measurement. Access software and formatting each accounted for 13 items on the test; while vocabulary and data/text entry each had 11 items. Editing, the remaining concept, had 12 items. Students produced the largest mean value, 7 (54%), for the concepts of access software and formatting. Students scored a low of 5 (45%), for the mean correct on the vocabulary concept items. The reliability (KR-20) values fell between .64 (vocabulary items), and .76 (formatting items).

Performance of the 71 BCA students who completed the spreadsheet test, by concept is displayed in Table 4. For the test, data/text entry had 13 items, access software and editing 12 items each, and vocabulary and formatting 11 items each. Students scored best on access software and data/text entry concepts.

Table 3

Performance of BCA Students (n=77), on Word Processing Vocabulary and Concepts

	Voc [a]	Access	Data/Text	Edit	Format
Items [b]	11	13	11	12	13
Minimum Correct	1	1	1	0	1
Maximum Correct	11	12	11	12	13
Mean Correct	5	7	6	6	7
Mean Percent Correct	45%	54%	55%	50%	54%
Standard Deviation	2.40	2.96	2.69	2.64	3.15
Kuder-Richardson 20	.64	.72	.73	.67	.76
Standard Error	1.45	1.57	1.40	1.52	1.56

[a] Voc = Vocabulary

Access = Access Software

Data/Text = Data/Text Entry

Edit = Editing

Format = Formatting

[b] Total Items = 60

Table 4

Performance of BCA Students (n=71), on Spreadsheet Vocabulary and Concepts

	Voc [a]	Access	Data/Text	Edit	Format
Items [b]	11	12	13	12	11
Minimum Correct	0	1	2	1	0
Maximum Correct	10	12	12	11	11
Mean Correct	5	6	6	5	5
Mean Percent Correct	45%	50%	46%	42%	45%
Standard Deviation	2.56	3.20	2.49	2.74	2.57
Kuder-Richardson 20	.68	.80	.60	.69	.68
Standard Error	1.45	1.45	1.58	1.52	1.45

[a] Voc = Vocabulary

Access = Access/Software

Data/Text = Data/Text Entry

Edit = Editing

Format = Formatting

[b] Total Items = 59

Students produced a mean correct value of 6 on each of these, 50% for the first and 46% for the latter. In relation to reliability, access software items had the highest KR-20 value, .80; while data/text entry items had the lowest KR-20 value, .60. Two concepts, vocabulary and formatting, had at least one student who had no items answered correctly (minimum correct). Access software and formatting concepts had at least one student each who answered all items correctly (maximum correct).

The performance of the 73 BCA students who completed the database software test was evaluated by concept, also. Their performance on the five concepts is presented in Table 5. Four concepts, vocabulary, access software, data/text entry, and formatting each had 12 items on the database test. Editing had 11 items. Of the three software types, database scores were the lowest. Only for editing was the minimum correct score not zero. It was 1. The concepts of editing and formatting each had at least one student who correctly answered, as a maximum all but 1 item correct. Student performance on the vocabulary concept generated a mean of 3 for the 12 items, or 25%. The mean correct for access software, editing, and formatting concept items was 4 (33%, 36%, and 33%, respectively). The largest mean correct was 5 (.42)

Table 5

Performance of BCA Students (n=73), on Database Vocabulary and Concepts

	Voc [a]	Access	Data/Text	Edit	Format
Items [b]	12	12	12	11	12
Minimum Correct	0	0	0	1	0
Maximum Correct	7	9	9	10	11
Mean Correct	3	4	5	4	4
Mean Percent Correct	25%	33%	42%	36%	33%
Standard Deviation	1.55	2.45	2.23	1.99	2.01
Kuder-Richardson 20	.05	.62	.50	.42	.39
Standard Error	1.51	1.51	1.57	1.52	1.57

[a] Voc = Vocabulary
Access = Access/Software
Data/Text = Data/Text Entry
Edit = Editing
Format = Formatting

[b] Total Items = 59

for data/text entry items. Reliability statistics (KR-20) for the concepts ranged from a low of .05 for vocabulary to a high of .62 for access software items.

Question Two

The second question is: What computer application software concepts and vocabulary included on the achievement tests were taught by the teachers?

Word Processing

The BCA students who took the word processing achievement test had been provided instruction by eight teachers. These eight teachers rated the 60 items on the word processing test as "taught the concepts and vocabulary for the item" or "did not teach the concepts and vocabulary for that item." The word processing test teacher ratings, by concepts and vocabulary categories are presented in Tables 6 through 10. Table 11 summarizes the teachers' ratings of word processing items taught for all 8 teachers.

Vocabulary. Eleven items on the word processing software achievement test dealt with vocabulary. The eight teacher ratings are presented in Table 6.

Table 6

Word Processing Vocabulary Items Taught, by Teacher

Item	Teacher 1	2	3	4	5	6	7	8
#4[a]	+	+	+	-	-	+	+	+
#6	+	+	-	-	+	-	+	-
#9	-	+	+	-	-	+	+	+
#16	+	+	+	+	+	+	+	+
#24	+	+	+	+	-	+	+	+
#25	+	+	+	-	-	+	+	+
#32	-	+	+	-	-	-	+	+
#37	-	+	+	+	-	-	-	-
#38	+	+	+	+	+	+	+	+
#46	+	+	+	+	-	-	+	+
#59	+	+	-	-	-	-	+	+

[a] (+ indicates item taught, - indicates item not taught)

One teacher, #2, rated all 11 items as having been taught. Conversely, teacher #5 rated only 3 of 11 items as having been taught.

Access software. Thirteen items on the word processing achievement test addressed the access/software concept. As shown in Table 7, teachers #2 and #7 rated all 13 items as taught, while teacher #5 rated only 4 items as taught.

Data/text entry. The concept data/text entry had 11 related test items. Teacher ratings are presented in Table 8. The extremes in terms of the items rated as taught were for teachers #2 and #5. Teacher #2 rated all 11 items as taught and teacher #5 rated only 1 item as taught. Three teachers, #4, #6, and #8, rated 9 of the items as taught.

Editing. Editing had a total of 12 items on the test. Teacher ratings are presented in Table 9. Teachers #2 and #7 rated all 12 items as taught. Teachers #5 and #6 rated the fewest items as taught, 7 and 6 items, respectively.

Table 7

Word Processing Access Software Items Taught, by Teacher

Item	Teacher 1	2	3	4	5	6	7	8
#2[a]	-	+	-	+	-	+	+	+
#7	+	+	+	+	-	+	+	+
#8	+	+	+	+	-	+	+	+
#11	+	+	-	+	-	+	+	+
#20	+	+	+	+	-	-	+	-
#22	+	+	+	+	+	+	+	+
#29	+	+	+	+	+	+	+	+
#42	+	+	+	+	-	-	+	+
#45	-	+	-	-	-	-	+	+
#48	+	+	+	+	-	+	+	+
#52	-	+	+	+	-	+	+	-
#53	+	+	+	+	+	+	+	+
#55	-	+	+	+	+	+	+	+

[a] (+ indicates item taught, - indicates item not taught)

Table 8

Word Processing Data/Text Entry Items Taught, by Teacher

Item	Teacher 1	2	3	4	5	6	7	8
#14*	-	+	-	-	-	+	+	-
#17	+	+	+	+	-	+	+	+
#18	+	+	+	+	-	+	+	+
#28	+	+	+	+	-	+	+	+
#41	-	+	-	+	-	+	+	+
#44	+	+	+	+	-	+	+	+
#47	+	+	-	+	-	+	+	+
#51	-	+	-	-	-	+	+	+
#56	-	+	+	+	-	-	+	+
#57	+	+	+	+	-	-	-	-
#58	+	+	+	+	+	+	+	+

* (+ indicates item taught, - indicates item not taught)

Table 9

Word Processing Editing Items Taught, by Teacher

Item	Teacher 1	2	3	4	5	6	7	8
#1[a]	+	+	+	+	+	+	+	+
#3	+	+	+	-	-	-	+	+
#13	+	+	-	-	-	+	+	-
#21	+	+	+	-	+	-	+	+
#23	+	+	+	-	+	+	+	+
#30	+	+	+	+	+	+	+	+
#33	+	+	+	+	-	-	+	+
#36	+	+	+	+	+	+	+	+
#40	-	+	-	+	+	-	+	-
#49	+	+	+	+	+	+	+	+
#50	+	+	+	+	-	-	+	-
#60	-	+	+	+	-	-	+	+

[a] (+ indicates item taught, - indicates item not taught)

Formatting. The concept of formatting had a total of 12 items on the word processing achievement test. Teacher ratings are presented in Table 10. Formatting had the most items rated by teachers as taught. Four teachers, #2, #6, #7, and #8, rated all 12 items as taught; while teachers #3 and #4 rated 11 items as taught. Teachers #1 and #5 rated 10 of 12 items as taught, respectively.

A summary of items rated as taught by teachers for the 60 word processing items is presented in Table 11. The number of items rated by the eight teachers as taught ranged from a low of 25 to a high of 60.

Spreadsheet

The same eight teachers provided instruction to the BCA students who took the spreadsheet achievement test. The spreadsheet software had 59 related items that were rated by the eight teachers. They rated each item as "taught the concepts and vocabulary for that item" or "did not teach the concepts and vocabulary for that item". These teacher ratings, by concept, by teacher are presented in Tables 12 through 16. The summary of teacher ratings of spreadsheet items taught is presented in Table 17.

Table 10

Word Processing Formatting Items Taught, by Teacher

Item	Teacher 1	2	3	4	5	6	7	8
#5[a]	+	+	-	-	-	-	-	-
#10	+	+	+	+	+	+	+	+
#12	-	+	+	+	+	+	+	+
#15	+	+	+	+	+	+	+	+
#19	-	+	-	+	+	+	+	+
#26	+	+	+	+	-	+	+	+
#27	+	+	+	+	+	+	+	+
#31	+	+	+	+	+	+	+	+
#34	+	+	+	+	+	+	+	+
#35	+	+	+	-	-	+	+	+
#39	+	+	+	+	+	+	+	+
#43	+	+	+	+	+	+	+	+
#54	+	+	+	+	+	+	+	+

[a] (+ indicates item taught, - indicates item not taught)

Table 11

Summary for 60 Word Processing Items, by Concept and Teacher

Concept	Teacher 1	2	3	4	5	6	7	8
Vocabulary	8	11	9	5	3	6	10	9
Access Software	9	13	10	12	4	10	13	11
Data/Text Entry	7	11	7	9	1	9	10	9
Editing	10	12	10	8	7	6	12	9
Formatting	10	13	11	11	10	12	12	12
Total Items Taught	44	60	47	45	25	43	57	50

Vocabulary. There were a total of 11 items devoted to vocabulary in the spreadsheet achievement test. Teacher ratings are presented in Table 12. Two teachers, #2 and #7, rated all 11 of the items as taught. Teacher #5 rated only 3 items as taught.

Access software. The spreadsheet software test had a total of 12 items related to the access software concept. Teacher ratings are presented in Table 13. Interestingly, teachers #2, #4, and #7 rated all 12 items as taught. In contrast, teacher #5 rated only 3 of 12 items as taught.

Data/text entry. The concept data/text entry had the largest number of items on the spreadsheet software test, 13. Teacher ratings are presented in Table 14. Teachers #2, #7, and #8 rated all 13 items as taught and teacher #4 rated 12 of 13 items as taught. Conversely, only 4 of 13 items were rated as taught by teacher #5.

Editing. The editing concept had 12 related items on the spreadsheet test. The rating of items for it by teacher is presented in Table 15. For spreadsheet software, these items represented the least frequently taught concept. Teachers #4, #3, and #5 rated 6, 5,

Table 12

Spreadsheet Vocabulary Items Taught, by Teacher

	Teacher							
Item	1	2	3	4	5	6	7	8
#5[a]	+	+	+	+	+	+	+	+
#8	+	+	-	+	-	-	+	+
#13	+	+	-	-	-	+	+	-
#27	+	+	+	+	-	+	+	+
#30	+	+	+	+	-	+	+	+
#34	+	+	+	+	+	+	+	+
#35	-	+	+	+	-	+	+	+
#39	+	+	+	+	-	+	+	+
#46	+	+	-	-	-	+	+	-
#55	-	+	-	+	+	-	+	-
#56	-	+	-	+	-	-	+	+

[a] (+ indicates item taught, - indicates item not taught)

Table 13

Spreadsheet Access Software Items Taught, by Teacher

Item	Teacher 1	2	3	4	5	6	7	8
#1[a]	+	+	-	+	+	-	+	+
#2	+	+	+	+	+	+	+	+
#3	-	+	+	+	-	+	+	-
#6	+	+	+	+	-	+	+	+
#25	+	+	+	+	-	+	+	+
#36	+	+	+	+	-	+	+	+
#38	+	+	+	+	-	+	+	+
#43	+	+	+	+	-	+	+	+
#47	+	+	-	+	-	+	+	-
#49	+	+	+	+	+	+	+	+
#52	-	+	+	+	-	-	+	+
#57	+	+	-	+	-	+	+	-

[a] (+ indicates item taught, - indicates item not taught)

Table 14

Spreadsheet Data/Test Entry Items Taught, by Teacher

Item	Teacher 1	2	3	4	5	6	7	8
#4[a]	+	+	+	+	+	+	+	+
#10	+	+	+	+	+	-	+	+
#14	+	+	+	+	-	+	+	+
#15	-	+	-	-	-	+	+	+
#18	+	+	+	+	+	+	+	+
#19	+	+	+	+	-	+	+	+
#23	+	+	+	+	-	+	+	+
#26	-	+	-	+	-	-	+	+
#28	+	+	+	+	+	+	+	+
#33	+	+	+	+	-	-	+	+
#40	-	+	-	+	-	-	+	+
#42	-	+	-	+	-	+	+	+
#59	+	+	+	+	-	+	+	+

[a] (+ indicates item taught, - indicates item not taught)

Table 15

Spreadsheet Editing Items Taught, by Teacher

	Teacher							
Item	1	2	3	4	5	6	7	8
#7[a]	+	+	+	+	+	+	+	+
#16	+	+	-	-	-	-	+	-
#20	-	+	+	+	-	+	+	+
#21	-	+	-	+	-	+	+	+
#22	-	+	+	+	-	+	+	+
#24	+	+	-	-	-	-	+	-
#31	+	+	+	+	-	+	+	+
#32	+	+	-	-	-	-	+	-
#37	+	+	+	+	-	+	+	+
#41	+	+	-	-	-	+	-	-
#45	+	+	-	-	-	+	+	+
#50	+	+	-	-	-	+	+	-

[a] (+ indicates item taught, - indicates item not taught)

and 1 items as taught, respectively. Teacher #2, however, rated all 12 items as taught.

Formatting. The formatting concept had a total of 11 test items. Teacher ratings are presented in Table 16. More items on this concept were rated as taught by teachers than any of the others. Teachers #2, #3, #6, and #7 rated all 11 items as taught. Teachers #4 and #8 rated 10 of 11 items as taught, while teacher #5 rated 5 items as taught.

A summary of items rated as taught by teachers for spreadsheet is presented in Table 17. The achievement test had a total of 59 items related to spreadsheet software. The rating of items taught by the eight teachers ranged from a low of 15 to highs of 58 and 59 items. Interestingly, 4 of the 8 teachers had a similar number of items rated as taught. Teachers #1, #4, #6, and #8, rated 45, 49, 47, and 47 items, respectively, as taught of the 59.

Database

The eight BCA teachers also provided instruction to the students in database software concepts and vocabulary. The database achievement test contained 59 items. Fewer of the database items were rated by

Table 16

Spreadsheet Formatting Items Taught, by Teacher

Item	Teacher 1	2	3	4	5	6	7	8
#9[a]	+	+	+	+	+	+	+	+
#11	+	+	+	+	+	+	+	-
#12	-	+	+	+	-	+	+	+
#17	+	+	+	-	-	+	+	+
#29	+	+	+	+	-	+	+	+
#44	+	+	+	+	-	+	+	+
#48	-	+	+	+	-	+	+	+
#51	+	+	+	+	+	+	+	+
#53	+	+	+	+	+	+	+	+
#54	+	+	+	+	-	+	+	+
#58	+	+	+	+	-	+	+	+

[a] (+ indicates item taught, - indicates item not taught)

Table 17

Summary for 59 Spreadsheet Items, by Concept and Teacher

	Teacher							
Concept	1	2	3	4	5	6	7	8
Vocabulary	8	11	6	9	3	8	11	8
Access Software	10	12	9	12	3	10	12	9
Data/Text Entry	9	13	9	12	4	9	13	13
Editing	9	12	5	6	1	9	11	7
Formatting	9	11	11	10	4	11	11	10
Total Items Taught	45	59	40	49	15	47	58	47

teachers as taught than the other two software types. Tables 18 through 22 contain the teacher ratings, by concept and vocabulary for the 59 items. Table 23 is a summary of teacher ratings of items taught.

Vocabulary. There were a total of 12 items on the database software test that related to vocabulary. The eight teacher ratings are presented in Table 18. Teacher #4 rated 4 items as taught, while teachers #3 and #5 rated 2 and no items as taught, respectively.

Access software. The database software test contained 12 items related to the concept of access software. Teacher ratings are presented in Table 19. Data indicate that 3 teachers, #6 #8, and #5 rated half or fewer of the items as taught. Two teachers, #2 and #7 rated all 12 items as taught for this concept.

Data/text entry. Data/text entry had 12 items on the database test. Ratings, by teacher are shown in Table 20. Teacher #5 rated 1 item out of the 12 as taught, while teacher #2 rated 12 of 12 items as taught. The remaining teacher ratings ranged from 10 items taught, teachers #1 and #7, to 7 items taught, teachers #3 and #8.

Table 18

Database Vocabulary Items Taught, by Teacher

Item	Teacher 1	2	3	4	5	6	7	8
#7[a]	-	+	-	-	-	+	+	-
#8	+	+	+	+	-	+	+	+
#12	-	+	-	-	-	-	+	-
#16	+	+	-	-	-	+	-	+
#25	+	+	-	+	-	-	+	-
#26	-	+	-	-	-	+	-	-
#27	+	+	+	+	-	+	+	+
#37	+	+	-	-	-	+	+	-
#46	-	+	-	-	-	-	-	-
#48	-	+	-	-	-	-	-	-
#53	-	+	-	+	-	+	+	+
#56	-	+	-	-	-	-	+	+

[a] (+ indicates item taught, - indicates item not taught)

Table 19

Database Access Software Items Taught, by Teacher

	Teacher							
Item	1	2	3	4	5	6	7	8
#3[a]	+	+	+	+	-	-	+	-
#5	+	+	+	-	-	-	+	-
#6	+	+	+	+	+	+	+	+
#19	+	+	+	+	+	-	+	-
#20	+	+	-	-	-	-	+	-
#21	-	+	-	-	-	+	+	-
#30	-	+	+	+	-	-	+	+
#34	+	+	-	+	-	+	+	+
#40	-	+	+	-	-	-	+	-
#41	+	+	+	+	+	+	+	+
#44	-	+	-	-	-	+	+	-
#47	+	+	+	+	+	+	+	+

[a] (+ indicates item taught, - indicates item not taught)

Table 20

Database Data/Text Entry Items Taught, by Teacher

	Teacher							
Item	1	2	3	4	5	6	7	8
#1[a]	+	+	+	+	-	-	+	-
#9	+	+	+	+	-	-	+	-
#10	+	+	+	-	-	+	+	+
#14	+	+	+	+	-	+	-	+
#15	-	+	-	-	-	-	+	-
#18	+	+	-	-	+	+	+	+
#22	+	+	+	+	-	+	+	+
#23	+	+	+	+	-	+	+	+
#33	+	+	+	+	-	+	+	+
#49	+	+	-	+	-	+	+	-
#50	+	+	-	+	-	+	+	+
#51	-	+	-	-	-	-	-	-

[a] (+ indicates item taught, - indicates item not taught)

Editing. There were a total of 11 items on the test related to the concept of editing. The eight teacher ratings are presented in Table 21. Two teachers, #3 and #5, rated only 1 item of the 11 as taught. Teacher #4 rated 2 items as taught and teacher #8 rated 4 of 11 items as taught. This means that fewer teachers indicated editing items as taught than items from any of the other concepts.

Formatting. Formatting had 12 related items on the database software test. The ratings of the eight teachers are presented for formatting in Table 22. The data show that teachers #8 and #5 rated 3 and 2 items as taught, respectively. Teacher #6 rated half the items as taught and teachers #1, #3, and #4 rated 7 items as taught.

A summary of items rated as taught by teachers for database is presented in Table 23. This software type had 59 items associated with it on the achievement test. The 8 teacher ratings of items taught ranged from lows of 8, 24, and 25 to highs of 49 and 59 items. Overall, this test had the fewest number of items rated as taught by teachers for the 3 types of software. Four teachers rated fewer than half the items as taught and 2 teachers rated slightly more than half.

Table 21

Database Editing Items Taught, by Teacher

Item	Teacher 1	2	3	4	5	6	7	8
#2[a]	-	+	-	-	-	-	-	-
#4	-	+	-	-	-	+	+	-
#11	+	+	-	+	-	-	-	+
#24	+	+	-	-	-	+	+	-
#29	+	+	-	-	-	+	+	-
#32	+	+	-	-	-	+	+	+
#36	+	+	-	-	+	+	+	+
#39	-	+	-	-	-	-	+	-
#42	-	+	-	+	-	+	+	-
#55	+	+	+	-	-	+	+	+
#57	-	+	-	-	-	-	-	-

[a] (+ indicates item taught, - indicates item not taught)

Table 22

Database Formatting Items Taught, by Teacher

Item	Teacher 1	2	3	4	5	6	7	8
#13[a]	+	+	+	+	-	-	+	-
#17	-	+	-	-	-	-	-	-
#28	-	+	+	+	-	-	+	-
#31	-	+	-	-	-	+	+	-
#35	+	+	+	-	-	-	+	+
#38	+	+	+	+	-	+	+	-
#43	+	+	-	-	-	-	+	-
#45	-	+	+	+	-	+	+	-
#52	+	+	-	-	+	+	+	+
#54	+	+	+	+	-	+	+	+
#58	-	+	-	+	-	-	+	-
#59	+	+	+	+	+	+	+	-

[a] (+ indicates item taught, - indicates item not taught)

Table 23

Summary for 59 Database Items, by Concept and Teacher

Concept	Teacher 1	2	3	4	5	6	7	8
Vocabulary	5	12	2	4	0	7	8	5
Access Software	8	12	8	7	4	6	12	5
Data/Text Entry	10	12	7	8	1	8	10	7
Editing	6	11	1	2	1	7	8	4
Formatting	7	12	7	7	2	6	11	3
Total Items Taught	36	59	25	28	8	34	49	24

Question Three

The third research question is: What is the instructional validity of the achievement tests based on student performance on items indicated as having been taught by the teachers?

Word Processing Items

To discern the degree of instructional validity of the word processing items, they were grouped according to their respective concept and vocabulary. The items were also matched with students who, according to their teachers, had been taught each item. Finally, the weighted average of students responding correctly and weighted discrimination coefficient for each item were calculated. Based on the criteria outlined in Chapter IV, sample size of the item needed to be equal to or greater than 10 for acceptability. Further, item weighted discrimination coefficient estimates were acceptable when found to be between .20 and .80. If an item's statistics met or exceeded these standards, the degree of instructional validity was said to be acceptable.

Table 24 contains the 11 items related to vocabulary and the corresponding number of students whose teachers indicated the item as having been taught. All vocabulary items met or exceeded the

criteria for an acceptable item. Number of students ranged from 14 to 77, and discrimination coefficients ranged from .36 to .75. Weighted average correct estimates ranged from .28 to .82. Nine of the 11 items had weighted average correct estimates of under .70.

Table 25 contains the statistics for the 13 items related to the concept access software. Each item statistic met or exceeded the acceptability criteria. Number of students ranged from 35 to 77, and discrimination coefficients ranged from .32 to .66. Weighted average correct statistics ranged from .43 to .76. Three of the average correct statistics were above .70.

Data/text entry had 11 items for it on the test. Statistics to answer question three for this concept are detailed in Table 26. Again, each item met or exceeded the acceptability criteria. Sample sizes ranged from 21 to 77 students, and discrimination coefficient estimates were from .27 to .74. Weighted average correct statistics were from .37 to .90. Nine of the items had percent correct estimates below .70.

Table 27 contains the statistics for the 12 editing concept items on the test. Only one item (#40), failed the discrimination coefficient criterion of acceptability with a coefficient of .18. It had 42

Table 24

Word Processing Vocabulary Weighted Average Responding Correctly and Weighted Discrimination Coefficients, by Item

Item	n	Weighted Average Correct	Weighted Average Discrimination Coefficient
#4	55[a]	.58	.45
#6	43	.72	.36
#9	48	.33	.52
#16	77	.61	.43
#24	61	.82	.39
#25	55	.73	.50
#32	42	.28	.54
#37	14	.43	.75
#38	77	.35	.60
#46	55	.49	.58
#59	46	.35	.45

[a] Number of students whose teachers indicated the item as taught

Table 25

Word Processing Access Software Weighted Average Responding Correctly and Weighted Discrimination Coefficients, by Item

Item	n	Weighted Average Correct	Weighted Average Discrimination Coefficient
#2	51[a]	.53	.32
#7	61	.67	.65
#8	61	.67	.35
#11	58	.43	.35
#20	36	.50	.37
#22	77	.74	.54
#29	77	.61	.48
#42	55	.58	.40
#45	39	.51	.42
#48	61	.75	.66
#52	35	.49	.59
#53	77	.66	.56
#55	70	.76	.44

[a] Number of students whose teachers indicated the item as taught

Table 26

Word Processing Data/Text Entry Weighted Average Responding Correctly and Weighted Discrimination Coefficients, by Item

Item	n	Weighted Average Correct	Weighted Average Discrimination Coefficient
#14	26[a]	.54	.27
#17	61	.90	.37
#18	61	.47	.43
#28	61	.76	.33
#41	45	.38	.68
#44	61	.64	.60
#47	58	.62	.74
#51	45	.69	.58
#56	48	.37	.28
#57	21	.62	.45
#58	77	.59	.42

[a] Number of students whose teachers indicated the item as taught

Table 27

Word Processing Editing Weighted Average Responding Correctly and Weighted Discrimination Coefficients, by Item

Item	n	Weighted Average Correct	Weighted Average Discrimination Coefficient
#1	77[a]	.61	.43
#3	49	.73	.36
#13	33	.61	.63
#21	65	.31	.40
#23	71	.54	.53
#30	77	.62	.49
#33	55	.47	.72
#36	77	.65	.63
#40	42	.16	.18
#49	77	.64	.52
#50	36	.53	.51
#60	48	.50	.53

[a] Number of students whose teachers indicated the item as taught

students responding. The remaining 11 items had student response numbers of 33 to 77 students. These 11 items had discrimination coefficients of .36 to .72. Weighted average correct estimates for the 11 qualifying items were from .31 to .73. Only one estimate, #3, was above .70. Thirteen items on the test associated with the formatting concept.

Table 28 presents the statistics for the formatting items. Number of students responding and discrimination coefficients met or exceeded the criteria. There were 12 to 77 students with coefficients of .26 to .66, respectively. Eight formatting items, more than any item for the other concepts, had the maximum number of 77 students responding.

Spreadsheet Items

To find the degree of instructional validity of the spreadsheet items on the test, a similar grouping of items within concept and to students taught was completed. The same criteria for sample size and discrimination coefficient estimates were adhered to. Tables 29-33 outline the findings for spreadsheet items.

Table 28

Word Processing Formatting Weighted Average Responding Correctly and Weighted Discrimination Coefficients, by Item

Item	n	Weighted Average Correct	Weighted Average Discrimination Coefficient
#5	12[a]	.50	.26
#10	77	.76	.50
#12	70	.51	.41
#15	77	.73	.54
#19	67	.57	.26
#26	61	.75	.58
#27	77	.49	.44
#31	77	.52	.64
#34	77	.54	.47
#35	55	.55	.66
#39	77	.49	.52
#43	77	.62	.45
#54	77	.70	.49

[a] Number of students whose teachers indicated the item as taught

Table 29 details the statistics for the 11 vocabulary items on the test. Of the 11 items, #46 had a discrimination coefficient (.19), below the chosen acceptability criteria of .20. The remaining 10 items had student response sizes from 32 to 71 and discrimination coefficient estimates of .23 to .78. Weighted average correct statistics for acceptable items ranged from a low of .25 to a high of .73. Eight of the 10 items had weighted average correct statistics of less than .70.

Table 30 details the statistics for the 12 access software concept items on the test. Each of the item statistics met or exceeded the criteria for the acceptable degree of instructional validity. Student responses ranged from 28 to 71, and discrimination coefficients were .25 to .71. Eight of the item weighted average correct estimates were less than .70.

Data/text entry had 13 items devoted to it on the spreadsheet test. Table 31 presents the statistics for these items. Items #26 and #42 had very low

Table 29

Spreadsheet Vocabulary Weighted Average Responding Correctly and Weighted Discrimination Coefficients, by Item

Item	n	Weighted Average Correct	Weighted Average Discrimination Coefficient
#5	71[a]	.70	.68
#8	32	.56	.60
#13	33	.45	.57
#27	55	.73	.52
#30	55	.60	.78
#34	71	.54	.46
#35	55	.29	.46
#39	55	.62	.37
#46	28	.46	.19
#55	43	.42	.51
#56	40	.25	.23

[a] Number of students whose teachers indicated the item as taught

Table 30

Spreadsheet Access Software Weighted Average Responding Correctly and Weighted Discrimination Coefficients, by Item

Item	n	Weighted Average Correct	Weighted Average Discrimination Coefficient
#1	61[a]	.52	.69
#2	71	.68	.43
#3	37	.73	.42
#6	55	.60	.54
#25	55	.69	.71
#36	55	.75	.31
#38	55	.66	.70
#43	55	.71	.62
#47	28	.72	.43
#49	71	.69	.44
#52	44	.18	.25
#57	38	.45	.68

[a] Number of students whose teachers indicated the item as taught

Table 31

Spreadsheet Data/Text Entry Weighted Average Responding Correctly and Weighted Discrimination Coefficients, by Item

Item	n	Weighted Average Correct	Weighted Average Discrimination Coefficient
#4	71[a]	.86	.40
#10	65	.59	.53
#14	55	.40	.58
#15	41	.41	.43
#18	71	.49	.51
#19	55	.40	.26
#23	55	.31	.29
#26	40	.45	.02
#28	71	.69	.59
#33	49	.41	.41
#40	40	.37	.64
#42	46	.17	.15
#59	55	.53	.46

[a] Number of students whose teachers indicated the item as taught

discrimination coefficient estimates, .02 and .15, respectively. The remaining 11 items had student response sizes from 40 to 71, and discrimination coefficients of .26 to .64. Weighted average correct statistics for the 11 qualifying items ranged from a low of .31 to a high of .86. However 10 of the 11 had weighted average correct statistics below .70.

Table 32 presents the statistics for the 12 editing concept items on the test. One item, #45, had an unacceptable discrimination coefficient estimate of .19. The remaining 11 items had student response sizes of 15 to 71. For the 11 items, their discrimination coefficient estimates ranged from .25 to .73. Weighted average correct estimates for the qualifying items ranged from .37 to .86. Ten of the 11 items had weighted percent correct estimates below .70.

The statistics for the 11 formatting concept items are presented in Table 33. Although all the items met or exceeded the sample size criterion, with sample sizes ranging from 50 to 71 students, four items did not generate acceptable discrimination coefficients. These items, #11, #29, #44, and #54, had discrimination coefficients of .13, .12, .10, and .12, respectively. The acceptable items had coefficients of .41 to .57. For these, the weighted average correct statistics ranged from .44 to .66.

Table 32

Spreadsheet Editing Weighted Average Responding Correctly and Weighted Discrimination Coefficients, by Item

Item	n	Weighted Average Correct	Weighted Average Discrimination Coefficient
#7	71[a]	.68	.68
#16	27	.45	.38
#20	50	.44	.65
#21	46	.41	.25
#22	50	.40	.63
#24	27	.37	.51
#31	55	.86	.32
#32	27	.59	.40
#37	55	.64	.73
#41	15	.40	.26
#45	46	.30	.19
#50	33	.55	.54

[a] Number of students whose teachers indicated the item as taught

Table 33

Spreadsheet Formatting Weighted Average Responding Correctly and Weighted Discrimination Coefficients, by Item

Item	n	Weighted Average Correct	Weighted Average Discrimination Coefficient
#9	71[a]	.54	.49
#11	58	.31	.13
#12	50	.62	.41
#17	50	.66	.47
#29	55	.71	.12
#44	55	.20	.10
#48	50	.54	.54
#51	71	.44	.57
#53	71	.65	.49
#54	55	.31	.12
#58	55	.64	.52

[a] Number of students whose teachers indicated the item as taught

The qualifying 7 items had coefficients of .41 to .57. Of the qualifying items, weighted average correct statistics ranged from .44 to .66.

Database Items

Items on the database test were grouped in the same manner as test items for the other two software types. Further, the same criteria was applied to the statistics for determining acceptable items: student responding needed to be equal to or greater than 10, discrimination coefficients needed to be between .20 and .80. Tables 34-38 present the statistics for the database software type test items.

Table 34 details the findings for the 12 items devoted to vocabulary. Items #25, #26, #46, and #48 generated estimates of the discrimination coefficient that were outside the criterion range, or had sample sizes smaller than the criterion sample size. Two of these items, #26 and #48, met neither of the criteria. One item, #25, had a discrimination coefficient less than .20. The remaining 7 qualifying items in this group had student response sizes of 26 to 52. The estimates of the discrimination coefficients for the qualifying vocabulary items ranged from .32 to .64. Weighted average correct estimates for the 7 items were from .16 to .55. This means that each of the percent

Table 34

Database Vocabulary Weighted Average Responding Correctly and Weighted Discrimination Coefficients, by Item

Item	n	Weighted Average Correct	Weighted Average Discrimination Coefficient
#7	26[a]	.23	.51
#8	49	.29	.39
#12	18	.16	.40
#16	31	.32	.64
#25	27	.07	-.16
#26	9	.11	.14
#27	52	.38	.39
#37	28	.39	.42
#46	4	.50	.71
#48	4	.75	.00
#53	44	.55	.32
#56	35	.23	.40

[a] Number of students whose teachers indicated the item as taught

correct estimates were below .70.

Statistics for the 12 items devoted to the concept access software appear in Table 35. More items, 11, from access software generated acceptable estimates than any other set of database concept and vocabulary items. Of the 11 items, sample sizes were from 21 to 73 students. Item #40, the only item whose estimate did not meet the criterion, had an unacceptable discrimination coefficient of .17. Weighted average correct estimates for the 11 qualifying items were from .13 to .63.

The statistics for the 12 items related to the data/text entry concept are shown in Table 36. Two items, #14 and #49, generated criterion passing response sizes, but failed to meet the discrimination coefficient criterion--estimates of between .20 and .80. Their estimates were .00 and .16, respectively. Item #51 had an unacceptable sample size of 4 students. The remaining qualifying items (9), had sample sizes of 18 to 66 students and discrimination coefficients of .32 to .65. The 9 items had weighted average correct estimates of between .17 to .63.

Editing had 11 items related to it on the test. Table 37 presents the statistics for these items.

Table 35

Database Access Software Weighted Average Responding Correctly and Weighted Discrimination Coefficients, by Item

Item	n	Weighted Average Correct	Weighted Average Discrimination Coefficient
#3	30[a]	.37	.34
#5	26	.19	.24
#6	73	.63	.62
#19	51	.19	.22
#20	23	.48	.49
#21	23	.13	.29
#30	42	.50	.45
#34	49	.37	.74
#40	21	.24	.17
#41	73	.45	.63
#44	23	.48	.32
#47	73	.46	.38

[a] Number of students whose teachers indicated the item as taught

Table 36

Database Data/Text Entry Weighted Average Responding Correctly and Weighted Discrimination Coefficients, by Item

Item	n	Weighted Average Correct	Weighted Average Discrimination Coefficient
#1	30[a]	.17	.37
#9	30	.47	.46
#10	48	.63	.52
#14	38	.61	.00
#15	18	.45	.44
#18	66	.42	.65
#22	52	.38	.52
#23	52	.48	.32
#33	52	.48	.44
#49	32	.28	.16
#50	49	.39	.47
#51	4	.50	.40

[a] Number of students whose teachers indicated the item as taught

Table 37

Database Editing Weighted Average Responding Correctly and Weighted Discrimination Coefficients, by Item

Item	n	Weighted Average Correct	Weighted Average Discrimination Coefficient
#2	4[a]	1.00	.00
#4	23	.31	.44
#11	30	.47	.54
#24	28	.75	.42
#29	28	.25	.06
#32	45	.24	.52
#36	66	.44	.68
#39	18	.50	.39
#42	27	.37	.49
#55	48	.36	.25
#57	4	.25	1.00

[a] Number of students whose teachers indicated the item as taught

Items #2, #29, and #57, neither met the criterion of response size (equal to or greater than 10), nor discrimination coefficient statistics of between .20 and .80. Eight items had response sizes of 18 to 66 students. Further, the 8 had discrimination coefficients of .25 to .68. Weighted average correct statistics for the qualifying items were from .24 to .75.

Finally, Table 38 presents the statistics for the 12 items related to the formatting concept. One item, #17, failed the response size criterion, with 4 students. Two other items, #43 and #58, failed the discrimination coefficient criterion, with estimates of -.20 and .04, respectively. The remaining 9 items had sample sizes of 23 to 66 students. Their discrimination coefficients were from .28 to .72. Weighted percent correct statistics for the qualifying items were from .12 to .57.

A summary of total number of items, by software, by concept which met or exceeded the chosen criteria is presented in Table 39. Word processing had 60 items on the test. More items, 98%, met or exceeded the response size criterion of equal to or greater than 10 students, than the other software types. Further, 98% of word processing items met or exceeded the

Table 38

Database Formatting Weighted Average Responding Correctly and Weighted Discrimination Coefficients, by Item

Item	n	Weighted Average Correct	Weighted Average Discrimination Coefficient
#13	30[a]	.57	.39
#17	4	.25	.56
#28	25	.32	.33
#31	23	.31	.28
#35	43	.37	.53
#38	35	.51	.52
#43	18	.22	-.20
#45	30	.33	.35
#52	66	.49	.72
#54	52	.48	.50
#58	22	.22	.04
#59	32	.12	.31

[a] Number of students whose teachers indicated the item as taught

Table 39

Summary of Instructionally Valid Items, by Software, by Concept

	Software		
Concept	Word Processing	Spreadsheet	Database
Vocabulary	11	10	8
Access Software	13	12	11
Data/Text Entry	11	11	9
Editing	11	11	8
Formatting	13	7	9
Valid Items[a]	59	51	45

[a] Total Test Items:

Word Processing = 60
Spreadsheet = 59
Database = 59

discrimination coefficient criterion of estimates between .20 and .80. All of the estimates for word processing items for concepts of vocabulary, access software, data/text entry, and formatting met or exceeded the criteria. The editing concept had only one item that failed to meet the chosen criteria. Therefore, 59 word processing items were found to contain an acceptable degree of instructional validity for this study.

There were 59 items on the spreadsheet software test. Table 39 also presents the total number of items found to be instructionally valid for this software type. Fifty-one (86%) of the spreadsheet items contained an acceptable degree of instructional validity, according to the criteria. Of the concepts devoted to spreadsheet, access software was the only one with 100% of its items meeting or exceeding the criteria. The formatting concept generated the fewest acceptable number of items, 7, among the spreadsheet concepts.

Last, Table 39 also contains the information outlining the total number of database items, by concept, with acceptable criterion estimates. There were 59 items on the database test. Only 45 of the items met the criteria. Fewer database items (76%), met the criteria for instructional validity than any of

the other software type items. Database items grouped under access software contributed the most items, 11 of 12, or 92%, as instructionally valid. Conversely, vocabulary had a low of 8 of 12 acceptable items, or 66%.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to develop a reliable and valid test with a high degree of instructional validity. It was used to test the performance of Business Computer Applications (BCA) students on their achievement of knowledge of computer application software concepts and vocabulary for word processing, spreadsheet, and database. In this chapter a summary of the study, conclusions, and recommendations are presented.

Summary

The review of the literature revealed that word processing, spreadsheet, and database computer application software are widely used in the workplace. Therefore, business students should learn to use them, including the concepts and vocabulary associated with their use. When learning is measured through testing, the issue of test-instruction congruence must be considered. Little attention, however, has been given to instructional validity related to use of computer application software terminology and concepts. This study addressed this concern.

Instrumentation

The major data collection instrument was an achievement test for computer application software concepts and vocabulary. It was divided into three software types: word processing, spreadsheet, and database, and was constructed from test items developed for the Business Computer Software Curriculum Series, Part 2 (1993). Test items included in the instrument were validated by a panel of experts. Following revisions based on input from the panel, it was field tested with students who were similar to the study participants. As a result of this field test, additional minor revisions were made to the items.

Data were also collected from teachers of the students. The teacher instrument contained all items that were included on the student instrument. They were asked to rate each item as to whether the computer application software concepts and vocabulary corresponding to that item had been taught.

Selected Sample

The selected sample consisted of BCA students in four large urban high schools, two suburban high schools, a small urban high school, and a rural county high school. Request proposals were sent to administrators of the high school divisions. Upon

receipt of approval, instruments and instructions were either mailed or delivered to test site facilitators to be presented to BCA teachers. Teachers then administered the tests to their students and returned completed op-scan answer sheets. Due to the length of the test, teachers administered items for each of the three software types to every third student. The teachers also completed the teacher instrument. It included the rating of test items as "taught" or "not taught" by the 8 BCA teachers. Seventy-seven BCA students completed the word processing test items, 71 students completed the spreadsheet test items, and 73 students completed the database test items.

Research Question 1

What is the performance of high school BCA students on achievement tests for computer application software concepts and vocabulary for three types of software, word processing, spreadsheet, and database?

For the 60 word processing items, the reliability estimate (KR-20) was .92. This estimate met guidelines for an appropriate level of reliability (Cronbach, 1970), with a high-positive indication of test reliability for group measures being .70 to .90+. Group performance on the 60 items resulted in a mean of 32 items correct, or 53%. The spreadsheet test

contained 59 items. Again, the reliability estimate was substantial, .92. The group's average score of 27, or 46%, was slightly lower than for the word processing items. There were 59 items on the database software test. The reliability estimate was .76, falling in the low-positive range. This estimate, although near the low end of the acceptable reliability continuum, indicates that this test was sufficiently reliable for further use. Compared to the other two software types, the group performance on the database items was the poorest. Students generated a mean items correct score of 21, or 36%.

Finally, to answer research question one, the performance of the students for each of the three software types was analyzed in five categories. On the word processing test, the access software and formatting concept categories each accounted for 13 items; while vocabulary and data/text entry each had 11 items. Editing had 12 items on the test. Students produced the largest mean value, 7 or 54%, for the access software and formatting concepts. Student performance on the formatting items was the highest with a mean percent correct of 57%. In addition, this concept also had the largest KR-20 value, .76.

For the spreadsheet items, concepts tested and number of items for each were data/text entry with 13

items, access software and editing with 12 items, and vocabulary and formatting with 11 items each. A mean correct of 6 was achieved by the students for the concepts of access software and data/text entry, 50% for the former and 46% for the latter. Mean percent correct scores were 50% for the other three concepts. Access software had the largest percent correct among the five concepts, 53%.

Concept categories for database had the following number of items on the test: vocabulary, access software, data/text entry, and formatting each had 12; while editing had 11 items. For each concept, except editing, at least one student answered no items correctly. Mean correct scores ranged from 3 to 5 items. Mean percent correct scores for this group ranged from 29% to 39%. Of note is the reliability estimate outcome for the 12 vocabulary items, it was .05.

Research Question 2

What computer application software concepts and vocabulary included on the achievement tests were taught by the teachers?

Word processing generated the most items indicated as having been taught by the BCA teachers. One teacher, #2, rated all items as taught. One teacher,

#5, rated only 25 of the word processing items as taught. Other teachers indicated that between 43 and 57 items were taught. Average number of items indicated as taught was 56, or 77%. Teachers indicated a similar number of spreadsheet items as being taught. Teacher #2 indicated all 59 items as taught; while teacher #5 rated only 15 items as taught. Spreadsheet items indicated as taught among teachers had a larger range than for word processing items. The average number of items taught was similar, however, 46, or 76%. The teachers were more conservative in indicating database items as taught. Again, teacher #2 rated all items as taught; while teacher #5 indicated 8 items as taught. Overall, the teachers rated fewer database items as taught than for other software types. the average number of database items indicated as taught was 33, or 56%.

Research Question 3

What is the instructional validity of the achievement tests based on student performance on items indicated as having been taught by the teachers?

Analyses outcomes indicated that word processing had the largest number of test items at appropriate levels of instructional validity among the three software types. One criterion for appropriateness was

for the group of students, whose teachers indicated the item as taught, to be equal to or greater than 10. The second was for the weighted discrimination coefficient to lie between .20 and .80 (Frary, personal communication, September 1, 1994; Crocker & Algina, 1986). Based on these criteria, only one word processing item (#40) failed to meet or exceed the standards proposed for instructional validity. Thus, 59 of the 60 word processing items were found to be instructionally valid.

Spreadsheet had 8 items of 59 (14%) that did not conform to the required coefficient and/or student group size. One item in vocabulary (#46) and one in editing (#45) were unsuitable. Two items (#26 and #42) among those for data/text entry did not meet the required criteria to be considered instructionally valid. Among items for the concept of formatting, 4 items (#11, #29, #44, and #54) did not meet the criteria standards. For access software items, each of the 12 were found to meet the instructional validity criteria. Altogether, 51 (86%) of the spreadsheet items were found to meet the instructional validity criteria.

Database software items had the fewest that were instructionally valid. This outcome could be expected since student performance was the lowest on the

database items among the software types. Also, this outcome resulted from the teachers indicating fewer database items as taught. Thus, potential weighted discrimination coefficients were lower and students participating fewer, resulting in fewer items meeting the instructional validity criteria. Only 45 of 59 (76%) items met or exceeded the criteria. Vocabulary items that failed the required criteria were: #25, #26, #46, and #48. Access software contributed the largest number of instructionally valid items among the concepts, 11 of 12, (92%). Only item #40 failed the criteria. Of the 12 database data/text entry items, #14, #49, and #51, respectively, did not meet the criteria. Items #2, #29, and #57, among the editing items did not meet instructional validity criteria. Formatting items that did not meet the criteria were: #17, #43, and #58.

Conclusions

From the outcomes of the data analyses completed and reported in this study to answer the three questions, conclusions as follows were drawn.

1. The first research question addressed the participating high school BCA students' performance on computer application software concepts and vocabulary for three types of software, word processing,

spreadsheet, and database. Without concern for whether the students had been taught the items or not, their performance on the test items, which had been validated by a panel of experts, must be considered as expected for word processing, slightly below expectations on spreadsheet, and below satisfactory on database. Percentage of items correct for the three types of software were 53%, 46%, and 36%, respectively.

Procedures as previously outlined in the item analyses discussion included choosing items with difficulty indices of not less than .50 (Lord, 1952a). Further, qualifying items needed to have discrimination indices of not less .50 (Crocker & Algina, 1986). Therefore, about half the students should be expected to answer each item correctly. Thus performance at or near 50% of the items correct would be expected and performance below 50% of the items correct would be lower than expected.

In addition to having face validity, the test items can be considered reliable for group testing purposes (Cronbach, 1970; Crocker & Algina, 1986; Berk, 1984). However, caution should be exercised when using items within the five vocabulary and concept categories for each type of software. For example, the KR-20 values for the 11 to 13 word processing items, within

the five categories, ranged from .76 to .05. The KR-20 reliability estimate for the 60 word processing items was .92; for the 59 spreadsheet items, the value was also .92; and for the 59 database items, it was .76.

2. The second research question addressed the extent that test items for the three types of software had been taught by the teachers or not. Most of the 8 teachers did not teach a substantial part of the concepts and vocabulary included in the validated test items used in the study. Overall, the teachers rated roughly 45% of the word processing and spreadsheet items as having been taught and 30% of the database items as having been taught. However, one teacher rated all items as taught; while another rated only 42% of the word processing, 25% of the spreadsheet, and 14% of the database items as having been taught. Findings related to the outcome for this question indicate that the recommended instructional curriculum related to the test items needs to be carefully examined and revised so that teachers can emphasize the most important concepts and vocabulary with their students.

3. The third question addressed the instructional validity of items indicated as having been taught by the teachers. Teachers selecting items for purposes of examining the achievement of their students related to software concepts and vocabulary should select items

determined to be instructionally valid in this study. Analyses outcomes indicated that 59 of the 60 word processing items were instructionally valid, that 51 of the 59 spreadsheet items were, and that 45 of the 59 database items were.

Recommendations

Gabriel (1985) unknowingly referred to instructional validity and its consequences for research in the educational environment. His study, like this one, used paper and pencil assessment. This study adds to the body of knowledge related to test-instruction congruence. Current interest in, and importance of this construct in education, warrant continued investigation of it.

Test Item Usage and Instruction

With respect to computer application software concepts and vocabulary, it is first recommended that the instrument of this study be reviewed and revised as indicated by study outcomes. It should then be administered to a representative sample of Virginia BCA students to further establish instructional validity of the test items. At present, school divisions with students similar to the study participants should adopt the instructionally valid items for use with their BCA

students. This will allow for valid and reliable assessment of their BCA students' knowledge of computer application software concepts and vocabulary.

Further Research

In terms of other needed research, this study should be replicated so that a more representative sample of the Virginia BCA students is included. This procedure would contribute to establishing an inferential model and identifying test items suitable for a wider range of BCA students. Any replication should be done with sensitivity and attention to time of year for administration of the instrument, teacher bias in self-reports, student absenteeism, and increasing the number of items per concept.

REFERENCES

REFERENCES

Berk, R. A. (Ed.). (1984). A guide to criterion-referenced test construction. Maryland: The Johns Hopkins University Press.

Beuchert, A. K. and Mendoza, J. L. (1979). A Monte Carlo comparison of ten item discrimination indices. Journal of Educational Measurement, 16, 109-118.

Bitter, G. G. (1986). Using a microcomputer in the classroom. Reston, VA: Reston Publishing Company.

Bork, A. (1985). Personal computers for education. New York: Harper & Row.

Bryan, M. (1987). Software publishing spreadsheet is major, innovative entry for pfs: series. P.C. Week, 4(12), 85, 89.

Business computer software curriculum series part 1: Business applications software. (1991). Richmond: Commonwealth of Virginia, Department of Education, Vocational and Adult Education.

Business computer software curriculum series part 2: Test items for business computer tasks. (1993). Richmond: Commonwealth of Virginia, Department of Education, vocational and Adult Education.

Business education suggested course competencies and performance objectives. (1993). Richmond: Commonwealth of Virginia, Department of Education.

Calfee, R. (1983). Establishing instructional validity for minimum competency programs. In G. Madaus (Ed.) The courts, validity, and minimum competency testing, 95-113. Boston: Kluwer-Nijhoff.

Campbell, D. T. and Stanley, J. C. (1963). Experimental & quasi-experimental designs for research on teaching. Handbook of research on teaching. N. L. Cage (Ed.). Chicago: Rand McNally.

Carey, R. and Gall, M. (1986)). Patterns of microcomputer use at home and at school by secondary school students, (ERIC Document Reproduction Service No. ED 276 404).

Carter, G. E. (1988). An investigation into computer education offered in New Hampshire secondary schools as perceived by teachers and compared to the needs of business as perceived by data processing managers. Unpublished doctoral dissertation, Boston University, Boston, MA.

Casady, M. J. (1988). Status of word/information processing systems from selected organizations. NABTE Review, 15, 20-24.

Cheney, P. H. & Nelson, R. R. (1988). A tool for measuring and analyzing end user computing abilities. Information Processing and Management, 24(2), 199-203.

Cheng, T. T., Plake, B., & Stevens, D. J. (1985). A validation study of the computer literacy examination: Cognitive aspect. AEDS Journal, 18(3), 139-147.

Childs, R. A. (1989). Constructing classroom achievement tests. (Report No. EDO-TM-89-8). Washington, DC: American Institute for Research. (ERIC Document Reproduction Service No. ED 315 426).

Collins, J. S. (1986). Microcomputer education and training: Where are we now and where are we going? Massachusetts CPA Review, 60(1), 20-25.

Connolly, J. (1989). Needs should dictate FP software decisions. National Underwriter Life and Health-Financial Services, Edition August 28, 1989, 8-10.

Crocker, L., & Algina, J. (1986). Introduction to classical and modern test theory. Fort Worth: Holt, Rhinehart and Winston, Inc.

Cronbach, L. J. (1970). Essentials of psychological testing. (3rd ed.). New York: Harper and Brothers.

D'Aborsca, L. A., & Sink, C. V. (1982). Microcomputer in business education. Journal of Business Education, 58(2), 47-49.

Davis, B. B. (1985). A curriculum on computer literacy for employment. Metropolitan Collegiate Center of Germantown, Philadelphia, PA.

Davis, M. M. (1993). An investigation of two Chapter 1 teachers' beliefs about reading and instructional practices. Reading Research and Instruction. 33(2), 105-118.

Debra P. vs Turlington (1981). Unites States Court of Appeals, 5th Circuit. 644F.2d397.

Diebold Group. (1984). Working session summary 84-1: managing human resources development. Business Computer Digest. 2(4).

D'Onofrio, M. J., Maxam, S., Frany, M. A., Wuller, F., Blockus, W., & Graf, D. (1990). Open Forum. Business Education Forum, 44(5), 31-39.

D'Onofrio, M. J., & Slama, M. E. (1983). An investigation of the computer literacy resulting from the use of microcomputers in the high school accounting classes. Delta Pi Epsilon Journal, 25, 143-154.

Downing, S. M., & Huladyna, T. M. (1989). A taxonomy of multiple-choice item-writing rules. Applied Measurement in Education, 2(1), 37-50.

Ellington, H. (1987). How computers can be used in tertiary education, (ERIC Document Reproduction Service No. ED 289 492).

Englehart, M. D. (1965). A comparison of several item discrimination indices. Journal of Educational Measurement, 2, 69-76.

Erekson, T. L., & Barr, L. (1985). New directions for the business education curriculum. NASSP, 69(484), 24-28.

Frary, R., Cross, L. H., Kehoe, J. F. & Weber, L. J. (1992). Testing memos. Virginia Polytechnic and State University, Blacksburg, VA: Measurement and Research Services.

Gabriel, R. M. (1985). Assessing computer literacy: A validated instrument and empirical results. AEDS Journal, 18(3), 153-169.

Gronlund, N. E., & Linn, R. L. (1990). Measurement and evaluation in teaching (6th ed.). New York: McMillan.

Hardy, R. A. (1984). Measuring instructional validity: A report of an instructional validity study for the Alabama High School Graduation Examination. Journal of Educational Measurement, 21(3), 291-301.

Hassan, S. S. (1985). Education for high-technology jobs. Washington, DC: National Institute of Education, (ERIC Document Reproduction Service No. ED 259 207).

Hills, P. (1987). Educating for a computer age. New York: Crook Helm.

Hunter, B., & Aiken, R. (1987). The evolution of computer courses in vocational education: Perspectives and directions. T.H.E. Journal, 14(7), 54+.

Johnson, J. K. (1989). ...Or none of the above. The Science Teacher, 56(4), 57-61.

Johnston, J. (1985). Information literacy: academic skills for a new age, (ERIC Document Reproduction Service No. ED 270 042).

Kizzier, D. L., Pollard, C., & Ford, J. (1991). Delta Pi Epsilon Journal, 33(3), 119-31.

Kroger, J. J. (1986). Computers, technology, and their impact on society. USA Today, 114, 54.

Lambrecht, J. J. (1989). Research questions related to teaching software. Business Education Forum, 43(5), 25-28.

Leinhardt, G. (1983). Overlap: testing whether it is taught. In G. Madaus (Ed.). The courts, validity, and minimum competency testing, 153-170. Boston: Kluwer-Nijhoff Publishing.

Leinhardt, G. & Seewald, A. M. (1981). Overlap: What's tested, what's taught? Journal of Educational Measurement, 18(2), 85-95.

Lloyd, B. H., & Gressard, C. (1984). The effects of sex, age, and computer experience on computer attitudes. AEDS Journal, 18(2), 67-77.

Lord, F. M. (1952a). The relationship of the reliability of multiple choice items to the distribution of item difficulties. Psychometrika, 18, 181-194.

Lutz, C. (1989). Computer literacy and secondary education. Business Education Forum, 44, 5-6.

Mathews, W. M. (1980). Monster or messiah?: The computer's impact on society. Jackson: University Press of Mississippi.

Mcleod, R., Jr. (1988). Decision support software for the IBM personal computer. Illinois: Science Research Associates, Inc.

Morris, W. (Ed.). (1982). American heritage dictionary. Boston: Houghton Mifflin Company.

Nellermore, D. A. (1992). Preparing students for employment--or what managers really want. Business Education Forum, 46(3), 11-13.

Oosterhof, A. C. (1976). Similarity of various item discrimination indices. Journal of Educational Measurement, 13, 145-150.

O'Reilly, R. (1990, January 4). The right program for financial planning. Los Angeles Times, D3.

Panagoplos, N. A. (1983). Microcomputers--fear not. Balance Sheet, 65(2), 33-35.

Pearlman, D. (1987, March 17). Plans 'n totals easy aid for financial reports. P.C. Week, 4, 69-70.

Pogrow, S. (1982). On technological relevance and the survival of U.S. public schools, Phi Delta Kappan, 63, 610-611.

Popham, E. L., Schrag, A. F., and Blockhus, W. (1975). A teaching-learning system for business education. New York: Gregg Division McGraw-Hill Book Company.

Powell, J. L., & Gellespie, C. (1990). Assessment: All tests are not created equally. Sarasota, FL: American Reading Forum, (ERIC Document Reproduction Service No. ED 328 908).

Powell, W. (1988). Database: A learning tool and a vocational competence. Journal of Education for Business, 63(4), 168-171.

Roach, J. V. (1983). America's educational challenge. Delta Pi Epsilon Journal, 25(3), 86-93.

Rose, J. S., Ryan, J., & Birdseye, A. T. (1984). Instructional validity: merging curricular, instructional and test development issues, (ERIC Document Reproduction Services No. ED 247 306).

Rowinsky, W.(1986, November 4). The search for better ways to make decisions. P.C. Week, 3, 152-154.

Ruby, R, Jr. (1983). Increase use of microcomputers in business education, (ERIC Document Reproduction Service No. ED 239 096).

Ruby, R., Jr. & Corder, S. (1991). Computer literacy in the classroom. Business Education Forum, 44(4), 15-17.

Schmidt, W. H., Porter, A. C., Schwille, J. R., Floden, R. E., & Freeman, D. J. (1983). Validity as a variable: Can the same certification test be valid for all students? In: G. F. Madus (Ed.). The courts, validity, and minimum competency testing. 133-151. Boston: Kluwer-Nijhoff.

Shick, J. (1990). Textbook tests: The right formula? The Science Teacher, 57, 33-39.

Shoffner, L. B. (1990). The effects of home environment on achievement and attitudes toward computer literacy. Education Research Quarterly, 14(1), 6-14.

Simonson, M. R., Maurer, M., Montag-Torandi, M., & Whitaker, M. (1987). Development of a standardized test of computer literacy and a computer anxiety index. Journal of Educational Computing Research, 3(2), 231-247.

Sparks, J. A. (1986). The effects of microcomputers in the home on computer literacy test scores, (ERIC Document Reproduction Service No. ED 286 491).

Staff. (1984). A focus on computer literacy, Business Education Forum, 39(1), 3-5.

Staff. (1984). Business education meets the needs of the nation, Business Education Forum, 39(1), 9.

Staff. (1984). The DPMA secondary curriculum on information technology and computer information systems, Data Processing Management Association.

Staff. (1986). A framework for assessing computer competence: defining objectives, National Assessment of Educational Progress, CN 6710, Princeton, N. J.: Objectives Booklet No. 17-CC-10. Educational Testing Service.

Stair, R. M., & Render, B. (1978). Management science: a self-correcting approach. Boston: Allyn & Bacon.

Toffler, A. (1990). Power shift. New York: Bantam Books.

Torandi, M. M. (1985). The development of a computer literacy assessment instrument, (ERIC Document Reproduction Service No. ED 256 342).

Weatherwax, J., & Weatherwax, R. C. (1991). Business analysis computer applications. Cincinnati, OH: South-Western.

Wiersma, W., & Jurs, S. G. (1990). Educational measurement and testing (2nd ed.). Massachusetts: Allyn and Bacon.

Wiggs, J. (1992). Providing skills for an information society. Business Education Forum, 46(4), 19-22.

Winfield, L. F. (1987). Teachers' estimates of test content covered in class and first grade students' reading achievement. Boston: Kluwer-Nijhof Publishing.

Wolverton, C. (1984). The quest for teaching/learning excellence in a technological age. Paper presented at American Vocational Association Conference, New Orleans, LA.

Wood, M. (1983). Computer Literacy. Balance Sheet, 64(4), 231-233.

Woolls, D. (1986). A program to get the most from your data. Accountancy, 98, 154-198.

APPENDIX A

BUSINESS COMPUTER APPLICATIONS

COURSE COMPETENCIES

Business Computer Applications

Course Competencies

1. *Perform simple mathematical functions both manually and electronically.*
2. *Perform business-related mathematical functions.*
3. *Compute and/or verify business forms or records.*
4. *Prepare, interpret, and analyze financial statements.*
5. *Use the touch method in operating a 10-key pad.*
6. *Demonstrate correct keyboarding techniques.*
7. *Describe the evolution of the computer.*
8. *Describe and explain the components and functions of a microcomputer system.*
9. *Sequence the steps in the data processing cycle and explain each step.*
10. *Distinguish among manual, mechanical, and electronic data processing systems.*
11. *Identify devices that are used for processing data electronically.*
12. *Categorize types of storage as primary or secondary.*
13. *Identify functions of common input/output devices.*
14. *Describe the functions of special purpose input/output devices.*
15. *Define binary and decimal numbering systems.*
16. *Operate hardware system(s).*
17. *Demonstrate the ability to load a program into the computer from a program disk.*
18. *Solve problems resulting from computer hardware and software failures.*
19. *Handle and care for storage media, organize disks, name a document on disk, update a directory and develop backup system.*

20. *Differentiate among computer languages.*
21. *Sequence steps for preparing a computer program.*
22. *Identify flowchart symbols.*
23. *Prepare a detailed program flowchart or other logical solution for a specified problem.*
24. *Explain functions of commonly used BASIC statements.*
25. *Document a program.*
26. *Key and run a BASIC program.*
27. *Evaluate the appropriateness of software packages for business applications (choosing the correct package to suit the need).*
28. *Use commercial software to demonstrate "user friendly" characteristics.*
29. *Identify applications that are appropriate for database and spreadsheet software.*
30. *Store, retrieve, and manipulate business records using a database software package.*
31. *Store, retrieve, and manipulate business records using a spreadsheet software package.*
32. *Describe the advantages, capabilities, and limitations of a spreadsheet and database.*
33. *Use graphics software to analyze and produce business information.*
34. *Use a word processing software package to produce business documents.*
35. *Identify areas of public concern in which computers may be used.*
36. *Describe situations involving violations of privacy and fraudulent or criminal uses of computers.*
37. *Analyze and perform filing functions manually and electronically.*

38. *Maintain a directory of documents for quick retrieval.*

39. *Compare and select the appropriate filing system equipment and supplies for a business application.*

40. *Keep area in and around the work station uncluttered.*

41. *Demonstrate cost-effective use of resource materials through efficient utilization of supplies allocated in a classroom.*

APPENDIX B

CONTENT VALIDATION COMMITTEE OF PRACTITIONERS

APPENDIX B

Content Validation Committee of Practitioners

Lydia Bell - Central Office Supervisor for Business and Marketing Education. Henrico Public Schools, Henrico County, VA 23223.

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APPENDIX C

SAMPLE ITEMS FOR VALIDATION

WORD PROCESSING

The following 6 pages contain matching items. Please rate these items by circling your selection from 1 to 4 (1=poor to 4=excellent). Each task is preceded by a task number which is for reference purposes. Following each task is a matching item. In this section, the correct answer is the corresponding task number, located at the end of the alternative and at the beginning of the task. Place comments about items at the end of the section and please note the task number. Return the rated items to: Art S. Williams, 2178 Mount Tabor Rd. #E, Blacksburg, VA 24060. Phone (703) 231-8207/office; or (703) 953-2422/home.

MATCHING - WORD PROCESSING

a. buffer (1283)
b. typeover (1348)
c. spell check (1345)
d. global (1304)
e. attribute (1281)
f. tabulate (1347)
g. decimal tab (1351)
h. replace (1339)
i. header (1305)
j. pagination (1337)
k. search (1340)
l. thesaurus (1360)
m. highlight (1333)
n. typethrough (1349)
o. hyphenation (1306)
p. sort (1344)
q. merge ((1354)
r. macro (1335)
s. move (1366)
t. copy (1300)
u. style (1359)
v. index (1353)
w. bold (1282)
x. center (1284)
y. delete (1285)
z. document (1286)
aa. edit (1287)
bb. font (1352)
cc. footer (1302)
dd. footnote (1303)
ee. format (1288)
ff. insert (1290)
gg. justify (1334)
hh. orphan (1362)
ii. overstrike (1291)
jj. retrieve (1293)
kk. subscript (1342)
ll. superscript (1343)
mm. template (1372)
nn. window (1350)
oo. word processing (1295)
pp. word wrap (1296)

Rating scale:
(poor---excellent)

(1362) Identify widow and orphan
1 2 3 4 The first line of a paragraph that appears at the bottom of the page. (1362)

(1295) Identify word processing
1 2 3 4 A system of producing typewritten or computer generated documents, such as business letters. (1295)

(1291) Identify overstrike
1 2 3 4 Used to cause two (2) characters to print in the same position. (1291)

(1293) Identify retrieve
1 2 3 4 Bringing a document from the directory to the screen. (1293)

(1343) Identify superscript
1 2 3 4 Text raised slightly above the line: i.e. 3^2. (1343)

(1334) Identify justify
1 2 3 4 The right margin is even in a document. (1334)

(1350) Identify window
1 2 3 4 A command used to view two documents at one time. (1350)

(1372) Use a keyboard template
1 2 3 4 Identifies the commands of the functions keys. (?)

(1342) Identify subscript
1 2 3 4 In the formula H_2O the printing of the 2 one third below the line of text. (1342)

(1296) Identify word wrap

1 2 3 4 The function of placing a word that begins before the right margin, but ends after it on the next line, without pressing enter or return. (1296)

(1284) Identify center

1 2 3 4 Placing text in the middle of the page. (1284)

(1303) Identify footnote

1 2 3 4 An explanatory note or reference that is printed at the bottom of the page. (1303)

(1302) Identify footer

1 2 3 4 A feature that allows the operator to create text that appears at the bottom of each page. (1302)

(1287) Identify edit

1 2 3 4 To prepare for publication or printing, as by correcting. (1287)

(1282) Identify bold

1 2 3 4 Emphasizes words and enhances the printed document. (1282)

(1290) Identify insert

1 2 3 4 To place within or something set in: i.e. placing a word between two words of already typed text. (1290)

(1352) Identify font

1 2 3 4 Printing type in one size and style. (1352)

(1285) Identify delete

1 2 3 4 Can be accomplished by using the backspace key, del key, or the space bar with typeover on. (1285)

(1286) Identify document (noun)

1 2 3 4 Any information you choose, such as a letter, memo, report, term paper, or table. (1286)

(1288) Identify format

1 2 3 4 How a document appears on the screen and how it looks when printed; includes such elements as line spacing, margin settings, and tab settings, etc. (1288)

(1345) Identify spell check

1 2 3 4 To check your document for errors in spelling. (1345)

(1283) Identify buffer

1 2 3 4 A device that temporarily stores data while it is being routed to a printer. (1283)

(1304) Identify global

1 2 3 4 The command which allows the user to search through the document for words or characters. (1304)

(1336) Identify move

1 2 3 4 Relocates text in the document. (1336)

(1337) Identify pagination

1 2 3 4 The ability to number or renumber all of the pages of text. (1337)

(1340) Identify search

1 2 3 4 The ability to find priority work. (1340)

(1344) Identify sort

1 2 3 4 To rearrange information so that it appears in a different order. (1344)

(1348) Identify typeover

1 2 3 4 Allows user to enter text over existing text. (1348)

(1305) Identify header

1 2 3 4 Places uniform information on each page such as title names. (1305)

(1335) Identify macro

1 2 3 4 Allows one or two keystrokes to replace a frequently used series of keystrokes. (1335)

(1354) Identify merge

1 2 3 4 To combine information into one document. (1354)

(1360) Identify thesaurus

1 2 3 4 Displays synonyms for a word in the document on the screen. (1360)

(1281) Identify attributes

1 2 3 4 A distinctive feature such as a bold or underline. (1281)

(1351) Identify decimal tab

1 2 3 4 The feature of a word processing program which causes characters containing a period to align at the period. (1351)

(1333) Identify highlight

1 2 3 4 A way to visually differentiate text. (1333)

(1306) Identify hyphenation

1 2 3 4 The insertion of a hyphen into a word so it may be divided between two lines of text. (1306)

(1339) Identify replace

1 2 3 4 A function which can change a phrase that appears many times in a document. (1339)

(1359) Identify style

1 2 3 4 The consistent attributes of the text such as headings and titles. (1359)

(1347) Identify tabulate

1 2 3 4 To arrange the text in columnar form. (1347)

(1349) Identify typethrough

1 2 3 4 The word processing function which causes characters to be printed when they are keyed. (1349)

COMMENTS

TASK NUMBER:

The following 18 pages contain multiple choice items. Please rate these items by circling your selection from 1 to 4 (1=poor to 4=excellent). Each task is preceded by a task number, which is for reference purposes. Following each task is a multiple choice item(s). Place comments about any item(s) at the end of the section and please reference the number in parentheses (task number). Enclosed is an answer key for the multiple choice section.

MULTIPLE CHOICE - WORD PROCESSING

Rating scale
(poor--excellent)

(1298) Identify block

1 2 3 4 You can delete, copy, and move text in the document using the: (1298)
a. global command
b. replace command
c. block command
d. retrieve command

(1305) Identify header

1 2 3 4 Use of this command can specify text which prints at the top of each page: (1305)
a. insert
b. footer
c. copy
d. header

(1335) Identify macro

1 2 3 4 A way to quickly type phrases you use frequently is to use a: (1335)
a. repeat phrase
b. macro
c. typethrough
d. replace

(1360) Identify thesaurus

1 2 3 4 For a list of synonyms for a word in the document use the: (1360)
a. thesaurus
b. search
c. spell check
d. typeover

(2151) Delete text, using the block feature

1 2 3 4 To delete a cluster of text in the document you are working on use this command: (2151)
a. append
b. move
c. replace
d. block

(1363) Enter a word processing program:

1 2 3 4 When using a program installed on hard disk, what is needed on the CRT before entering a program? (1363)
a. the cursor
b. the prompt
c. the disclaimer
d. the directory

1 2 3 4 When using a program on floppy disk, what is needed on the video display screen to enter the program? (1363)
a. the cursor
b. the prompt
c. the disclaimer
d. the directory

1 2 3 4 If you have the C> prompt on the screen and want to get to the A> prompt, key the following: (1363)
a. A> enter
b. A: enter
c. A" enter
d. A; enter

(1364) Exit a Word Processing program

1 2 3 4 To exit a word processing program: (1364)
a. remove the disk and turn off the equipment
b. prompt the file directory
c. use a function key(s) to exit
d. type "STOP"

1 2 3 4 You can exit a word processing program by: (1364)
a. returning to the A> or C>
b. placing the printer "on line"
c. pressing the Esc key
d. removing the disk and turning off the equipment

(1365) Save a document on disk

1 2 3 4 Before exiting a program you want to SAVE: (1365)
a. type "SAVE THIS"
b. use a function key(s) to save
c. move the cursor to the bottom of the last page of the text
d. use the set tabs keys

1 2 3 4 When saving a file for the first time, most software packages prompt the user to: (1365)
a. center the text
b. name the file
c. edit the file
d. insert spell check disk

(1366) Retrieve a document

1 2 3 4 In order to retrieve a file, it must be: (1366)
a. in the printer, ready to be printed
b. in a file directory
c. displayed on the video screen
d. in secondary storage

1 2 3 4 What must be known about a file in order to retrieve it: (1366)
a. the file extension
b. the file length
c. the file name
d. the file prefix

(1367) Access the HELP function

1 2 3 4 What kind of keys are used to access the HELP command: (1367)
a. number keys
b. alphabetic keys
c. function keys
d. arrow keys

1 2 3 4 What feature allows the user to learn about the different functions of a program: (1367)
a. file directory function
b. HELP function
c. assist menus
d. caps lock function

(1368) Move the cursor through a document

1 2 3 4 One way to move a cursor through a document, without changing text position, is to use the: (1368)
a. end key
b. space bar
c. arrow keys
d. return key

1 2 3 4 In order to move a cursor to the top or bottom of a page of text, strike the: (1368)
a. control or shift keys
b. page up or page down keys
c. alt or control keys
d. top or bottom keys

(1372) Use a keyboard template

1 2 3 4 The keyboard template identifies which group of keys? (1372)
a. number keys
b. alphanumeric keys
c. home row keys
d. function keys

(1373) Use bold print to display text

1 2 3 4 Text displayed in a heavy typestyle is: (1373)
a. reverse print
b. underlined print
c. bold print
d. overstriked print

(1374) Use capital letters to display text

1 2 3 4 To capitalize the first letter of a word, use the: (1374)
a. number lock key
b. any function key
c. shift key
d. control key

1 2 3 4 To type all the letters in a word or sentence in capitals, first use the: (1374)
a. caps lock key
b. num lock key
c. alt + shift key
d. control key

(1375) Center text or line of a document

1 2 3 4 To center text: (1375)
a. first count the number of spaces needed manually
b. type "center" before the text
c. use the backspace method
d. use a centering function key

(1376) Set, use, and clear tabs in a document

1 2 3 4 A feature used to indent paragraphs is; (1376)
a. tab key
b. left justification
c. right justification
d. insert key

1 2 3 4 A method of erasing previously set tabs is referred to as: (1376)
a. erasing decimals
b. stop tabs
c. clear tabs
d. clear justification

(1377) Underlining text automatically

1 2 3 4 In order to underline text automatically: (1377)
a. turn on underline function, type text, turn off underline function
b. type text, turn on underline function, turn off underline function
c. turn off underline function, type text, turn on underline function
d. turn on underline function, turn off underline function, type text

(1378) Underline and remove underline from exiting text

1 2 3 4 After typing a letter, to underline previously typed text: (1378)
a. put the cursor in front of the text and use the underline function key
b. put the cursor in front of the text and use the shift + the hyphen key
c. put the cursor in front of the text, block the text, then use the underline key
d. put the cursor any where in the text, turn on the format feature, then use the underline feature

(1379) Double underscore text

1 2 3 4 Placing two lines under text is called: (1379)
a. double display
b. double highlight
c. double underscoring
d. overstrike

(1380) Use word wrap feature

1 2 3 4 The feature that does not allow part of a word to be left at the end of a line is: (1380)
a. word search
b. word split
c. word wrap
d. word end

1 2 3 4 Word wrap is a feature that automatically: (1380)
a. indents for paragraphs
b. goes to the HELP feature
c. keeps word from splitting at the end of a line
d. hyphenates long words at the end of a line

(1381) Use insert and typeover mode

1 2 3 4 Normally, the default mode for insert/typeover is: (1381)
a. typeover
b. replace
c. insert
d. separate

(1382) Create and place footnotes within a document

1 2 3 4 An explanatory note or reference that is printed at the bottom of the page is a(n): (1382)
a. sidenote
b. endnote
c. pagenote
d. footnote

1 2 3 4 When creating a footnote, most word processing software packages: (1382)
a. force the user to do manual spacing
b. automatically adjust page ending
c. automatically shift to the end of the document
d. places any footnote at the beginning of the page

(1383) Access dot/leader tabs

1 2 3 4 A type of tab that contains dots between items of text is: (1383)
a. dot tab
b. dot/left tab
c. dot/leader tab
d. item/dot tab

(1384) Generate an outline

1 2 3 4 When generating an outline, the first step is to access: (1384)
a. the paragraph numbering menus
b. the document format menus
c. the page numbering feature
d. the file directory

(1390) Delete text, using backspace, replace/typeover, and delete

1 2 3 4 You can delete text by all of the following **EXCEPT** the: (1390)
a. backspace key
b. return key
c. replace/typeover key
d. delete key

(1391) Delete a character or space, a word, a line, a paragraph, and a page

1 2 3 4 When deleting a word, one option is to: (1391)
a. use the arrow key
b. backspace over the word
c. use the space bar to move over the word
d. use the format code and type over the word

(1393) Delete a code

1 2 3 4 To delete a code, access the: (1393)

a. reveals codes
b. format codes
c. font codes
d. merge codes

(1394) Insert a character or space, a word, aline, a paragraph, and a page

1 2 3 4 In order to insert a line of text into an already existing document, begin typing the new text with the: (1394)

a. "TYPEOVER" mode on
b. "INSERT" mode on
c. "REVEALS" mode on
d. "CAPS LOCK" mode on

(1395) Use the strikeover method to show text having both old and revised versions

1 2 3 4 The strikeover method is used to show text that has been: (1395)

a. revised in a document
b. underlined in a document
c. bold faced in a document
d. capitalized in a document

(1396) Spell check a document during editing

1 2 3 4 One of the spell check features is: (1396)

a. synonyms
b. acronyms
c. definitions
d. accents

(1398) Turn BLOCK on and off

1 2 3 4 The block feature allows the user to do all of the following, EXCEPT: (1398)

a. underline existing text
b. delete existing text
c. renumber existing pages
d. center existing text

(1399) Delete a footnote/endnote

1 2 3 4 When deleting a footnote, the system will automatically: (1399)

a. renumber the remaining footnotes
b. place numbers on pages
c. delete other footnotes
d. edit other footnotes

(1401) Hyphenate words at the end of a line

1 2 3 4 In order to hyphenate words at the end of the line, first turn on the: (1401)

a. hyphenation feature
b. reveals code
c. end of line code
d. separate-a-word code

(1403) Access and use the thesaurus

1 2 3 4 The thesaurus allows the user to check the: (1403)
a. spelling of a word
b. synonyms and acronyms of a word
c. accents of a word
d. hyphenation of a word

(1407) Create a MACRO

1 2 3 4 A "MACRO" is a series of: (1407)
a. software used with a computer
b. keystrokes under a particular name
c. programs under several names
d. hardware used with a computer

(1409) Globally replace characters

1 2 3 4 A command that allows the user to replace characters throughout a document: (1409)
a. copy
b. subscript
c. global
d. typethrough

(1410) Selectively replace characters

1 2 3 4 When using the replace key, the search will begin at the: (1410)
a. beginning of the document
b. point where the cursor is located
c. end of the document
d. middle of the document

(1411) Suppress widows and orphans

1 2 3 4 A widow is the: (1411)
a. last line of a paragraph that appears at the bottom of a page
b. first line of a paragraph that appears at the bottom of a page
c. last line of a paragraph that appears at the top of a page
d. first line of a paragraph that appears at the top of a page

(1420) Reformat text

1 2 3 4 Changing the format of the document once typed requires the user to: (1420)
a. change line spacing
b. change defaults for the system
c. change right, left, top, and bottom margins
d. reformat text

(1423) Change line spacing

1 2 3 4 To go from single spacing to double spacing within the document the user would change: (1423)
a. the defaults for the system
b. font settings
c. line spacing
d. the format

(1425) Align text at the right margin

1 2 3 4 In order to have text line up on the right of the page requires you to: (1425)

a. indent text from the left and right margin
b. right justify text
c. center text vertically
d. reset and clear tabs

(1431) Rearrange text with the move function

1 2 3 4 To relocate the last paragraph to the position of the first paragraph you would use: (1431)

a. reformat text function
b. repeat function
c. selectively replace characters function
d. rearrange text with move function

(1440) Print selected files from a word processing directory
(1441 Print a selected group of files

1 2 3 4 When printing selected files from a directory, select the proper: (1440 & 1441)

a. format codes
b. switch commands
c. menu items
d. merge codes

(1442) Get on-screen HELP for printing function

1 2 3 4 In order to access the HELP screen: (1442)

a. use the number keys
b. use the function keys
c. type "HELP"
d. print all "HELP" commands

(1443) Print a document

1 2 3 4 When printing a document, the user produces a: (1443)

a. soft copy
b. disk copy
c. drive copy
d. hard copy

(1447) Print more than one copy of a document
(1451) Print one page of a multipage document

1 2 3 4 When using the print function, you can do all of the following EXCEPT: (1447 & 1451)

a. print a document not in a directory
b. print a document
c. print one page of a multipage document
d. print two copies of a document

(1448) Work with hand-fed paper or sheet feeder

1 2 3 4 A printer that is fed one sheet of paper at a time will: (1448)

a. stop print at the end of every sheet
b. stop printing at the end of every paragraph
c. continue to print at the end of every sheet
d. continue printing as long as the printer is on

(1452) Print a block of text

1 2 3 4 The first step when printing a block of text is to: (1452)

a. underline the text
b. indent the paragraphs
c. block the text
d. center the text

(1454) Print envelopes

1 2 3 4 When printing envelopes, regardless of size: (1454)

a. alignment in the printer is not important
b. use of multicolored ribbons is important
c. font selection is important
d. alignment in the printer is important

(1457) Use different printer fonts and printer enhancements

1 2 3 4 If the font is changed in the middle of a document, text is affected: (1457)

a. only on the last page
b. from the position of the change to the beginning of the document
c. from the position of the change to the end of the document
d. from the beginning to the end of the document

(1458) Print, using different sized paper

1 2 3 4 In order to print, using different sized paper: (1458)

a. take the printer off line
b. unplug the printer
c. adjust the paper feed guides
d. measure the amount of information of the screen

1 2 3 4 In order to print, using different sized paper, identify: (1458)

a. printer size
b. margins, top and bottom
c. paper size and type
d. disk type and style

(1477) Consolidate two document files

1 2 3 4 A way to consolidate two document files is to use: (1477)

a. edit
b. move
c. merge
d. replace

(1470) Rename files on data disk

1 2 3 4 To change the name of a file requires you to: (1470)

a. copy files to another directory
b. rename files on data disk
c. delete files to another directory
d. move files to another directory

(1478) Lock or password protect a file

1 2 3 4 A way to secure documents so only those with a reason to view them are able to do so is to: (1478)

a. lock or password protect a file
b. create a new directory
c. change data drive
d. change start up options

TASK NUMBER **COMMENTS:**

APPENDIX D

SAMPLE ITEMS FOR FIELD TESTING

WORD PROCESSING

For the following matching items, 6 through 24, darken the number of the SINGLE BEST answer on your answer sheet. Please, DO NOT write on the test. GUESS if unsure. Use only a #2 pencil to mark your answers.

MATCHING - WORD PROCESSING

Part I
Possible Answers:

1. header
2. center
3. subscript
4. footnote
5. overstrike
6. word wrap
7. orphan
8. wordprocessing
9. superscript
10. retrieve

Begin at number 6 on your answer sheet.

6. The first line of a paragraph that appears as the last line at the bottom of the page.

7. A system of producing typewritten or computer generated documents, such as business letters.

8. Used to cause two (2) characters to print in the same position.

9. Bring a document from the directory to the screen.

10. Text raised slightly above the line: i.e. 3^2.

11. In the formula H_2O the printing of the 2 one third below the line of text.

12. The function that avoids the necessity of using the enter key at the end of a line in order to continue on the next line.

13. Place text in the middle of the page vertically.

14. An explanatory note or reference that is printed at the bottom of the page.

MATCHING - WORD PROCESSING
Part II
Possible Answers:

1. insert
2. edit
3. window
4. format
5. font
6. bold
7. justify
8. document
9. delete
10. template

Begin at number 15 on your answer sheet.

15. The right margin is even in a document.

16. A command used to view two documents at one time.

17. Identifies the commands of the functions keys.

18. To prepare for publication or printing, as by correcting.

19. Emphasizes words by having them appear in heavy print and enhances the printed document.

20. To place within or something set in: i.e. placing a word between two words of already typed text.

21. The print type in one size and style.

22. Can be accomplished by using the backspace key, del key, or the space bar with typeover on.

23. Any information you choose, such as a letter, memo, report, term paper, or table.

MULTIPLE CHOICE - WORD PROCESSING

For the following multiple choice items, 24 through 67, darken the SINGLE BEST answer on your answer sheet. Please DO NOT write on the test. You may not finish all the items. Work as quickly as possible to do as many as you can and GUESS if unsure.

Begin at number 24 on your answer sheet.

24. You can delete, copy, and move text in the document using the:
    1. global command
    2. replace command
    3. block command
    4. retrieve command

25. Use of this command can specify text which prints at the top of each page:
    1. insert
    2. footer
    3. copy
    4. header

26. A way to quickly type phrases you use frequently is to use a:
    1. repeat phrase
    2. macro
    3. typethrough
    4. replace

27. For a list of synonyms for a word in the document use the:
    1. thesaurus
    2. search
    3. spell check
    4. typeover

28. When using a program installed on hard disk, what is needed on the CRT before entering a program?
    1. the cursor
    2. the prompt
    3. the disclaimer
    4. the directory

29. When using a program on floppy disk, what is needed on the video display screen to enter the program?
    1. the cursor
    2. the prompt
    3. the disclaimer
    4. the directory

30. If you have the C> prompt on the screen and want to get to the A> prompt, key the following:
    1. A> enter
    2. A: enter
    3. A" enter
    4. A; enter

31. To exit a word processing program:
    1. remove the disk and turn off the equipment
    2. prompt the file directory
    3. use a function key(s) to exit
    4. type "STOP"

32. You can exit a word processing program by:
    1. returning to the A> or C>
    2. placing the printer "on line"
    3. pressing the Esc key
    4. removing the disk and turning off the equipment

33. Changing from single line spacing to double line spacing and back is a:
    1. block/move text function
    2. format change
    3. effects margins left/right
    4. may effect the word wrap feature

34. When saving a file for the first time, most software packages prompt the user to:
    1. center the text
    2. name the file
    3. edit the file
    4. insert spell check disk

35. In order to retrieve a file, it must be:
    1. in the printer, ready to be printed
    2. in a file directory
    3. displayed on the video screen
    4. in secondary storage

36. What must be known about a file in order to retrieve it:
    1. the file extension
    2. the file length
    3. the file name
    4. the file prefix

37. Which of the following is a page numbering style:
    1. binary
    2. decimal
    3. arabic
    4. greek

38. One way to move a cursor through a document, without changing text position, is to use the:
    1. end key
    2. space bar
    3. arrow keys
    4. return key

39. A <u>format</u> feature of most software is the ability to:
    1. change printer from the printer control menu
    2. indent text from the left and right margins
    3. get on screen help for merging
    4. create tables

40. The keyboard template identifies which group of keys?
    1. number keys
    2. alphanumeric keys
    3. home row keys
    4. function keys

41. To capitalize the first letter of a word, use the:
    1. number lock key
    2. any function key
    3. shift key
    4. control key

42. Aligning text evenly at the right margin, with no hyphenation is to:
    1. center
    2. left justify
    3. right justify
    4. word align

43. To type all the letters in a word or sentence in capitals, first use the:
    1. caps lock key
    2. num lock key
    3. alt + shift key
    4. control key

44. A method of erasing previously set tabs is referred to as:
    1. erasing decimals
    2. stop tabs
    3. clear tabs
    4. clear justification

45. In order to underline text automatically:
    1. turn on underline function, type text, turn off underline function
    2. type text, turn on underline function, turn off underline function
    3. turn off underline function, type text, turn on underline function
    4. turn on underline function, turn off underline function, type text

46. Placing two lines under text is called:
    1. double display
    2. double highlight
    3. double underscoring
    4. overstrike

47. A <u>format</u> feature of most word processing software is the ability to use:
    1. headers and footers
    2. print several pages of a document
    3. a mouse to input data
    4. spell check

48. Normally, the default mode for insert/typeover is:
    1. typeover
    2. replace
    3. insert
    4. separate

49. An explanatory note or reference that is printed at the bottom of the page is a(n):
    1. sidenote
    2. endnote
    3. pagenote
    4. footnote

50. When creating a footnote, most word processing software packages:
    1. force the user to do manual spacing
    2. automatically adjust page ending
    3. automatically shift to the end of the document
    4. places any footnote at the beginning of the page

51. A type of tab that contains dots between items of text is:
    1. dot tab
    2. dot/left tab
    3. dot/leader tab
    4. item/dot tab

52. When generating an outline, the first step is to access:
    1. the paragraph numbering menus
    2. the document format menus
    3. the page numbering feature
    4. the file directory

53. You can delete text by all of the following **EXCEPT** the:
    1. backspace key
    2. return key
    3. replace/typeover key
    4. delete key

54. After creating a footnote, the user is able to:
    1. rename the footnote
    2. print just the footnotes of a document
    3. view the footnote on the screen with the text
    4. edit the footnote

55. The strikeover method is used to show text that has been:
    1. revised in a document
    2. underlined in a document
    3. bold faced in a document
    4. capitalized in a document

56. One of the spell check features is:
    1. synonyms
    2. acronyms
    3. definitions
    4. accents

57. The block feature allows the user to do all of the following, EXCEPT:
    1. underline existing text
    2. delete existing text
    3. renumber existing pages
    4. center existing text

58. In order to hyphenate words at the end of the line, first turn on the:
    1. hyphenation feature
    2. reveals code
    3. end of line code
    4. separate-a-word code

59. The thesaurus allows the user to check the:
    1. spelling of a word
    2. synonyms and acronyms of a word
    3. accents of a word
    4. hyphenation of a word

60. A "MACRO" is a series of:
    1. software used with a computer
    2. keystrokes under a particular name
    3. programs under several names
    4. hardware used with a computer

61 A command that allows the user to replace characters throughout a document:
    1. copy
    2. subscript
    3. global
    4. typethrough

62. When using the replace key, the search will begin at the:
    1. beginning of the document
    2. point where the cursor is located
    3. end of the document
    4. middle of the document

63. A widow is the:
    1. last line of a paragraph that appears at the bottom of a page
    2. first line of a paragraph that appears at the bottom of a page
    3. last line of a paragraph that appears at the top of a page
    4. first line of a paragraph that appears at the top of a page

64. Changing the format of the document once typed requires the user to:
    1. change line spacing
    2. change defaults for the system
    3. change right, left, top, and bottom margins
    4. reformat text

65. To go from single spacing to double spacing within the document the user would change:
    1. the defaults for the system
    2. font settings
    3. line spacing
    4. the format

66. In order to have text line up on the right of the page requires you to:
    1. indent text from the left and right margin
    2. right justify text
    3. center text vertically
    4. reset and clear tabs

67. To relocate the last paragraph to the position of the first paragraph you would use:
    1. reformat text function
    2. repeat function
    3. selectively replace characters function
    4. rearrange text with move function

APPENDIX E

ACHIEVEMENT TESTS FOR WORD PROCESSING, SPREADSHEET, AND DATABASE SOFTWARE

MULTIPLE CHOICE - WORD PROCESSING

For the following multiple choice items, 1 through 60, darken the SINGLE BEST answer on your answer sheet. Please DO NOT write on the test. Do as many items as you can and GUESS if unsure. In the space for your name write the **software type** of your test, **WORD PROCESSING.**

1. To prepare a document for publication or printing, as by correcting is
   1. editing.
   2. viewing.
   3. alternating.
   4. report generating.

2. When using a program installed on a hard disk, which of the following is needed on the CRT before entering a program?
   1. the cursor
   2. the prompt
   3. the disclaimer
   4. the directory

3. When using the replace key, the search will begin at the
   1. beginning of the document.
   2. point where the cursor is located.
   3. end of the document.
   4. middle of the document.

4. The thesaurus allows the user to check the
   1. spelling of a word.
   2. synonyms and acronyms of a word.
   3. accents of a word.
   4. hyphenation of a word.

5. Which of the following is a page numbering style?
   1. binary
   2. decimal
   3. arabic
   4. italic

6. Placing two lines under text is called
   1. double display.
   2. double highlight.
   3. double underscoring.
   4. overstrike.

7. If you have the C> prompt on the screen and want to get to the A> prompt, what do you key?
   1. A> enter
   2. A: enter
   3. A" enter
   4. A; enter

8. To bring a document from the directory to the screen is to
   1. retrieve.
   2. begin word processing.
   3. access.
   4. move.

9. The first line of a paragraph that appears as the last line at the bottom of the page is called
   1. a widow.
   2. an orphan.
   3. a label.
   4. an integer.

10. Changing from single line spacing to double line spacing and back is
   1. a block/move text function.
   2. a format change.
   3. a margins left/right change.
   4. a word wrap feature.

11. You can exit a word processing program by
   1. returning to the A> or C>.
   2. placing the printer "on line".
   3. pressing the ESC key.
   4. removing the disk and turning off the equipment.

12. A <u>format</u> feature of most software provides the ability to
   1. change printer from the printer control menu.
   2. indent text from the left and right margins.
   3. get on screen help for merging.
   4. create tables.

13. The strikeover method is used to show text that has been
   1. revised in a document.
   2. underlined in a document.
   3. bold faced in a document.
   4. capitalized in a document.

14. What is used to cause two (2) characters to print in the same position?
   1. insert
   2. word wrap
   3. print command
   4. overstrike

15. To have text aligned on the right of the page you
   1. indent text from the left and right margin.
   2. right justify text.
   3. center text vertically.
   4. clear and reset tabs.

16. A system of producing typewritten or computer generated documents, such as business letters is
   1. composing.
   2. documenting.
   3. word processing.
   4. spreadsheets.

17. To type all the letters in a word or sentence in capitals, first use the
   1. CAPS LOCK key.
   2. NUM LOCK key.
   3. ALT + SHIFT key.
   4. CONTROL key.

18. Normally, the default mode for insert/typeover is
    1. typeover.
    2. replace.
    3. insert.
    4. separate.

19. To place text in the middle of the page vertically is
    1. printing.
    2. vertical spacing.
    3. setting margins.
    4. centering.

20. Which identifies the commands of the functions keys?
    1. menu command
    2. insert/typeover
    3. database command
    4. template

21. One of the spell check features is
    1. synonyms.
    2. acronyms.
    3. definitions.
    4. accents.

22. In order to retrieve a file, it must be
    1. in the printer, ready to be printed.
    2. in a file directory.
    3. displayed on the video screen.
    4. formatted.

23. To relocate the last paragraph to the position of the first paragraph you would use
    1. reformat text function.
    2. repeat function.
    3. selectively replace characters function.
    4. rearrange text with move function.

24. Which command can specify text which prints at the top of each page?
    1. insert
    2. footer
    3. copy
    4. header

25. For a list of synonyms for a word in a document use the
    1. thesaurus.
    2. search.
    3. spell check.
    4. typeover.

26. To underline text automatically, you
    1. turn on underline function, type text, turn off underline function.

    2. type text, turn on underline function, turn off underline function.

    3. turn off underline function, type text, turn on underline function.

    4. turn on underline function, turn off underline function, type text.

27. Changing the format of a document once typed requires the user to
    1. change line spacing.
    2. change defaults for the system.
    3. change right, left, top, and bottom margins.
    4. reformat text.

28. To capitalize the first letter of a word, use the
    1. NUMBER LOCK key.
    2. any function key.
    3. SHIFT key.
    4. CONTROL key.

29. To exit a word processing program
    1. remove the disk and turn off the equipment.
    2. prompt the file directory.
    3. use a function key(s) to exit.
    4. type "STOP."

30. A method of erasing previously set tabs is referred to as
    1. erasing decimals.
    2. stop tabs.
    3. clear tabs.
    4. clear justification.

31. A <u>format</u> feature of most word processing software is the ability to use
    1. headers and footers.
    2. print several pages of a document.
    3. a mouse to input data.
    4. spell check.

32. A widow is the
    1. last line of a paragraph that appears at the bottom of a page.
    2. first line of a paragraph that appears at the bottom of a page.
    3. last line of a paragraph that appears at the top of a page.
    4. first line of a paragraph that appears at the top of a page.

33. You can delete, copy, and move text in the document using the
    1. global command.
    2. replace command.
    3. block command.
    4. retrieve command.

34. To go from single spacing to double spacing within the document, the user would change
    1. the defaults for the system.
    2. font settings.
    3. line spacing.
    4. the format spacing.

35. To print type in one size and style, you
    1. type set.
    2. line space.
    3. create a macro.
    4. use the font feature.

36. You can delete text by all of the following **EXCEPT** the
    1. backspace key.
    2. return key.
    3. replace/typeover key.
    4. delete key.

37. A "MACRO" is a series of
    1. software used with a computer.
    2. keystrokes under a particular name.
    3. programs under several names.
    4. hardware used with a computer.

38. Any information you create, such as a letter, memo, report, term paper, or table is called
    1. word processing.
    2. reporting.
    3. documenting.
    4. formatting.

39. What feature aligns the margin on the right of a document?
    1. set left/right margins
    2. right justify
    3. flush right
    4. right center

40. A command that allows the user to replace characters throughout a document is
    1. copy.
    2. subscript.
    3. global.
    4. typeover.

41. A type of tab that contains dots between items of text is
    1. a dot tab.
    2. a dot/left tab.
    3. a dot/leader tab.
    4. an item/dot tab.

42. An explanatory note or reference that is printed at the bottom of the page is
    1. a footer.
    2. an endnote.
    3. a pagenote.
    4. a footnote.

43. Aligning text evenly at the right margin, with no hyphenation is to
    1. center right.
    2. left justify.
    3. right justify.
    4. word align.

44. To place within or something set in, such as placing a word between two words of already typed text, is
    1. typeover.
    2. word wrap.
    3. insert.
    4. retrieve.

45. When generating an outline, the first step is to access
    1. the paragraph numbering menus.
    2. the document format menus.
    3. the page numbering feature.
    4. the file directory.

46. The keyboard template identifies which group of keys?
    1. number keys
    2. alphanumeric keys
    3. home row keys
    4. function keys

47. Text raised slightly above the line: for example 3^2, is
    1. a macro.
    2. a superscript.
    3. an format feature.
    4. an overstrike.

48. When saving a file for the first time, most word processing software prompt the user to
    1. center the text.
    2. name the file.
    3. edit the file.
    4. insert spell check disk.

49. The block feature allows the user to do all of the following, EXCEPT
    1. underline existing text.
    2. delete existing text.
    3. renumber existing pages.
    4. center existing text.

50. What can be accomplished by using the BACKSPACE key, DEL key, or the SPACE BAR with TYPEOVER on?
    1. delete
    2. red line
    3. overstrike
    4. mark text

51. In the formula H_2O the printing of the 2 one third below the line of text is
    1. superscript.
    2. label.
    3. subscript.
    4. footnote.

52. When using a program on a floppy disk, what is needed on the video display screen to enter the program?
    1. the cursor
    2. the prompt
    3. the disclaimer
    4. the directory

53. One way to move a cursor through a document, without changing text position, is to use the
    1. END key.
    2. SPACE BAR.
    3. ARROW keys.
    4. RETURN key.

54. What feature emphasizes words by having them appear in heavy print and enhances the printed document?
    1. underline
    2. bold
    3. edit
    4. center

55. What must be known about a file in order to retrieve it?
    1. the file extension
    2. the file length
    3. the file name
    4. the file prefix

56. When creating a footnote, most word processing software packages
    1. force the user to do manual spacing.
    2. automatically adjust page ending.
    3. automatically shift to the end of the document.
    4. place any footnote at the beginning of the page.

57. A way to quickly type phrases you use frequently is to use a
    1. repeat phrase.
    2. macro.
    3. typeover.
    4. micro.

58. What function avoids the necessity of using the ENTER key at the end of a line in order to continue on the next line?
    1. return
    2. reveal codes
    3. word wrap
    4. copy

59. A command used to view two documents at one time is
    1. double view.
    2. view command.
    3. window.
    4. format.

60. After creating a footnote, the user is able to
    1. rename the footnote.
    2. print just the footnotes of a document.
    3. view the footnote on the screen with the text.
    4. edit the footnote.

MULTIPLE CHOICE - SPREADSHEET

For the following multiple choice items, 1 through 59, darken the SINGLE BEST answer on your answer sheet. Please DO NOT write on the test. Do as many items as you can and GUESS if unsure. In the space for your name write the **software type** of your test, **SPREADSHEET.**

1. Creating range names is useful when
   1. the range name is easy to remember.
   2. the user frequently refers to the same range of data.
   3. the file name is saved as the range name.
   4. the data must be entered twice.

2. The process of accessing an already created worksheet is
   1. to replicate.
   2. to duplicate.
   3. to retrieve.
   4. to save.

3. Which of the following may the user access anytime while working in a spreadsheet?
   1. file function
   2. shift print directory
   3. scroll menu
   4. help function

4. Which function erases data?
   1. copy
   2. protect
   3. save
   4. delete

5. The basic unit of a worksheet formed by the intersection of a row and a column is
   1. a cell.
   2. an insert.
   3. a relative address.
   4. an absolute value.

6. What function moves the cell pointer to a specific location?
   1. HOME
   2. RETURN
   3. COMETO
   4. GOTO

7. What mode can an operator use to make changes to a worksheet?
   1. change
   2. format
   3. display
   4. edit

8. The numeric value of a quantity without regard to its sign is its
   1. function.
   2. absolute value.
   3. formula value.
   4. numeric label/title.

9. A <u>format</u> feature of spreadsheet software is the ability to
   1. print just the data displayed on the screen.
   2. set column width for one column.
   3. copy a formula.
   4. name a range of cells.

10. An entry beginning with an alpha character, or any other character not considered a value is a
   1. letter.
   2. label.
   3. window.
   4. cell.

11. When a user of spreadsheet software places a dollar sign ($), or a comma (,) in numeric data, they are using the
   1. formula feature.
   2. format function.
   3. cell address function.
   4. range function.

12. As the result of an arithmetic operation, the answer is 712.45768. If the operator <u>formats</u> the cell to contain 712.46, they have
   1. truncated the answer.
   2. rounded the answer to an integer.
   3. sent the original answer to a new cell address.
   4. rounded the answer for display.

13. In spreadsheet software, when the user splits the screen either vertically or horizontally, they are using the
   1. column and row of a cell.
   2. format feature.
   3. window feature.
   4. display function.

14. A formula may be entered using
   1. ranges.
   2. lines.
   3. capitals.
   4. labels.

15. One way to enter a cell address in a formula is called
   1. returning to a cell.
   2. copying a cell.
   3. changing a cell.
   4. pointing to a cell.

16. Fixing row and column titles on the screen is
   1. freezing titles.
   2. unfreezing headings.
   3. pointing a range.
   4. restricting title selections.

17. An operator of spreadsheet software can set decimal places for a single cell or range of cells, this is a
   1. format feature.
   2. default feature.
   3. window feature.
   4. report.

18. Which of the following is a spreadsheet function that duplicates a range of cells in a new location?
    1. save worksheet
    2. copy
    3. cell address
    4. move

19. Which of the following identifies the rule for using @functions?
    1. sum the cell addresses
    2. list all entries as positive values
    3. enclose the arguments in parentheses
    4. leave spaces between each argument

20. All columns to the right of a deleted column
    1. move up one space.
    2. shift to the right.
    3. remain in the same position.
    4. shift to the left.

21. Which of the following changes related values as a result of changing a value used in a formula?
    1. recalculate
    2. function change
    3. status change
    4. copy

22. All rows below a deleted row
    1. shift up.
    2. shift down.
    3. remain in the same position.
    4. become highlighted.

23. A formula may also be entered using
    1. columns.
    2. functions.
    3. data.
    4. labels.

24. When using the frozen vertical titles feature
    1. column titles are frozen.
    2. column titles are displayed.
    3. row titles are frozen.
    4. row titles move to column heading position.

25. The main menu of spreadsheet software consists of
    1. the horizontal and vertical titles.
    2. some label values to be recalculated.
    3. a series of choices that appear on the display screen.
    4. several formulas.

26. An operator can use which of the following instead of typing the range address?
    1. range position
    2. copy a range
    3. save range
    4. range name

27. The process of moving horizontally or vertically through the worksheet is
    1. windowing.
    2. menuing.
    3. scrolling.
    4. editing.

28. A descriptive label, usually placed at the top of the spreadsheet is a
    1. title/heading.
    2. formula.
    3. row.
    4. integer.

29. When an operator of spreadsheet software increases a column width to accommodate a large number, they are using the
    1. global command.
    2. data entry function.
    3. format function.
    4. freeze column feature.

30. A word processing feature used to place part of a document in another location is
    1. word wrap.
    2. label.
    3. move.
    4. replace.

31. One way to cancel commands before execution is to press the
    1. SHIFT key.
    2. NUM LOCK key.
    3. ESC key.
    4. CONTROL key.

32. Frozen titles may be removed using the
    1. title clear command.
    2. browse command.
    3. any function key.
    4. freeze titles.

33 A mathematical expression that defines the relationship among two or more cells in a worksheet is
    1. an integer.
    2. a value.
    3. a formula.
    4. a column expression.

34. Which is a vertical line of cells on a worksheet?
    1. status line
    2. spreadsheet
    3. row
    4. column

35. Which is a spreadsheet address that will automatically change when the cell is copied or moved?
    1. absolute cell
    2. copied report
    3. displayed cell
    4. relative cell

36. When the user wants to leave a spreadsheet program, they can select the
    1. leave command.
    2. quit command.
    3. remove command.
    4. function command.

37. When a row/column is inserted, existing rows/columns
    1. move off the screen to display just the inserted row/column.
    2. most of the rows/columns are saved.
    3. move down or over to make room.
    4. must have a new range name.

38. A series of choices that appear on the control panel is the
    1. main menu.
    2. main cell address.
    3. label or value.
    4. formula.

39. A horizontal line of cells across the worksheet is a
    1. cell name.
    2. column.
    3. label.
    4. row.

40. Sometimes when using a function, it is easier to
    1. enter each cell address.
    2. enter each value.
    3. create a range name.
    4. create a value list.

41. When using the frozen horizontal titles feature
    1. column titles take row positions.
    2. column titles may be edited.
    3. row titles are frozen.
    4. column titles are frozen.

42. Which is a built in formula that allows the user to supply values but not operators?
    1. function
    2. formula
    3. value
    4. math feature

43. The GOTO function
    1. clears the screen and accesses a command menu.
    2. moves a range of cells in a worksheet.
    3. allows the user to move to the main menu.
    4. moves the cell pointer to a specific location.

44. A <u>format</u> feature of spreadsheet software is the ability to
    1. enter formulas using parentheses.
    2. enter numbers as text.
    3. create named cell ranges.
    4. display the date on the spreadsheet.

45. The viewing area on the display screen when the screen is partitioned into several different viewing areas is
    1. a split view.
    2. the window.
    3. a row and column.
    4. the worksheet.

46. Which is any member of the set of positive and/or negative whole numbers; to include zero?
    1. null set
    2. positive null set
    3. integer
    4. value or label

47. In spreadsheets, a ready-made file containing labels and formulas for user data entry is
    1. a template.
    2. a function.
    3. a table.
    4. an address file.

48. If a user of spreadsheet software wants to change the width of all the cells of a spreadsheet, they can use the
    1. global column width command.
    2. windows feature.
    3. global insert multiple columns function.
    4. global numeric data function.

49. After creating a spreadsheet, the program will allow the user to retain the spreadsheet by
    1. saving.
    2. scrolling.
    3. quitting the program.
    4. viewing.

50. Using the window feature of spreadsheets
    1. divides the screen into two sections.
    2. creates several views of a cell address.
    3. reverses the order of two screen sections.
    4. most spreadsheets do not have a window feature.

51. Displaying numbers, when calculations result in decimals, as whole numbers is a spreadsheet
    1. format feature.
    2. alpha data feature.
    3. right justify as default feature.
    4. not possible when adding two or more decimal numbers.

52. Normally, the place to enter a spreadsheet program is a the
    1. control panel.
    2. cell pointer.
    3. beginning directory.
    4. beginning prompt.

53. The correct answer to a calculation is 984.1162, rounded to two decimal places the answer is
    1. 984.11.
    2. 984.12.
    3. 984.13.
    4. 984.10.

54. After inserting rows/columns
    1. the width of the rows/columns is lengthened.
    2. any formulas change and refer to different data.
    3. all range names change position.
    4. any formulas continue to refer to the same data.

55. Which is a type of value whose address cannot be changed?
    1. relative cell
    2. function
    3. protected
    4. integer

56. One method of entering a range is to
    1. create values for the range.
    2. create a name for the range.
    3. list the formulas for the range.
    4. protect most of the range.

57. Ready made file containing labels and formulas for user data entry is a
    1. table.
    2. worksheet.
    3. record.
    4. template.

58. Inserting rows/columns
    1. inserts a range of data.
    2. adds blank rows/columns.
    3. adds all functions to a worksheet.
    4. inserts two files to the worksheet.

59. Which identifies the current cell address and displays the mode of operation in a spreadsheet?
    1. status line
    2. relative address
    3. labels and values
    4. worksheet status

MULTIPLE CHOICE - DATABASE

For the following multiple choice items, 1 through 59, darken the SINGLE BEST answer on your answer sheet. Please DO NOT write on the test. Do as many items as you can and GUESS if unsure. In the space for your name write the **software type** of your test, **DATABASE.**

1. A type of file to which data are written is
   1. an output file.
   2. a relational file.
   3. a table file.
   4. a record file.

2. Parts of existing tables (files) may be used to
   1. create a new table (file).
   2. create several menus.
   3. delete two or more file names.
   4. browse tables (files).

3. Specific information, for example, specific fields and/or records, used to generate a report are called report
   1. items.
   2. headings.
   3. variables.
   4. titles.

4. Which of the following can be drawn for readability in database software?
   1. stars and stripes
   2. headers and footers
   3. boxes and lines
   4. pictures and figures

5. What feature allows you to review the contents of a table?
   1. view
   2. browse
   3. query
   4. save

6. To open a database file already created, the user must know the:
   1. file name.
   2. record name.
   3. file characteristics.
   4. file prefix.

7. The name given to the special character used in a statement or command to show the logical relationship between data elements is
   1. a logical text field.
   2. a relational operator.
   3. a search operator.
   4. a relational command.

8. If certain rows are searched and displayed, the information displayed is
   1. records.
   2. fields.
   3. formulas only.
   4. files.

9. When the operator enters the data/text to include the fields and records, they have
   1. created an input file.
   2. edited all data/text.
   3. named the file.
   4. accessed the printer.

10. The symbols +, -, *, /, **, () are used as
   1. format symbols.
   2. ascending/descending operators.
   3. marked record signs.
   4. arithmetic operators.

11. Changing from text to numeric values is changing
   1. input devices.
   2. data type.
   3. entry levels.
   4. record length.

12. What type of database stores data in a set of tables and uses common columns among the tables to allow for multiple-table operations?
   1. table database
   2. relational database
   3. flat file database
   4. common database

13. When an operator names a file and then describes the fields, they are specifying the
   1. database search criteria.
   2. system variables.
   3. database structure.
   4. fields to be copied.

14. A collection of records is a
   1. buffer.
   2. cell address.
   3. worksheet.
   4. file.

15. The Association of Records Managers and Administrators (ARMA) has alphabetic filing rules for inputing
   1. names of individuals, and/or organizations.
   2. reports and/or forms.
   3. moving text and/or files.
   4. simple and/or complex searches.

16. A field with a value of **TRUE** or **FALSE** is a
   1. numeric field.
   2. relational database.
   3. key field.
   4. logical field.

17. Database software allows for use of break
   1. editors/modifiers.
   2. footers/headers.
   3. saves/deletes.
   4. text/values.

18. What type of field is used primarily to store words, but may also store zip codes and social security numbers?
    1. numeric.
    2. flat file.
    3. character.
    4. system variable.

19. The type of search condition used to retrieve data with one criteria is a
    1. compound search.
    2. complex search.
    3. single search.
    4. simple search.

20. To quickly go to a particular record, an operator moves the record
    1. form.
    2. pointer.
    3. modifier.
    4. name.

21. An example of a system variable is a
    1. column title.
    2. field name.
    3. copy command.
    4. date.

22. The type of field containing both letters and numerals is
    1. a system variable.
    2. an arithmetic operator.
    3. an alphanumeric.
    4. a label.

23. Data input may be accomplished with a
    1. relational command.
    2. keyboard.
    3. record pointer.
    4. CRT.

24. Combining two tables can also be referred to as
    1. a merge.
    2. an index.
    3. a save.
    4. an edit.

25. Which of these is necessary if you want your report to perform mathematical calculations?
    1. report formula
    2. report function
    3. report variable
    4. mathematical variable

26. To shorten by cutting off is to
    1. abbreviate.
    2. output.
    3. numerate.
    4. concatenate.

27. Which of these may be used to sort data?
    1. ascending/descending order
    2. numerical sequence
    3. record sequence
    4. any order

28. Reports may have
    1. headers.
    2. leaders.
    3. cell addresses.
    4. no variable names.

29. Those values that are set by the system and may be used but cannot be changed are
    1. system values.
    2. alphanumeric values.
    3. system variables.
    4. record variables.

30. When an operator wants to make a file available for processing, they must
    1. scan a directory.
    2. select a name for the file.
    3. open a file.
    4. close a file.

31. Subtotals may be printed throughout a report with
    1. total lines.
    2. record breaks.
    3. headers/footers.
    4. control breaks.

32. When an operator deletes a record, they remove a
    1. row.
    2. column.
    3. cell address.
    4. field.

33. What is a collection of different files, records, and fields organized according to structure that allows manipulation of the data?
    1. spreadsheet
    2. table
    3. database
    4. file structure

34. In database, if the operator is looking for information meeting two or more criteria, it is referred to as a
    1. compound search condition.
    2. cumulative conditional search.
    3. relational search.
    4. compound display.

35. Which of these allows for naming database fields?
    1. format menu
    2. command names
    3. title/name
    4. record length

36. To remove text from a column, the operator
    1. changes the entries in a record.
    2. adds new data to a field.
    3. deletes the file.
    4. deletes the field.

37. The page, time, or date are known as
    1. criterion variables.
    2. system variables.
    3. menu selections.
    4. report items.

38. A line of text on every page of a report, at the top of the page is a
    1. footer.
    2. box.
    3. top page line.
    4. header.

39. The user of database software can easily create a combined file from two database files, if the files are
    1. unidemsional database files.
    2. on the same disk.
    3. relational database files.
    4. input files.

40. Using certain menu selections the operator may display
    1. the hierarchy of fields.
    2. several open databases.
    3. a list of tasks to perform.
    4. the structure of the tables (files).

41. To arrange data in ascending or descending order you
    1. browse.
    2. key data sequentially.
    3. sort.
    4. select.

42. Changes and modifications may be performed within a
    1. modifier.
    2. variable.
    3. field/column.
    4. change agent.

43. Which of the following may the operator print on a report?
    1. report size
    2. file directory
    3. system data
    4. all of the above

44. To request a special report from the database, the operator would
    1. query the database.
    2. flowchart the request.
    3. structured the design.
    4. specialize relative addresses.

45. An operator may place a line of text at the bottom of every page of a report. These lines of text are referred to as
    1. footers.
    2. bottom titles.
    3. footnotes.
    4. page notes.

46. What is the process of connecting or linking in a series?
    1. concatenating
    2. joining together
    3. reporting variables
    4. ralationalizing

47. Normally, the first thing to do when creating a database file is to
    1. name the relational operator.
    2. query the database.
    3. format the fields for records.
    4. print the database structure.

48. What is referred to as "absence of value"?
    1. concatenation
    2. null value
    3. flat file
    4. field value

49. Each field in a database structure has a
    1. command/function.
    2. sort/search.
    3. file/record.
    4. title/name.

50. Database allows the user to use shortcut formulas that make it easier to perform certain calculations, they are called
    1. functions.
    2. calculation operators.
    3. arithmetic variables.
    4. math formulas.

51. What is a line in the body of the report that describes a transaction?
    1. multiple command
    2. detail line
    3. transaction line
    4. record menu line

52. In database software, formats may be selected for such items as the
    1. date.
    2. time.
    3. currency.
    4. all of the above.

53. Which function is used to choose rows from a file?
    1. select
    2. browse
    3. form
    4. sort

54. If an operator changes the database design, they are editing/modifying the database
    1. rules.
    2. text.
    3. structure.
    4. default values.

55. Which of these may be used to edit text?
    1. report
    2. form
    3. table
    4. record editor

56. Which of the following temporarily stores data while it is being routed to a destination, such as a printer?
    1. secondary storage
    2. hard drive
    3. buffer
    4. flat file

57. Combining text values from two or more fields, placing a space between them, and truncating all trailing (blank) spaces is known as
    1. truncation.
    2. concatenation.
    3. database varying.
    4. compounding.

58. The type of field that identifies the names and characteristics of the field within a record is
    1. a form.
    2. a report.
    3. a structure.
    4. a modifier/identifier.

59. When an operator specifies the layout of a report, they are
    1. saving the report.
    2. editing the report.
    3. specifying the report variables.
    4. designing the report.

APPENDIX F

COVER LETTER AND TEST ADMINISTRATOR INSTRUCTIONS

Sample Cover Letter

Arthur S. Williams, Sr.
2178 Mount Tabor Rd. #E
Blacksburg, VA 24060

Test Site Facilitator
Address

Date:

Dear Test Site Facilitator:

Enclosed please find the instructions for the Business Computer Applications teachers in your school(s). Also, the teacher surveys, student achievement tests--with answer keys by software, and answer sheets are enclosed.

Please distribute the materials to the Business Computer Applications teachers. Each teacher should complete a teacher survey. Each student should complete an achievement test. Please ask that teachers who deliver direct instruction to a group of students keep those student and teacher instruments together. No school, teacher, nor student will be identified by name and the strictest confidentiality will be followed in conducting the study.

At the completion of the administration of the achievement test and teacher surveys, have the BCA teachers return all materials to me in the enclosed self-addressed stamped box.

Return materials to: Art S. Williams, 2178 Mount Tabor Rd. #E, Blacksburg, VA 24060.

Thank you for assisting in completing this research, as outlined in my initial request. The results will be sent to you at the end of the project. If you need to contact me, please write to: Arthur S. Williams, 2178 Mount Tabor Rd. #E, Blacksburg, VA 24060. You may phone me at: (703) 953-2422/home, or (703) 231-8207/office.

Sincerely,

Arthur S. Williams, Sr.
VTE Doctoral Candidate

Enclosures: Teacher Instructions
Teacher Surveys
Student Achievement Tests
Answer Keys by Software
Answer Sheets

SAMPLE TEST ADMINISTRATOR INSTRUCTIONS
All Software Types

Test Administrator Instructions:
Business Computer Applications Teacher

Please do not write your name on any materials returned to the project researcher. Do not have your students write their name or any identifying marks on the test or answer sheet. The names of any school, teacher, or student will not be revealed and the strictest confidentiality will be adhered to. Return all teacher surveys, and student achievement tests in the enclosed self-addressed stamped box to:

Art S. Williams
2178 Mount Tabor Rd. #E
Blacksburg, VA 24060

Questions or problems may be answered by phoning: (703) 953-2422/home or (703) 231-8207/office.
Enclosed you will find the following documents:

1. Teacher Instrument

   a. Please have all Business Computer Applications (BCA) teachers complete the BCA teacher self-report. Write the name of your school in the space for name on the answer sheet.

   b. Rate each item, on the answer sheet, 1 through 62, as taught or not taught, by software type. On the answer sheet, darken 1 = taught the concepts and vocabulary for that item, or 2 = not taught the concepts and vocabulary for that item.

   c. Please complete items 63 and 64 according to your experience in teaching in general and teaching BCA in particular.

2. Student Instrument

   a. Distribute the tests as evenly as possible, such that every third student will receive one of the software types: word processing, spreadsheet, or database. Please read these instructions before administering the test to all students completing the BCA course.

   b. All students completing the BCA course should complete the achievement test. **It is important for students to write the software type, i.e. word processing, spreadsheet, or database, on their answer sheet in the space where their name normally would appear!**

   c. Students should darken the number of the SINGLE BEST answer on the answer sheet. Please DO NOT write on the test. GUESS if unsure. Use a #2 pencil only to mark the answers.

   d. Please make sure that student and corresponding teacher(s) instruments remain together.

Thank you for your assistance in completing the teacher instrument and administering the student instrument. All school divisions will receive a copy of the results of the study.

VITA

Arthur S. Williams, Sr. was born in Denver, Colorado on January 3, 1950. As a military dependent, he and his family came to the Commonwealth of Virginia. As a high school freshmen, he racially integrated a theretofore racially segregated school division in Chesterfield, VA. After four years as a star athlete and good academic student at Thomas Dale High School, he entered the U. S. Air Force. He was honorably discharged after a three and one half year tour of duty in the Mediterranean Sea Region. He then matriculated, as a scholarship athlete in varsity basketball, to Brevard College, Brevard, N. C. Injury curtailed the experience during the 1974 season. He later completed the requirements for a B. S. Degree from Virginia State University in 1977 in Business Administration. He also received a M.Ed. in Business Education from the same university in 1989. He is completing the doctoral program at Virginia Polytechnic Institute and State University, Blacksburg, VA in Vocational and Technical Education. The requirements will be fulfilled in the fall of 1994.

His teaching career began at Prince George High School, Prince George, VA in 1988. A year was spent as an assistant professor at Key Business College, Richmond, VA. Here he taught computer application

software: word processing, spreadsheet, and database. At present, he is an assistant professor in the Business Administration, Office Systems, and Business Education Department of Murray State University. His teaching assignment includes: computer application software, business communications, and introduction to business.

He is a member of the following professional organizations: National Business Education Association; American Vocational Education Research Association; American Vocational Association; Phi Delta Kappa, Delta Pi Epsilon, Omicron Tau Theta, and Kappa Delta Pi national honorary fraternities. He has hobbies of golf, bowling, tennis, pocket billiards, progressive jazz and classical music, and horseback riding.

His career goals involve the attainment of Master Instructor and Full Professor at a major world university. He plans to continue research in computer application software use, and testing and measurement in computer operations. Further, he would like to assist the community with his expertise no matter where he may live, in order to help it grow and prosper.