AN ANALYSIS OF POST-HIGH SCHOOL BUSINESS DATA PROCESSING CURRICULA IN OKLAHOMA

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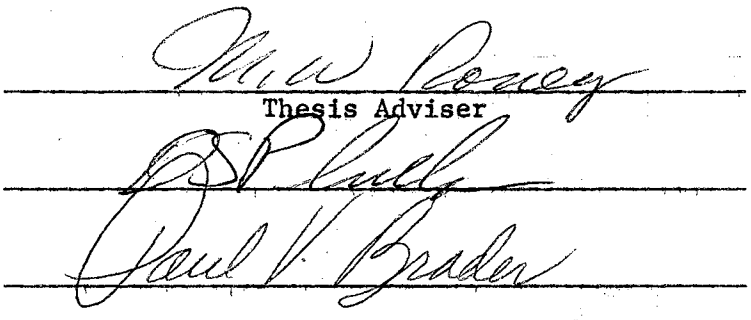

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CHAPTER I

INTRODUCTION

Within the past six years there has been an increasing interest on the part of business and industrial organizations relative to the utilization of computers. This interest in computers has spread throughout our educational system with many high schools introducing computers to their students by educational materials or actual computer operations. This development at the high school level is demonstrated by a report of the High School Advisory Board of the School Mathematics Study Group which recently recommended (1):

> The number of individuals who will work or be directly affected by digital computers in the next decades will be so great that the entire high school population needs to learn something about computers.

This type of activity at the high school level and the increasing demands of business and industry will have a very marked effect on the area school and junior college curricula. With the current emphasis upon obtaining a college education, enrollment has increased greatly during recent years; and even greater growth is anticipated in the future. This situation has enabled the junior college and area schools to be of value as a means of providing formal education beyond the twelfth grade.

The future will be even more demanding as advances in cybernation continue at a rapid pace and the number of computers in operation continues to increase. This increase is remarkable when it is considered

that in 1945 a successful electronic digital computer did not exist, and in 1951 there were fewer than one hundred computers in operation in the United States. Today, a recent study by Booz, Allen, and Hamilton, Inc., indicates there are 35,000 computers valued at 10 billion dollars in business and industrial applications, and it is estimated in the 1970's this will grow to 50,000 computers valued at 20 billion dollars (2).

The Problem

The task of training personnel to work with and in computer and data processing systems is being faced today by many smaller colleges and area schools. The demand for personnel by business, government, and industry cannot be met by the graduates of a few institutions. The problem is: How well are the business data processing programs in Oklahoma post-high school institutions fulfilling the knowledge area requirements of Oklahoma business and industry? This study is concerned with the instructional curricula of data processing compared with the needs of business.

Need for the Study

Vincent S. Darnowski (8) reported the following facts in one of his recent articles. The need for trained data processing personnel, particularly for business use, is expected to rise sharply during the next few years. Programmers, especially, will be in demand. The computer or electronic data processing industry has grown from an infant employing a relative handful of people to a giant needing the services of one and one-half million people in less than two decades.

Darnowski further stated that the United States Department of Labor estimates a growth to eight million employees in the 1970's.

The State of Oklahoma in 1966, through the efforts of the State Department of Vocational Education, established a program of instruction to train programmers, systems analysts, and other data processing related personnel (25). This educational endeavor which was planned to meet the growing demands in electronic data processing of Oklahoma business and industry has been in existence for only a few years. The educational facilities are now present in Oklahoma, but should be under review, since it is a new curriculum area. Educators should not doubt the curriculum which they teach.

Research Questions

The following questions have been established for this study:

1. Do the post-high school business data processing programs in Oklahoma include knowledge areas deemed appropriate by the Oklahoma business and industrial concerns?
2. Are post-high school business data processing programs in Oklahoma designed in accordance with the curriculum suggested by the State Department of Vocational and Technical Education?

Procedures

Names and addresses of one hundred fifty business and industrial data processing installations in the State of Oklahoma that employ programmers and systems analysts were obtained from the Oklahoma State Department of Vocational Education (See Appendix A). A survey instru-

ment in the form of a questionnaire was designed to be used in this study. The questionnaire was used to obtain answers to questions concerning the requirements of business and industry for trained programmers and systems analysts.

The questionnaire, along with a transmittal letter stating the purposes of the study, was mailed to the data processing installations (See Appendix B). A self-addressed, stamped envelope was included with the material sent in order to assist the installations in returning the questionnaire.

After a period of four weeks, a follow-up letter was sent to those installations not responding in order to obtain a substantial return. Responses to the items in the questionnaire were tabulated to be compared with existing programs in the post-high school institutions.

In order to survey the offerings of the programs in selected Oklahoma post-high school institutions in electronic business data processing, postcards were mailed to the registrars of five junior colleges, two technical institutions, and four area vocational-technical centers, requesting a catalogue for use in analyzing the data processing curriculum.

Limitations

In making this study, several problems seemed apparent. These limiting factors are:

1. The names and addresses of the industrial groups, business organizations, or other agencies using data processing systems were obtained from the State Department of Vocational Education.
2. The business organization's experience in years of service

may affect the interpretation of the questionnaire.

3. The catalogue offerings may not provide a realistic picture of the courses taught or if the objectives were being met.

4. The instructor experience of the author influenced the selection of the knowledge areas used in the survey questionnaire.

Definition of Terms

Data processing occupational titles will be used throughout this study. To avoid confusion a listing of these titles and their definitions, which are currently accepted, is included for the reader's benefit (13).

Operator implies the person who manipulates the computer controls, places information media into the input devices, removes the output and performs other related functions.

Programmer is a person who prepares problem solving procedures and flow charts and who may also write and debug routines.

Systems Analyst is a person skilled in the definition of and the development of techniques for the solving of a problem by a computer.

CHAPTER II

REVIEW OF LITERATURE

Computers have been called "electronic brains", but a computer cannot think. A human operator must put data, facts, and figures into a computer. Then he must tell the computer what to do with the information. The computer then performs a series of operations with the data, according to the instructions of the stored program. This stored program of instructions was written by a human programmer following a flow chart.

Early History of Equipment

The electronic data processing equipment is a product of our age. This equipment represents the tools developed to help man calculate, standardize, and understand the events that occur in the world around him. Thus the early history of computers and unit record equipment is in part the history of man's progress in understanding his environment. In this sense the early history of this equipment can be traced back to those devices and principles that were developed before the introduction of electronics in the 1930's.

Modern data processing equipment and its predecessors can be classified by certain characteristics. In general we can consider two classes of computers, the analog and the digital. These two classes of computers had a long history of development before they reached

their present electronic stage of sophistication.

Analog Computer: The analog computer is considered to be a continuous function computer and is probably the very earliest form of counting or numerical manipulation. It sets up a direct relationship between a variable in a problem and a physical quantity in the computation device. Numbers are represented by lengths, such as on a slide rule, or the electrical current in a conductor. The analog computers, in general, are limited in their accuracy by the precision in which measurements of length, volume, or other physical quantities can be made.

An analog computer more than 2000 years old was discovered by divers near the Isle of Antikythera, off the coast of Greece, around the turn of the twentieth century. This computer was rebuilt and determined to be an analog computer of the solar system built by the Greeks, around the year 100 B.C. (3).

The development of the analog computer continued from this early beginning, to the present, by the efforts of several prominent men. These individuals are listed with their inventions in Table I.

This class of computer is used to great advantage in solving engineering problems where many differential equations are involved. It is not a general multi-purpose computer which can be used to advantage in the business world as well as the scientific area. It is normally found in the engineering schools of higher education and in research centers.

Digital Computer: The digital computer is considered a discrete computer since it does its calculations by manipulating digits. The distinquishing feature of the digital computer is the capacity to store

TABLE I

THE HISTORICAL DEVELOPMENT OF ELECTRONIC DATA PROCESSING EQUIPMENT

Analog Computers:

1.	Surveying and map making in Babylonia.	3800 B.C.
2.	Greek Computers.	100 B.C.
3.	Slide Rule by William Oughtred	1621
4.	Flyball Governor by James Walt	1788
5.	Planimeter by J. H. Hermann.	1814
6.	Harmonic Analyzers & Synthesizers by Lord Kelvin	1892
7.	Mechanical Differential Analyzer by Vannevar Bush.	1931
8.	Electronic Differential Analyzers (BOEING by Boeing Airplane Company; EASE by Berkeley Scientific Company; GEDA by Goodyear Aircraft Company, etc.)	1945-Date

* *

Digital Computers:

1.	Abacus	3000 B.C.
2.	Napiers' Bones by John Napier.	1617
3.	Adding Machine by Blaise Pascal.	1642
4.	Difference and Analytic Engines by Charles Babbage	1812
5.	Punched-card Machines by Herman Hollerith	1890
6.	Mark I by Howard H. Aiken	1944
7.	Electronic Delay Storage Automatic Calculator by M. V. Willkes	1949
8.	Whirlwind I by M.I.T.	1953
9.	Second Generation Computers (transistors replaced vacuum tubes)	Late 1950's
10.	Third Generation Computers (miniaturized solid state components)	Early 1960's
11.	Future Generation Computers (include the use of microwaves, lasers, and the study of cryogenics).	Late 1960's

a chain of instructions, called a stored program, and manipulate data electronically by using these instructions. "To put it briefly: an analog computer measures, while a digital computer counts" (6). This comparison will give some idea of the difference between the two classes of computers and also some insight as to why the digital computer is considered a multi-purpose machine. The inner manipulations of the digital machine correspond to the everyday manipulations in business.

The historical development of the digital computer has been traced back to the "Abacus". This tool is still used in Japan where it is called a Saroben. In fact a unique contest was held in Japan in November, 1946: "Kiyoshi Mastuzaki, a clerk in a Japanese communications department, using the Abacus, challenged Private Thomas Wood of the U. S. Army, using a desk calculating machine, and defeated him in a speed contest involving additions, subtractions, multiplications, and divisions" (5).

The digital computer has developed, from its interesting historical beginning, into a highly sophisticated piece of equipment. Various forms and sizes of the digital computer can be found throughout our business and educational institutions. A brief outline of the digital computer development was presented in Table I.

Development in Higher Education

The historical development of computers in higher education started with the introduction of data processing systems which did not contain computers. The first systems included punch card equipment, such as sorters, key-punches, reproducers, and accounting machines.

These systems were installed in statistical departments of some of the larger universities and colleges for the processing of statistical data, and in registrar and business offices to handle the volumes of records common to that type of work. Some of the first schools in the United States to have this equipment were the University of Iowa in 1925; Texas A & M University in 1927; Virginia Polytechnic Institute in 1934; and the State College of Iowa in 1938 (14).

The introduction of punched card equipment in colleges and business was not very surprising after Dr. Herman Hollerith had demonstrated the practical use of such machines in the 1890 United States Census. He was working with the monumental task of the census in 1887, when he invented a machine designed to record, compile and tabulate census data by the use of a punched paper tape (26). The machines improved the process to the point that the 1890 census was completed in one-fourth the time it took to finish the 1880 census. This was a great step forward for anyone working with large volumes of statistical data.

The establishment of computers on college and university campuses did not follow data processing until the introduction of electronics in the 1940's. The first computer was built in 1944, on the Harvard College campus by Howard H. Aiken with the support of the International Business Machines Corporation (3). This machine was an Automatic Sequence Controlled Calculator called Mark I. This computer was soon followed by the hundreds of makes and models we know today. At the present time, electronic data processing in institutions is developing very rapidly with many schools introducing computer science courses to help train their students in this technical area.

Related Research

The development of an educational program in small colleges and area vocational-technical centers which will help provide students with the required background for the data processing industry was a difficult project. The shortage of qualified teaching personnel was a major problem which schools had to contend with, as well as the rising salaries resulting from this shortage.

Thomas Keenan (16) reported in a recent article:

> We must anticipate the day when an introductory computer science course will be as natural in science education as is a basic course in calculus or a foreign language, and as many as 100,000 college students will be annually enrolled in computer science courses.

The Associate Commissioner for Research, Dr. R. Louis Bright (22), of the United States Department of Health, Education, and Welfare in comments before a meeting of the Association for Educational Data Systems stated, "the impact of the computer on the American Society has been vastly underrated". He urged that all high school and college students be given a course in the social implications of computers and what they can and can not do. Dr. Bright further stated, "any person who graduates today from a four year liberal arts college without being instructed in the use of computers has been severely cheated".

The two references mentioned above indicate there will be a continuing shortage of qualified personnel until higher education is able to educate enough instructors to teach the required courses. Due to this shortage, Dr. Francis Tuttle (25), State Coordinator of Area Vocational-Technical Education in Oklahoma, accepted the position of Project Director for "Summer Institute to Train Data Processing Teachers for the new Oklahoma State-Wide Computer Science System".

The basic purpose of the institute was to develop technically qualified teachers for data processing technology programs for both in-state and out of state. Oklahoma had established a state-wide data-communications computer processing technical program. There was an extreme need for qualified teachers.

The research project included a research study report by Arthur Lee Hardwick (25), "To Determine the Feasibility of Establishing a Program to Train Computer Programmers Utilizing a Time-sharing System and Remote Data-Communications Transmission Terminal". His report was concerned with the problem of adequate preparation of data processing programmers and systems analysts at the most reasonable cost to the local school. He found that the system should include:

1. A limited configuration of unit record equipment to teach the basic concepts of the equipment.
2. Assembler language programming for third generation hardware is a necessity and if second generation hardware is still in use, its assembler language should be considered.
3. Compiler language programming consisting of the two basic languages of COBOL and FORTRAN. These two languages must be taught if the student is to be employed by the majority of organizations requiring computer personnel.
4. Advanced compiler language programming should be integrated into the instructional program.
5. Machine language programming for the type of system used should be utilized in the instructional program.
6. Second generation equipment should not be considered when it is to be the complete (stand-alone) system for a program.

7. Third generation hardware is a necessity in the instructional program to adequately instruct data processing personnel.

8. The concepts of random access, magnetic tapes, and monitor systems must be taught.

9. Data-communications technique should be considered as a method to provide more computing power for the program.

CHAPTER III

PROGRAM DEVELOPMENT IN SELECTED POST-HIGH SCHOOL INSTITUTIONS IN OKLAHOMA

Technological advancement in recent years is requiring education beyond the high school level for most students. The two-year college and the area school is an educational resource that in recent years has begun to show its potential. Today these institutions make up a strong and important link in the education chain. They are bringing educational opportunities within the financial and geographic reach of many.

The passage of State Question 434 in 1966 provided the legal basis for Oklahoma school districts to join together in providing area schools. It also gave the State Board for Vocational Education authority to formulate the area vocational-technical school districts. Area vocational-technical schools provide more advanced vocational and technical education than may be provided by local high schools. The area concept is not limited to the present area vocational-technical school districts in Oklahoma. As defined by the Vocational Education Act of 1963, an area program may be (2):

1. A specialized high school used exclusively to provide full time vocational education in preparation for full time work in industry.

2. A department of a high school used exclusively or principally to provide training, in at least five different occupational fields, to students available for full time study prior to entering the labor market.

3. A technical or vocational school providing vocational education predominantly to persons who have completed or left school and who are able to study on a full time basis before going to work.

4. A department or division of a junior college, community college, or university providing vocational education in at least five different occupational fields, under the supervision of the State Board of Vocational Education, and leading to immediate employment but not toward a baccalaureate degree.

The Oklahoma state-wide computer science system allows local schools to offer a sophisticated program. The system was designed around a data center located at Oklahoma City utilizing the RCA Spectra 70-35E third generation computer tape-disc operating system. Each local site has a second generation RCA 301 card-tape system with supporting unit record equipment from IBM. The data center will provide programming languages such as Assembly, RPG, FORTRAN IV, COBOL, and other new third generation programming languages as developed.

Northern Oklahoma College and the OSU Tech Institute, Oklahoma City branch, were not a part of the state-wide system. These two schools have computer systems from IBM to support their programs.

The successful operation of a school depends, in large part, upon the type of students enrolled in the program. The technical school must attract students, educate, and place them as technicians, fulfilling what industry demands. This philosophy of student selection was a large problem to the instructors and counselling staff. For the most part, the business data processing technical programs operated on the policy of requiring that the student had taken a course in Algebra. The student must also be tested by a program test battery such as the American College Test (A.C.T.), Differential Aptitude Test (D.A.T.), or the IBM Aptitude Test for Programmer Personnel (A.T.P.P.).

The Aptitude Test for Programmer Personnel was designed to aid in the selection of individuals for training in the programming of IBM electronic computers (15). The test was made up of three subtests: a letter series test, a figure series test, and an arithmetical reasoning test. These subtests do not measure all of the abilities required in learning programming, but they do provide an efficient estimate of some of the factors necessary for success. The interpretations of these tests revealed an individual may have success, in the field of data processing, if he attained a total score of above 36 from a maximum score of 95.

Terry P. Spradley (23), in his study made in 1968, found that the American College Testing Program (A.C.T.) could be justified as predictors of success in a two year post-high technical institute.

> Minimum A.C.T. scores for success in business data processing can be predicted from regression analysis. The results of the regression equation analysis indicated that potential students should have minimum A.C.T. scores of English 15, Mathematics 14, Social Science 16, Natural Science 16, Composite 17, and have some mathematics beyond Algebra I in order to expect success in business data processing as indicated by a 2.0 (C) grade average or better.

Altus Junior College

Altus Junior College was established in 1926 as a coeducational college. The college is under the local control of the Altus Public School District. The college offers basic university-parallel courses in liberal arts.

Altus Junior College is fully accredited. It is a member of the Oklahoma Association of Junior Colleges, approved by the Oklahoma Regents for Higher Education. Students may transfer credits to any

senior college. The college is authorized by the Oklahoma Regents for Higher Education to offer the full two-year course leading to an Associate of Arts Degree (1).

Technical education in the field of business data processing began with the fall term, 1966. The department had two data processing instructors and followed a curriculum suggested by the State Board of Vocational-Technical Education (See Appendix C).

Cameron State College

The State legislature of Oklahoma on May 20, 1908, created six district agricultural schools of a secondary grade for instruction in agriculture and mechanics. A group of businessmen, working with the Chamber of Commerce, purchased 160 acres of land west of Lawton. The school was named for E. D. Cameron who was then State Superintendent of Schools (7).

The school was located temporarily in the basement of a Lawton business building. In November, 1909, Cameron opened with a faculty of six and a student body of one hundred and eight students. The institution moved into a three story brick building in March, 1911, on the present site of Cameron College.

Cameron College is accredited by the North Central Association of Colleges and Secondary Schools and is a member of the American Association of Junior Colleges. It awards the Associate in Arts Degree or a Certificate of Completion (7).

Technical education in the field of business data processing began in September, 1966. The courses offered followed basically the suggested curriculum of the Oklahoma State Board for Vocational-

Technical Education (See Appendix C). The technical education department began with two instructors.

Eastern Oklahoma State College

Eastern Oklahoma State College was established by the State in 1909 as the Oklahoma School of Mines and Metalurgy, offering degrees in engineering. The school was closed during World War I, but in 1920 it reopened with mining engineering and trade and industrial education courses for disabled veterans comprising the curriculum.

Mining engineering was discontinued in 1924 with the addition to the college program of teacher training and extension courses for miners. The State Legislature changed the name of the school to Eastern Oklahoma College in 1927, and gave it authority to provide trade and industrial courses on a pre-college level, and to issue degrees, diplomas, and certificates (11).

The Associate Degree is awarded after completion of requirements. Eastern is officially accredited by the North Central Association of Colleges and Secondary Schools and all Oklahoma State School Accrediting Agencies. It is a member of the American Association of Junior Colleges, Council of North Central Junior Colleges, and the American Council of Education (11).

The two year technical program in data processing began with the fall term of 1966 (See Appendix C). The department had one data processing instructor and became a part of the business division. A one year special program in data processing may be pursued in lieu of the two year technical program.

Northern Oklahoma College

On March 1, 1901, the legislative assembly of Oklahoma Territory passed an act appropriating money for the establishment of the University Preparatory School to be located at Tonkawa. The following September the doors of the new school opened with two hundred and twenty-seven men and women enrolled.

The College Department was established in 1920, and the institution became a fully accredited junior college. The name was changed to Northern Oklahoma Junior College by an act of the state legislature in 1941. Further changes were made in 1965 with the passage of the Higher Education Code by the state legislature. This changed the institution's official name to Northern Oklahoma College, as well as expanding its Board of Regents from three to five men (18).

Northern Oklahoma College is a member of the North Central Association of Colleges and Secondary Schools, Council of North Central Junior Colleges. It offers the Associate in Arts Degree, the Associate in Business Degree, the Associate in Science Degree, or the Junior College Certificate (18).

The school offers technical, business, and vocational programs. The data processing curriculum has been taught for several years (See Appendix C). It is staffed by one data processing instructor and relies upon him for total education. At the present time the department is upgrading equipment and the curriculum.

Northeastern Oklahoma Agricultural and Mechanical College

Northeastern Oklahoma A & M College had its beginning in 1919

when the governor signed a bill creating the Miami School of Mines. A special Board of Regents, authorized under House Bill 552, at once organized the school so that it offered only college work, largely of a scientific nature (17).

Classes were held in the Mining and Exchange Building in Miami for one year. In 1920 the institution moved into a new building located on forty acres of land donated by the citizens of Miami. Here it operated as a school of mines until 1925, at which time the legislature changed the name of the school to Northeastern Oklahoma Junior College, and general collegiate courses were added to the curriculum. Control of the college remained in the hands of the special Board of Regents until 1939 when the school and the six teachers colleges were placed under the supervision of the Board of Regents of the State Colleges (17). By an act of the state legislature in April, 1943, the name of the college was changed to Northeastern Oklahoma Agricultural and Mechanical College.

Northeastern Oklahoma A & M College is fully accredited by our state institutions and by the North Central Association of Colleges and Secondary Schools. It offers the Associate in Arts Degree for graduation when students complete requirements (17).

A data processing curriculum is offered in the Business Education Division (See Appendix C). This curriculum is staffed by four data processing instructors to prepare the graduate for employment in a variety of positions in the field of business data processing.

OSU Technical Institute

Oklahoma City Branch

The Oklahoma City Technical Institute was established in 1961. The institute is a cooperative project among Oklahoma State University, the Oklahoma City Public Schools, the State Board of Vocational Education, Oklahoma City University, and leaders in local business and industry. The institute is also a division of the OSU College of Engineering. It offers seven two year college programs. Graduates of these programs are awarded an Associate Degree in Technology (20).

A computer programming technology curriculum is offered to help meet the demands of business, industry, and science (See Appendix C). This curriculum produces technicians who can work side by side with the engineer or scientist to help analyze the specific problem at hand.

Oklahoma State Tech, Okmulgee

The Oklahoma State University, Stillwater, Oklahoma, organized the Okmulgee Branch on October 1, 1946. The school serves the areas of vocational and technical education. The school has become known as Oklahoma State Tech, and is located on the eastern edge of Okmulgee.

The courses at Oklahoma State Tech are approved by the Board of Regents for the Oklahoma State University and the Agricultural and Mechanical Colleges, the Oklahoma State Regents for Higher Education, and the Oklahoma State Accrediting Agency. To receive a Certificate of Accomplishment the student must complete all units of instruction (19).

The data processing curriculum has the objective of training programmers and systems analysts (See Appendix C). The four trimester program will afford the student an opportunity of being able to meet

the demands of this electronic era. The program is staffed by four data processing instructors.

Bartlesville Area Vocational-Technical Center

The Bartlesville Area School was established in 1968. The school is a cooperative project among surrounding high schools, the State Board of Vocational Education, and leaders in local business and industry. The school is a composite of both high school and post-high school technical programs.

The data processing program at the school is approved by the Oklahoma State Accrediting Agency, the Oklahoma State Office for Vocational Education, and by the Veterans Administration. A Certificate of Technical Training is awarded for successful completion (4).

The two year technical program in data processing (See Appendix C) began with the fall term of 1968. The department had one data processing instructor. A special night course in programming was also offered to up-grade and retrain personnel.

Duncan Area Vocational-Technical Center

The Duncan Board of Education authorized the construction of new buildings, on available land near the Duncan High School. This action established the area school and its doors opened for the fall term in 1966. The school included programs for both high school and post-high school students.

The courses at the Duncan Area School are approved by the Oklahoma State Accrediting Agency, the Veterans Administration, and the Oklahoma State Office for Vocational Education. To receive a Certi-

ficate of Accomplishment the student must complete all units of instruction (10).

The data processing curriculum (See Appendix C) is offered in the technical education department. The program is in conjunction with the Oklahoma state-wide computer system. The program is staffed by two data processing instructors.

O. T. Autry Area Vocational-Technical Center

The Enid Board of Education in cooperation with business and industry organized the O. T. Autry Area Vocational-Technical Center which opened for the first time in September, 1967. The school is a composite of both high school programs, post-high school technical programs, and up-grade and retraining programs. The school is located on the northwest edge of Enid with all modern facilities and equipment.

The data processing course at the school is approved by the Veterans Administration for all the educational programs under their jurisdiction, the Oklahoma State Accrediting Agency, and the Oklahoma State Office for Vocational-Technical Education. A Certificate of Technical Training is awarded for successful completion (21).

A data processing curriculum (See Appendix C) is offered in the technical education department in conjunction with the Oklahoma state-wide computer system. This program is staffed by two data processing instructors to prepare the graduate for employment of a variety of positions in the field of business data processing.

Tulsa Area Vocational-Technical Center

The Technical Education Division of the Oklahoma State Board for

Vocational Education developed a state-wide computer science system. The purpose was to train computer programmers and systems analysts. The Tulsa Public School Board of Education supported this endeavor and as a result the school, located on the south side of Tulsa, was in operation for the fall semester of 1966 (24).

The course at the school is approved by the Oklahoma State Accrediting Agency and the Oklahoma State Office for Vocational-Technical Education. A Certificate is presented for successful completion.

A data processing curriculum (See Appendix C) is offered in the technical education department. The program is staffed by two data processing instructors and two identical programs are conducted each day.

CHAPTER IV

ANALYSIS OF CATALOGUE AND QUESTIONNAIRE DATA

An analysis of the course offerings in the catalogues for each of five junior colleges, two technical institutions, four area schools, and selected knowledge areas of one hundred nine businesses is given in this chapter to reveal the status of computer programming technology in business data processing.

Analysis of Catalogue Data

The departmental titles present an insight into the educational programs offered. Table II condenses the titles of the departments. Out of the eleven schools in this study, only one has a department title other than "data processing technology". Oklahoma State Tech was listed under the business education department. Only four post-high school institutions had a further breakdown of titles. Three schools are included in business division and one in the business education division. These four schools are Cameron State College, Eastern Oklahoma State College, Northern Oklahoma College, and Northeastern Oklahoma A & M College. With all schools emphasis was being placed upon curriculum areas in the field of data processing, "computer programming technology".

Data processing instructors are few in number when compared to

TABLE II

LISTING OF DATA PROCESSING TITLES IN SELECTED INSTITUTIONS

School	Department	Division
Altus Junior College	EDP Technology	
Cameron State College	EDP Technology	Business
Eastern Oklahoma State College	EDP Technology	Business
Northern Oklahoma College	EDP Technology	Business
Northeastern Oklahoma A & M College	EDP Technology	Business Education
OSU Tech Institute, Oklahoma City Branch	EDP Technology	
Oklahoma State Tech	Business Education	
Bartlesville Area Voc-Tec Center	EDP Technology	
Duncan Area Voc-Tec Center	EDP Technology	
O. T. Autry Area Voc-Tec Center	EDP Technology	
Tulsa Area Voc-Tec Center	EDP Technology	

the number of other technical education instructors. As shown in Table III, there are twenty-four data processing instructors in the post-high school programs in Oklahoma. This table does not include the personnel at the Oklahoma City Data Center. The data center has two state employed personnel and three programmers and systems analysts from the Radio Corporation of America (RCA). These five additional personnel lend support to the state-wide program.

TABLE III

NUMBER OF DATA PROCESSING INSTRUCTORS IN ELEVEN OKLAHOMA POST-HIGH SCHOOLS

Institution	No. of Instructors
Altus Junior College	2
Cameron State College	2
Eastern Oklahoma State College	1
Northern Oklahoma College	1
Northeastern Oklahoma A & M College	4
OSU Tech Institute, Okla. City Branch	3
Oklahoma State Tech	4
Bartlesville Area Voc-Tech Center	1
Duncan Area Voc-Tech Center	2
O. T. Autry Area Voc-Tech Center	2
Tulsa Area Voc-Tech Center	2
TOTAL	24

There was a similarity of courses offered in the data processing curriculums of the eleven schools. Tables IV, V, VI, and VII include

TABLE IV

COMPARISON OF FIRST SEMESTER COURSE OFFERINGS
IN TERMS OF CREDIT HOURS

Course	Sem. Hours at Each Institution												
	A	B	C	D	E	F	G	H	I	J	K	L	M
ounting I	4	4	3	3	3		3	4	4	4	4	4	6
gebra and Trigonometry								5					
llege Algebra				3	3	4							
mmunication Skills I, English	3	3	3	3	3	3	3	3	3	3	3		
ta Processing Math I	3	3					3		3	3	3	4	3
ectro Mechanical Machines	5	5	3	3	5	5	5		5	5	5	3	3
tro. to Business Data Processing	2	2	3	2	3		2		2	2	2	3	3
litary Science				2									
ientation and Library Science					1								
rsonal and Occupational Guidance								1					
ysical Education				1		1	1						
ogramming I			4					4				4	
eech						3							
Total Hours	17	17	16	17	18	16	17	17	17	17	17	18	15

United States Office of Education
Oklahoma State Board for Voc. Educ.
Altus Junior College
Cameron State College
Eastern Oklahoma State College
Northern Oklahoma College
Northeastern Oklahoma A & M College

H. OSU Tech, Oklahoma City
I. Oklahoma State Tech
J. Bartlesville Area Center
K. Duncan Area Center
L. Enid Area Center
M. Tulsa Area Center

TABLE V

COMPARISON OF SECOND SEMESTER COURSE OFFERINGS
IN TERMS OF CREDIT HOURS

Course	Semester Hours at Each Institution												
	A	B	C	D	E	F	G	H	I	J	K	L	M
Accounting II	4	4	3	3	3		3	4	4	4	4	4	3
Analytical Geometry								3					
Communication Skills II, English	3		3	3	3	3	3						
Computer Programming I	4	4		4	5	4			4	4	4		6
Computer Programming II			4					4				5	
Data Processing Applications	2	2			2		2		2	2	2	2	3
Data Processing Math II	4	4	3	4	3		4		4	4	4	4	3
Electro Mechanical Machines II			3			3							
Government, American								3					
History, American				3	3								
Intro. to Programming Systems							3						
Military Science				2									
Modern Business						2						3	
Office Training						2							
Physical Education						1	1						
Statistics								2					
Technical Writing		3							3	3	3		
Trigonometry						3							
Total Hours	17	17	16	19	19	18	16	16	17	17	17	18	15

A. United States Office of Education
B. Oklahoma State Board for Voc. Educ.
C. Altus Junior College
D. Cameron State College
E. Eastern Oklahoma State College
F. Northern Oklahoma College
G. Northeastern Oklahoma A & M College
H. OSU Tech, Oklahoma City
I. Oklahoma State Tech
J. Bartlesville Area Center
K. Duncan Area Center
L. Enid Area Center
M. Tulsa Area Center

TABLE VI

COMPARISON OF THIRD SEMESTER COURSE OFFERINGS
IN TERMS OF CREDIT HOURS

Course	Semester Hours at Each Institution												
	A	B	C	D	E	F	G	H	I	J	K	L	M
Accounting I						3							
Analysis I								5					
Applied Calculus				5									
Boolean and Matrix Algebra								3					
Business Organization	3	2	3				3	3	2	2	2		
COBOL Programming				4								5	
College Algebra			3										
Computer Programming II	5	4				4	4	3	4	4	4	4	3
Cost Accounting	3	3	3	3	3				3	3	3	3	3
Economics						3							
FORTRAN Programming		4	4		5				4	4	4		6
Government, American						3	3						
History, American						3	3						
Military Science				2									
Physical Education				1	2	1							
Programming Systems	3				3		4	4				3	
Statistics	3	4	3	3	4				4	4	4		3
Technical Report Writing												3	
Total Hours	17	17	16	18	17	17	17	18	17	17	17	18	15

A. United States Office of Education
B. Oklahoma State Board for Voc. Educ.
C. Altus Junior College
D. Cameron State College
E. Eastern Oklahoma State College
F. Northern Oklahoma College
G. Northeastern Oklahoma A & M College
H. OSU Tech, Oklahoma City
I. Oklahoma State Tech
J. Bartlesville Area Center
K. Duncan Area Center
L. Enid Area Center
M. Tulsa Area Center

TABLE VII

COMPARISON OF FOURTH SEMESTER COURSE OFFERINGS
IN TERMS OF CREDIT HOURS

Course	Semester Hours at Each Institution												
	A	B	C	D	E	F	G	H	I	J	K	L	M
Accounting II						3							
Advanced Programming Programs				2				2					
Advanced Programming Systems	6	5	4		6				5	5	5	3	5
Analysis II								5					
COBOL Programming		4	4			3	6		4	4	4		5
Data Processing Project	2	2	3		2		2		2	2	2	2	2
Economics						3							
FORTRAN Programming				4		3		3				4	
Government, American	3			3	3								
Military Science				2									
Physical Education				1	2	1							
Statistics							3					4	
Systems Design and Development	4	4	3	2	4	4	4	4	4	4	4	4	3
Technical Report Writing								3					
Total Hours	15	15	14	14	17	17	15	17	15	15	15	17	15

A. United States Office of Education
B. Oklahoma State Board for Voc. Educ.
C. Altus Junior College
D. Cameron State College
E. Eastern Oklahoma State College
F. Northern Oklahoma College
G. Northeastern Oklahoma A & M College
H. OSU Tech, Oklahoma City
I. Oklahoma State Tech
J. Bartlesville Area Center
K. Duncan Area Center
L. Enid Area Center
M. Tulsa Area Center

courses offered in data processing and the number of semester hours of credit offered in each subject pertaining to the first, second, third, and fourth semesters respectively. The course was recorded by the title which best describes the content of the course. The course listed as I or II was one in which a sequence of courses was offered, with the II designating more advanced work. At the time of the study, no college credit was allowed in the four area schools and Oklahoma State Tech. Advanced standing exams are available to the students of these five schools.

A categorical breakdown of the courses into five subject matter areas lends further knowledge to the programs. The subject matter areas are: general education, mathematics, business, auxiliary technical, and computer technology. For the reader's benefit, a brief description of the courses in each subject matter area is listed below:

1. General education: communication skills, English, personal and occupational guidance, physical education, and the humanities and social science.

2. Mathematics: data processing mathematics, college algebra, trigonometry, geometry, analysis, and applied calculus.

3. Business: accounting, statistics, business organization, and cost accounting.

4. Auxiliary technical: electro mechanical machines, and technical writing.

5. Computer technology: introduction to business data processing, programming, COBOL, FORTRAN, programming systems, data processing project, and systems design and development.

Percentage values relative to the state-wide course hours of

instruction in each category, by the semester, are presented in Table VIII. The analysis of this table illustrates the fact that general education and mathematics are presented early in all programs, and these two categories represent 13.1 and 12.2 percent respectively of the total hours. The auxiliary technical courses were presented early to allow students to become familiar with the field of data processing. These courses comprise 8.6 percent of the total program. Business courses have a high concentration in the first three semesters; 21.1, 23.6, and 37.0 percents respectively, and 22.9 percent of the total hours. The courses in computer technology advanced as indicated by 18.9, 33.8, 43.4, and 80.2 percents respectively for each semester.

Table VIII shows that approximately three-fourths (74.7 percent) of the hours of instruction were in the categories of business, auxiliary technical, and computer technology.

Analysis of Questionnaire Data

The questionnaire survey was conducted with the intent of describing knowledge areas that exist, present or future in business, and comparing them with existing programs and objectives. The questionnaire was used to obtain insight to the instructional program, the characteristics of business needs, and the status of the program.

The questionnaire was sent to one hundred fifty businesses in the State of Oklahoma which employ programmers and systems analysts. These names and addresses were obtained from the State Department of Vocational Education, Department of Technical Education. Names and addresses of those businesses to whom the questionnaire was sent may be found in Appendix A. Appendix B includes a copy of the question-

TABLE VIII

LISTING OF CREDIT HOUR RANGE AND PERCENT OF TOTAL HOURS FOR EACH SUBJECT MATTER AREA BY SEMESTER

	General Education	Mathematics	Business	Auxiliary Technical	Computer Technology
1st Semester					
Hour Range	3 - 4	2 - 3	3 - 4	3 - 4	3 - 4
Avg. Hours	3.36	2.64	3.45	3.82	3.09
Percent	20.6	16.1	21.1	23.3	18.9
2nd Semester					
Hour Range	2 - 3	3 - 4	4 - 5	1 - 2	6 - 7
Avg. Hours	2.64	3.55	4.18	1.36	6.18
Percent	14.9	20.0	23.6	7.7	33.8
3rd Semester					
Hour Range	1 - 2	1 - 2	6 - 7	0 - 1	7 - 8
Avg. Hours	1.64	1.45	6.36	.27	7.45
Percent	9.5	8.5	37.0	1.6	43.4
4th Semester					
Hour Range	1 - 2	0 - 1	1 - 2	0 - 1	12 - 13
Avg. Hours	1.09	.45	1.18	.27	12.18
Percent	7.2	3.0	7.8	1.8	80.2

naire, along with a transmittal letter stating the purposes of the study.

After a period of four weeks, a follow-up letter was sent to those installations not responding to the questionnaire in order to obtain a substantial return. Out of the one hundred fifty questionnaires mailed, one hundred nine were returned, for a 72.7 percent return.

For purposes of analysis, responses to the items in the questionnaire were tabulated and analyzed. Tables will be used in presenting the data. All data analyzed will be based on the information received from the one hundred nine installations. The questionnaire was developed in such a manner as to include three possible choices to each item: required, preferred, and not required. This study will treat all choices in a comparative manner, and establish critical knowledge areas from the installations sampled.

The summarization of the questionnaire shown in Table IX lists the number of responses and its percentage in each of the twenty-two knowledge areas. The stated knowledge areas had a total of 1500 responses in the required and preferred choices for a percentage of 62.5. Technical report writing received a one hundred percent response for required and preferred choices.

The survey dealt with business courses primarily in the areas of accounting, cost accounting, business statistics, economics, and history-government. Accounting, cost accounting, and business statistics compiled percentages of 90.8, 90.8, and 81.7 respectively. History-government and economics subject matter were rated lower with 50.5 and 34.9 percents respectively. The survey data indicates that

TABLE IX

OKLAHOMA BUSINESS AND INDUSTRY RATINGS IN TWENTY-TWO KNOWLEDGE AREAS OF DATA PROCESSING

Knowledge Area	Business and Industry Ratings					
	Required		Preferred		Not Required	
	Number	Percent	Number	Percent	Number	Percent
Economics	11	10.1	37	24.8	71	65.1
History-Government	22	20.2	33	30.3	54	50.5
Accounting	83	76.1	16	14.7	10	9.2
Cost Accounting	75	68.8	24	22.0	10	9.2
Business Statistics	51	46.8	38	34.9	20	18.3
Technical Report Writing	102	93.6	7	6.4	0	0.0
Data Processing Mathematics	76	69.7	28	25.7	5	4.6
College Algebra	21	19.3	24	22.0	64	58.7
Advanced Mathematics	6	5.5	19	17.4	84	77.1
Unit Record Equipment	23	21.1	49	45.0	37	33.9
2nd Generation Central Processing Units	21	19.3	16	14.7	72	66.0

TABLE IX (continued)

3rd Generation Central Processing Units	29	26.6	57	52.3	23	21.1
Basic Machine Language Programming	12	11.0	27	24.8	70	64.2
Assembler Language Programming	39	35.8	22	20.2	48	44.0
COBOL Programming	83	76.1	23	21.1	3	2.8
FORTRAN Programming	14	12.8	19	17.4	76	69.8
RPG Programming	35	32.1	41	37.6	33	30.3
Advanced Compiler Languages	6	5.5	24	22.0	79	72.5
Random Access Concepts	33	30.3	21	19.3	55	50.4
Magnetic Tape Concepts	64	58.7	27	24.8	18	16.5
Monitor Systems Concepts	57	52.3	22	20.2	30	27.5
Business Systems Design and Development	19	17.4	43	39.5	47	43.1

advanced mathematics was rarely required with only 5.5 percent responding to this item. Data processing mathematics and algebra appealed most to the business data processing installations. These two areas had 95.4 and 41.3 percents respectively from the choices of required and preferred. The survey showed 66.1 percent of the responses, required and preferred, in the area of unit record equipment. Approximately two-thirds (66 percent) responded that knowledge on second generation central processing units was not required. The majority indicated a strong trend to the third generation central processing units. A percentage of 78.9 installations were influenced by this latest development of equipment.

The programming languages had emphasis placed upon COBOL, RPG, and Assembly as the three most widely used in business situations. The language of COBOL had responses, required and preferred, of 97.2 percent. Only 2.8 percent of the installations indicated that COBOL was not required. Approximately two-thirds of the installations desired a need for both RPG and Assembly language programming. FORTRAN and basic machine language programming were the least required for systems operation within the installations surveyed. Advanced compiler languages, as indicated in Table IX, were required by only six of the installations.

A knowledge of business systems design and development was indicated as being required or preferred by 56.9 percent of the installations. The concepts of magnetic tape and disc were important areas to the business operation. Supervisory concepts, under the control of a monitor system, received almost three-fourths (72.5 percent) of the required and preferred choices in the businesses.

The knowledge areas representing 50 percent or more of the required and preferred responses are listed in Table X. The fifteen knowledges listed indicate critical areas in the selection of programmers and systems analysts.

TABLE X

OKLAHOMA'S CRITICAL KNOWLEDGE AREAS FOR PROGRAMMERS AND SYSTEMS ANALYSTS

3rd Generation Central Processing Units
Accounting
Assembler Language Programming
Business Statistics
Business Systems Design and Development
COBOL Programming
Cost Accounting
Data Processing Mathematics
History-Government
Magnetic Tape Concepts
Monitor Systems Concepts
Random Access Concepts
RPG Programming
Technical Report Writing
Unit Record Equipment

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

In Chapter I the statement of the problem, scope of this study, procedures, and expected outcomes were presented.

Chapter II presented a brief early history of the development of data processing equipment. In section two a brief historical development of this equipment in higher education was discussed. The third section presented a review of several research reports which were related to this to this study.

The development of five junior colleges, two technical institutions, and four area schools was presented in Chapter III. This chapter gave a brief background of data processing at each school.

In Chapter IV an analysis of the data processing programs in each school catalogue and of the business questionnaire findings was presented. Section one dealt with the school curricula. Section two analyzed the possible needs of business.

Summary

The specific problem of this study was concerned with the business data processing instructional programs in selected Oklahoma post-high school institutions fulfilling the knowledge area requirements of Oklahoma business and industry.

The research questions of this study were:

1. Do the post-high school business data processing programs in Oklahoma include knowledge areas deemed appropriate by the Oklahoma business and industrial concerns?

2. Are the post-high school business data processing programs in Oklahoma designed in accordance with the curriculum suggested by the State Department of Vocational and Technical Education?

The eleven schools were presented by department titles and only one had a department title other than "data processing technology". This one school was in the business education department. Three schools were included in the business division and one in the business education division. Only these four schools were in a division. Tables listed all courses offered in each of the four semesters for each school. The suggested curricula of the Oklahoma State Department of Vocational Education and of the United States Office of Education were presented to be compared with the existing programs. Approximately three-fourths of the hours of instruction were in the categories of business, auxiliary technical, and computer technology.

The questionnaire survey was conducted with the intent of describing knowledge areas that existed in Oklahoma business and industrial installations. The number of responses in each of the twenty-two knowledge areas surveyed were listed. Oklahoma's critical knowledge areas for programmers and systems analysts included third generation central processing units, accounting, assembly language, business statistics, business systems design and development, COBOL programming, cost accounting, and data processing mathematics. Also included were history and government, magnetic tape concepts, random access concepts, RPG programming, technical report writing, and unit record equipment.

Conclusions

The department titles indicate that the school administrators and the instructional staff are involved with the new field of data processing. The curriculum suggested by the Oklahoma State Department of Vocational Education is receiving major emphasis in the business data processing programs. The programs also parallel the guide from the United States Office of Education developed by Maurice W. Roney. The categorical relationship is important when compared to the objectives of the State Department of Vocational Education. These objectives are to train business programmers, systems analysts, and for other data processing positions which do not generally require a baccalaureate degree.

Analysis of the twenty-two knowledge areas surveyed in Oklahoma business installations revealed fifteen knowledge areas which should be in an instructional program for business data processing. These fifteen knowledge areas are incorporated into the course of study in the school programs. These knowledge areas suggest that business organizations would like to have programmers and systems analysts well equipped with a background in business and computer technology.

Business and industry in Oklahoma expect to employ competent technicians who will require a minimum amount of on-the-job training. Oklahoma does have programs in business data processing to meet the educational requirements of Oklahoma business and industry.

The findings of this study indicate that existing curricula in the Oklahoma post-high school business data processing programs did include knowledge areas which Oklahoma business and industry deemed appropriate. Oklahoma post-high school business data programs, at

this time, do not need major changes. It is also concluded that the programs are designed in accordance with the curriculum suggested by the State Department of Vocational Education.

Recommendations

A reader of this study should gain an awareness of the business data processing programs in Oklahoma, the beginning, its development, and what may be expected for the near future. The author noted additional areas which should be investigated further. They are:

1. A continued analysis should be carried on for the programs in business data processing in the State of Oklahoma.
2. The placement of business data processing graduates in business and industry needs to be studied.
3. The procedures for the selection of qualified students should be reviewed.
4. A criteria for evaluating student proficiency and progress measurement should be established for the various curricula.

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APPENDIX A

NAMES AND LOCATIONS OF OKLAHOMA DATA PROCESSING INSTALLATIONS

NAMES AND LOCATIONS OF OKLAHOMA DATA PROCESSING INSTALLATIONS

Installation Name	Location
Allis Chalmers Mfg. Company	Oklahoma City
Amerada Petroleum Company	Tulsa
American Airlines	Tulsa
American General Life Insurance Company	Tulsa
American Iron and Machine Workers Company	Oklahoma City
American Fidelity Assurance	Oklahoma City
American Metal Climax	Blackwell
Anderson Wholesale	Muskogee
Apco Oil Corporation	Oklahoma City
Atlas Life Insurance Company	Tulsa
AVCO Corporation	Tulsa
Bartlett-Collings Company, Inc.	Sapulpa
Benhum and Blair Construction Company	Oklahoma City
Black Sivalls and Bryson	Oklahoma City
Blackwell Zinc Company	Blackwell
Blue Cross-Blue Shield	Tulsa
Braden Aermotor Corporation	Broken Arrow
Brown-Dunkin Company	Tulsa
Brunswick Zebco Plant	Tulsa
Bunte Candies, Inc.	Oklahoma City
Canadian Valley Electric	Seminole
CCI Corporation, Crane, Carrier	Tulsa
Century Geophysical Corporation	Tulsa
Central Merchandise Company	Oklahoma City
Central National Bank and Trust Company	Enid
Champlin Petroleum Company	Enid
Cities Service Company	Ponca City
Cities Service Oil Company	Bartlesville
Citizens National Bank	Muskogee
City National Bank	Oklahoma City
City of Midwest City	Midwest City
City of Oklahoma City	Oklahoma City
City of Oklahoma City, Personnel Department	Oklahoma City
City of Stillwater	Stillwater
City of Tulsa	Tulsa
Commercial National Bank	Muskogee
Computer Consulting Corporation	Norman
Computer Service Center	Tulsa
Continental Oil Company	Ponca City
Data Control Company	Tulsa
Data Processing Association	Tulsa
Department of Interior-Mines	Tulsa
Douglas Aircraft Company, Inc.	Tulsa
Dowell Chemical Company	Tulsa
Federal Aviation Adminstration	Oklahoma City
Farmers and Merchants State Bank	Tulsa
Felix Sylvanus	Oklahoma City
Fidelity National Bank and Trust Company	Oklahoma City
First National Bank and Trust Company	Oklahoma City
Fleming Company	Oklahoma City

Installation Name	Location
Fred Cooper, Inc.	Tulsa
Froug Company	Tulsa
General Electric Company	Oklahoma City
Globe Life and Accident Insurance	Oklahoma City
Groendyke Transportation	Enid
Gulf Oil Company	Oklahoma City
Halliburton Company	Duncan
Happy Company	Tulsa
Hayes International	Midwest City
Helmerich and Payne Inc.	Tulsa
Hillcrest Medical Center	Tulsa
Home Federal Savings and Loan Association	Tulsa
Humble Oil and Refining Company	Tulsa
Industrial Fabricating	Tulsa
Inter State Library	Oklahoma City
Jarboe Sales Company	Tulsa
John Roberts, Inc.	Norman
Kerr McGee Oil Industries	Oklahoma City
Kingwood Oil Company	Oklahoma City
Liberty National Bank and Trust	Oklahoma City
Loffland Brothers Company	Tulsa
Macklanburg Duncan Company	Tulsa
Metro Data Center	Tulsa
Mid American Pipeline Company	Tulsa
Mid Continental Life Insurance	Oklahoma City
Midwester Instrument, Inc.	Tulsa
Midwestern Life Insurance	Enid
National Bank of Tulsa	Tulsa
National Tank Company	Tulsa
National Trailer Company	Tulsa
Nelson Electric	Tulsa
North American Aviation	McAlester
North American Rockwell Corporation	Tulsa
North American Rockwell Corporation	Bethany
Northeastern State College	Talequah
Oklahoma Army National Guard	Oklahoma City
Oklahoma City Board of Education	Oklahoma City
Oklahoma Department of Highways	Oklahoma City
Oklahoma Drug Sales	Lawton
Oklahoma Farm Bureau Mutual	Oklahoma City
Oklahoma Gas and Electric Company	Oklahoma City
Oklahoma Mortgage Company	Oklahoma City
Oklahoma Natural Gas Company	Tulsa
Oklahoma Public Welfare Department	Oklahoma City
Oklahoma Publishing Company	Oklahoma City
Oral Roberts Evangelist University	Tulsa
PAM Data Center	Enid
Pan American Petroleum Corporation	Tulsa
Peoples State Bank	Tulsa
Petroleum Publishing Company	Tulsa
Phillips Petroleum Company	Bartlesville
Pioneer Telephone Company	Kingfisher

Installation Name	Location
Pittsburg Plate Glass Company	Henryetta
Ponca City Savings	Ponca City
Pontiac Division GMC	Oklahoma City
Public Service Company	Tulsa
Pure Milk Produce	Tulsa
Republic Supply Company	Oklahoma City
Reserve National Insurance	Oklahoma City
Robberson Steel Company	Oklahoma City
Scrivner-Stevens Company	Oklahoma City
Seampruff, Inc.	McAlester
Security Bank	Ponca City
Seismograph Service Corporation	Tulsa
Service Air Inc.	Enid
Service Bureau Corporation	Oklahoma City
Service Pipe Line	Tulsa
Sinclair Oil and Gas Company	Tulsa
Shawnee Industries	Shawnee
Shell Oil Company	Tulsa
Skelly Oil Company	Tulsa
Sohio Petroleum Company	Oklahoma City
Southwest Distributor Company	Lawton
Southwest Insurance Company	Oklahoma City
Southwestern Bell Telephone Company	Tulsa
Southwestern Computing Service	Tulsa
Sperry Rand Corporation	Tulsa
St. Anthony Hospital	Oklahoma City
Standard Life and Accident Insurance	Oklahoma City
Statistical Computing Center	Oklahoma City
Sunray DX Oil Company	Tulsa
Sylvania Electric Products, Inc.	Shawnee
Terminal Distributing Company	Tulsa
Texaco Inc.	Tulsa
T. G. & Y.	Oklahoma City
Tidewater Oil Company	Oklahoma City
Tinker Air Force Base	Midwest City
Tri-State Insurance Company	Tulsa
Tulsa Rig Reel Manufacturing Company	Tulsa
Tuloma Gas Products	Tulsa
Union Equity COOP Exchange	Enid
Union National Bank	Bartlesville
Unit Parts Company	Oklahoma City
United Founders	Oklahoma City
U. S. Gypsum Company	Southard
West and Mikesell	Clinton
Westinghouse Air Brake Company	Enid
Western Electric Company	Oklahoma City
Veterans Administration	Muskogee
Video Independent Theater	Oklahoma City

APPENDIX B

LETTER AND QUESTIONNAIRE

USED IN THE STUDY

December 10, 1968

(Name of Business this form
letter was mailed to)

Dear Sir:

Technical education business data processing programs have been developed in the State of Oklahoma for the training of programmers and systems analysts. To adequately analyze these programs, the participation of professional personnel directing the operation of all types of data processing installations is essential. It is desirable to know the status of data processing in Oklahoma so an evaluation can be made of the state instructional programs.

Request for your participation consists of the enclosed questionnaire, on your needs, and any additional comments or pertinent information that will assist in making this survey more effective.

This information given by you is strictly confidential and will be handled as research data, available only for analysis. No information on any specific company will be revealed in the analysis or final report. Please return the questionnaire to Robert A. Cruce, O. T. Autry Area Vocational-Technical Center, 1201 West Willow, Enid, Oklahoma, in the enclosed self-addressed envelope, for which no postage is needed. The form will remain there until destroyed.

Your cooperation in completing the questionnaire and returning it to me will be greatly appreciated. May I take this opportunity to thank you for your time used in fulfilling my request.

Sincerely,

Robert A. Cruce
Data Processing Instructor

Please check the following indicating your requirements for adequately trained programmers and systems analysts.

Required (+) Preferred (-) Not Required (blank)

Knowledge Area	Status (+, -, blank)
1. Economics	1.
2. History-Government	2.
3. Accounting	3.
4. Cost Accounting	4.
5. Business Statistics	5.
6. Technical Report Writing	6.
7. Data Processing Mathematics	7.
8. College Algebra	8.
9. Advanced Mathematics	9.
10. Unit Record Equipment	10.
11. 2nd Generation Central Processing Units	11.
12. 3rd Generation Central Processing Units	12.
13. Basic Machine Language Programming	13.
14. Assembler Language Programming	14.
15. COBOL Programming	15.
16. FORTRAN Programming	16.
17. R P G Programming	17.
18. Advanced Compiler Languages	18.
19. Random Access Concepts	19.
20. Magnetic Tape Concepts	20.
21. Monitor Systems Concepts	21.
22. Business Systems Design and Development	22.

APPENDIX C

BUSINESS DATA PROCESSING CURRICULUMS OF POST-HIGH INSTITUTES IN OKLAHOMA

DATA PROCESSING

U. S. OFFICE OF EDUCATION

Washington, D. C.

SUGGESTED CURRICULUM

First Semester

M 103 Data Processing Mathematics I
C 102 Introduction to Business Data Processing
C 105 Electric Accounting Machines
A 104 Accounting I
G 113 Communications Skills I

Second Semester

M 124 Data Processing Mathematics II
C 122 Data Processing Applications
C 124 Computer Programming I
A 144 Accounting II
G 123 Communications Skills II

Third Semester

C 215 Computer Programming II
C 213 Programming Systems
A 243 Statistics
A 253 Business Organization
A 263 Cost Accounting

Fourth Semester

C 264 Business Systems Design and Development
C 266 Advanced Programming Systems
C 262 Data Processing Field Project
G 263 Social Science

DATA PROCESSING

OKLAHOMA STATE BOARD FOR VOCATIONAL-TECHNICAL EDUCATION

Stillwater, Oklahoma

SUGGESTED CURRICULUM

First Semester

Accounting I
Data Processing Mathematics I
Communication Skills I
Electric Accounting Machines
Introduction to Business Data Processing

Second Semester

Accounting II
Data Processing Mathematics II
Technical Writing
Computer Programming I
Data Processing Applications

Third Semester

Cost Accounting
Statistics
Computer Programming II
Business Organization
FORTRAN Programming

Fourth Semester

Systems Design and Development
Programming Systems
COBOL Programming
Data Processing Field Project

DATA PROCESSING

ALTUS JUNIOR COLLEGE

Altus, Oklahoma

CURRICULUM

First Semester

C 117 Programming I
C 102 Introduction to Business Data Processing
A 104 Accounting I
A 105 Electric Accounting Machines
English

Second Semester

C 119 Programming II
A 144 Accounting II
A 106 Electric Accounting Machines II
M 163 Fundamentals of Mathematics

Third Semester

C 215 Programming III
A 263 Cost Accounting
M 5 College Algebra
M 243 Statistics
A 253 Introduction to Business

Fourth Semester

C 264 Systems Design and Development
C 225 Programming IV
C 262 Data Processing Field Project
C 266 Advanced Programming

DATA PROCESSING

CAMERON STATE COLLEGE

Lawton, Oklahoma

CURRICULUM

First Semester

113 English
112 DP, Introduction to Data Processing
213 Accounting I
143 Mathematics, Algebra
123 DP, Unit Record Equipment
112 Military Science, Boys
111 Physical Education, Girls

Second Semester

123 English
223 Accounting II
164 Math, Data Processing
244 DP, Programming I
223 History
122 Military Science, Boys
121 Physical Education, Girls

Third Semester

233 Cost Accounting
263 Business Statistics
254 DP, Programming II, COBOL
215 Math, Applied Calculus
212 Military Science, Boys
211 Physical Education, Girls

Fourth Semester

213 Government
264 DP, Programming III, FORTRAN
282 DP, Advanced Programming Problems
282 DP, Systems Development and Design
222 Military Science, Boys
221 Physical Education, Girls

DATA PROCESSING

EASTERN OKLAHOMA STATE COLLEGE

Wilburton, Oklahoma

CURRICULUM

First Semester

133 College Algebra
103 Introduction to Data Processing
115 Accounting Machines
103 Communication Skills
213 Elements of Accounting
111 Orientation and Library Science

Second Semester

163 Fundamentals of Math
112 Data Processing Applications
115 Computer Programming
223 Accounting II
203 Communication Skills
123 American History

Third Semester

205 Computer Programming
213 Programming Systems
214 Elementary Math Statistics
223 Cost Accounting
142 Physical Education

Fourth Semester

214 Business Systems
216 Advanced Programming Systems
222 Data Processing Project
223 American National Government
152 Physical Education

DATA PROCESSING

NORTHERN OKLAHOMA COLLEGE

Tonkawa, Oklahoma

CURRICULUM

First Semester

155 Data Processing
145 Elementary and College Algebra
102 Speech
101 English
101 Physical Education

Second Semester

153 Data Processing
163 Data Processing
102 English
151 Modern Business
183 Trigonometry
203 Office Training
102 Physical Education

Third Semester

254 Data Processing
101 Government
201 History
201 Economics
201 Accounting
103 Physical Education

Fourth Semester

256 Data Processing
264 Data Processing
202 Economics
202 Accounting
104 Physical Education

DATA PROCESSING

NORTHEASTERN OKLAHOMA A & M COLLEGE

Miami, Oklahoma

CURRICULUM

First Semester

103 Mathematics
102 Basic Computing Machines
105 Electro-Mechanical Machines
113 Accounting
113 English
111 Physical Education

Second Semester

124 Mathematics
122 Data Processing Applications
123 Introduction to Programming Systems
123 Accounting
123 English
121 Physical Education

Third Semester

234 Computer Programming I
274 Advanced Programming Systems
113 Government
213 History
113 Introduction to Business

Fourth Semester

266 Computer Programming II
264 Systems Development and Design
262 Data Processing Field Project
243 Data Processing Statistics

DATA PROCESSING

OSU TECHNICAL INSTITUTE

Oklahoma City, Oklahoma

CURRICULUM

First Semester

1113 Freshman Composition
1715 Algebra and Trigonometry
1214 Data Processing Accounting I
1314 Computer Programming I
1031 Personal and Occupational Guidance

Second Semester

1813 Analytical Geometry
2812 Statistics
1424 Data Processing Accounting II
1524 Computer Programming II
2013 American Government

Third Semester

2015 Beginning Analysis I
2313 Boolean and Matrix Algebra
2114 Programming Systems
2213 Computer Programming III
2493 American History

Fourth Semester

2115 Beginning Analysis II
1233 Technical Report Writing
2323 Scientific Programming
2424 Systems Development and Design
(2) Electives

DATA PROCESSING

OKLAHOMA STATE TECH

Okmulgee, Oklahoma

CURRICULUM

First Trimester

Principles of Accounting I
Data Processing Mathematics I
Communications Skills I
Electric Accounting Machines
Introduction to Business Data Processing

Second Trimester

Principles of Accounting II
Data Processing Mathematics II
Technical Report Writing
Computer Programming I
Data Processing Applications

Third Trimester

Cost Accounting
Statistics
Computer Programming II
Business Organization
FORTRAN Programming

Fourth Trimester

Systems Design and Development
Programming Systems
COBOL Programming
Data Processing Field Project

DATA PROCESSING

BARTLESVILLE AREA VOCATIONAL-TECHNICAL CENTER

Bartlesville, Oklahoma

CURRICULUM

First Semester

Principles of Accounting I
Data Processing Mathematics I
Communications Skills I
Electric Accounting Machines
Introduction to Business Data Processing

Second Semester

Principles of Accounting II
Data Processing Mathematics II
Technical Report Writing
Computer Programming I
Data Processing Applications

Third Semester

Cost Accounting
Statistics
Computer Programming II
Business Organization
FORTRAN Programming

Fourth Semester

Systems Design and Development
Programming Systems
COBOL Programming
Data Processing Field Project

DATA PROCESSING

DUNCAN AREA VOCATIONAL-TECHNICAL CENTER

Duncan, Oklahoma

CURRICULUM

First Semester

Principles of Accounting I
Data Processing Mathematics I
Communications Skills I
Electric Accounting Machines
Introduction to Business Data Processing

Second Semester

Principles of Accounting II
Data Processing Mathematics II
Technical Report Writing
Computer Programming I
Data Processing Applications

Third Semester

Cost Accounting
Statistics
Computer Programming II
Business Organization
FORTRAN Programming

Fourth Semester

Systems Design and Development
Programming Systems
COBOL Programming
Data Processing Field Project

DATA PROCESSING

O. T. AUTRY AREA VOCATIONAL-TECHNICAL CENTER

Enid, Oklahoma

CURRICULUM

First Semester

Accounting I
Data Processing Mathematics I
Computer Programming I
Basic Business Computer Concepts
Electro-Mechanical Machines

Second Semester

Accounting II
Data Processing Mathematics II
Introduction to Business
Computer Programming II
Data Processing Applications

Third Semester

Cost Accounting
Technical Report Writing
Programming Systems Analysis
Computer Programming III
Advanced Computer Programming I

Fourth Semester

Data Processing Statistics
Advanced Computer Programming II
Business Systems Design and Development
Electronic Data Processing Equipment
Data Processing Field Project

DATA PROCESSING

TULSA AREA VOCATIONAL-TECHNICAL CENTER

Tulsa, Oklahoma

CURRICULUM

First Semester

Data Processing Math I
Introduction to Business Data Processing
Electric Accounting Machines
Accounting I

Second Semester

Data Processing Math II
Accounting II
Computer Programming I
Data Processing Applications

Third Semester

FORTRAN Programming
Cost Accounting
Statistics
Computer Programming II

Fourth Semester

Business Systems Design and Development
Programming Systems
COBOL Programming
Data Processing Field Project

VITA

Robert Allen Cruce

Candidate for the Degree of

Master of Science

Thesis: AN ANALYSIS OF POST-HIGH SCHOOL BUSINESS DATA PROCESSING CURRICULA IN OKLAHOMA

Major Field: Technical Education

Biographical:

Personal Data: Born in Okemah, Oklahoma, April 14, 1939, the son of Mr. and Mrs. R. D. Cruce.

Education: Graduated from Okemah High School, Okemah, Oklahoma, in May, 1957; attended Northeastern Oklahoma A & M College in 1957; received the Bachelor of Science in Education Degree from East Central State College in May, 1962, with majors in Mathematics and Science; completed requirements for the Master of Science Degree at Oklahoma State University in May, 1970, with a major in Technical Education.

Professional Experience: Mathematics Teacher, Enid Public School System, Enid, Oklahoma, 1962-67; Data Processing Instructor, O. T. Autry Area Vocational-Technical Center, Enid, Oklahoma, 1967-70.

Professional Organizations: Phi Delta Kappa, Oklahoma Technical Society, National Education Association, Oklahoma Education Association, Enid Education Association, Oklahoma National Guard Association, Red Red Rose.