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A CASE STUDY OF TEACHER PREPARATION IN
BUSINESS DATA PROCESSING
IN OKLAHOMA

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A CASE STUDY OF TEACHER PREPARATION IN
BUSINESS DATA PROCESSING
IN OKLAHOMA

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CHAPTER I

THE PROBLEM

Introduction

In preparing young people for positions in business, educators today are facing the most challenging task since the Industrial Revolution. Perhaps no other technological innovation has had as great an impact on society as has the invention of the computer. In 1954 a computer was used for the first time to process business information. The impact of this development has been a great change in the education of people for work in business occupations. With the many technological innovations in the modern-day business world, the need for training young people for automation must be recognized. Business education has been slow to recognize this need, and schools have been slow in incorporating data processing into their curricula. With the growing number of data processing installations

in business offices, the education of people who work in the automated office has become a growing concern of business educators.

One of the most crucial elements in the development of any curriculum is that of a well-qualified faculty.¹ Industry has been one of the major sources of data processing faculty. The part-time instructor from industry, however, has not always been entirely satisfactory. State colleges and public schools cannot compete with industry in getting full-time instructors in the schools. There is a scarcity of qualified data processing teachers in the public schools and institutions of higher learning. Although much is being done by businessmen and educators to cope with this shortage, there still remains the tremendous task of revising school curricula to meet the changing needs of business.

The outlook for business education is best described in a recent article by Cook and Lanham.

According to the United States Census Bureau forecasts, the population of this country will be over 235 million people in the early 70's. Nearly half of the population, about 114 million will be under 25 years of age. This means 50 percent of the population will be potential seekers of education Technical skill will be a necessity if the

¹Lawrence A. Allen, "An Analysis of Data Processing and Computer Science Curricula from Selected Institutions of Higher Education With Implications for the Private College of Business," The Husson Review, II, No. 1 (Fall-Winter, 1968), 18.

worker is to be employed. Office workers will have to know how to operate new electronic devices Employment pressures will be most severe for those young people who have no training for the new economy of electronics and automation, for they will be placed in dead-end jobs requiring few if any skills We must train teachers in the new technology of business so that this technology can become a part of the senior high school curriculum We must look to the college-bound students as a source for future college faculty.¹

The current problem of a shortage of trained workers and teachers in the field of data processing was substantiated in the 1968 study by Bangs at the University of Colorado. His findings indicate that institutions are not preparing enough persons in data processing occupations to meet the demands of business and that teacher-training institutions must prepare more teachers for the field of business data processing.²

Wall's analysis is indicative of the thoughts of many business educators today.

The four-year institutions in which business education teachers are prepared have not developed programs to train vocational data processing teachers at either the undergraduate or graduate level. A

¹Fred S. Cook and Frank W. Lanham, "Business Education's Problem in the 1970's," Business Education World, XLIX, No. 4 (December, 1968), 3.

²F. Kendrick Bangs and Mildred C. Hillestad, Curricular Implications of Automated Data Processing for Educational Institutions, A research report performed pursuant to contract number OE-6-85-030 with the Office of Education, United States Department of Health, Education, and Welfare, September, 1968 (Boulder, Colorado: University of Colorado, 1968), p. 10.

considerable increase in course offerings in business data processing has taken place during the past three years in these institutions. Most of the courses, however, are of a descriptive and introductory type, in which a hands-off-equipment approach is taken. One third of the institutions studied do not offer a course in BDP. While 71% of the senior institutions studied have computers, only one-half follow an open-door policy which permits students a 'on-hands' experience with the equipment.¹

Problems associated with data processing programs are (1) lack of qualified staff; (2) financing equipment; and (3) determining curriculum. Wall recommended that consideration by the federal government be given to assisting senior institutions in regard to teacher education programs in an attempt to solve some of these problems.

A survey conducted at the University of Colorado concluded that the greatest deterrent to incorporating computer courses into the present curriculum was the lack of qualified faculty. The majority of schools surveyed had no computer curriculum, yet 97 per cent of the respondents stated that education concerning the computer should be in the curriculum.² One solution to this problem has been to educate the present faculty in computer technology. A combination of approaches seems to be the most effective way to educate

¹Lewis E. Wall, "A Study of the Effectiveness of Data Processing Summer Institutes for Business Teachers," Summary of project funded by Office of Education, United States Department of Health, Education, and Welfare, Colorado State University, 1967, p. 5. (Mimeographed.)

²J. Daniel Couger, "Educating Faculty About Computers," The Journal of Business Education, XLIV, No. 6 (March, 1969), 249.

the faculty. Some approaches used are: (1) special faculty seminars, (2) computer manufacturer's courses, (3) courses sponsored by professional organizations, and (4) self-education.

Statement of the Problem

The problem of this study was to delineate the circumstances in which the recruitment, the selection, and the preparation of data processing teachers are accomplished. More specifically, the intent of this study was to reveal aspects of data processing curricula so that certain hypotheses could be formulated relative to the future of teacher preparation.

An aspect of this study was determination of how the current teachers of data processing in formal school programs, both public and private, obtained their preparation in the area of data processing. After the information was gathered and analyzed, hypotheses were formulated about the prospects of recruitment, selection, and preparation of business teachers for data processing.

Kerlinger points out that many investigations must often be undertaken before the desirable aim of hypothesis testing through research can be achieved.¹ Hypotheses were developed in this study that may be tested in further research in this area.

¹Fred N. Kerlinger, Foundations of Behavioral Research, (New York: Holt, Rinehart and Winston, Inc., 1964), p. 388.

Limitations

This case-study approach was limited to teachers in Oklahoma who were teaching courses in unit record data processing and computer programming for business students during the 1969-1970 academic school year. Data processing teachers in both public and private school programs were interviewed. Information obtained by the use of a questionnaire was limited to ten colleges in other states, selected arbitrarily by the researcher, which offered programs in data processing for business teachers. This study does not include the computer-science programs that are mathematics oriented.

Source of Data

Current literature pertaining to teacher preparation in data processing was reviewed, and the information gathered from the literature was included in this study. To develop a broader base for the study, information was gathered on data processing programs in ten colleges in other states with the use of a questionnaire.

The source of data for the development of information in this study was primarily the personal interview with the business teacher. An in-depth interview was used to obtain information concerning (1) the extent of the

teacher's preparation in data processing and (2) the curriculum now offered in Oklahoma.

Procedure

The first step in this study was to develop a background from available literature about teacher preparation for data processing. Secondly, an investigation was then conducted concerning the nature and the adequacy of existing data processing programs in other states. Thirdly, a questionnaire was developed and mailed to ten colleges selected by the researcher.

Additional study was then made of the interview technique in research so that the researcher could become knowledgeable in the technique and could construct an appropriate interview guide. An interview guide was then developed for gathering information from each teacher in Oklahoma.

The next step involved the actual gathering of information from the in-depth interviews with the data processing teachers. An attempt was made to contact one teacher in each school offering business data processing. Each interview was written up as a case report, and these reports were analyzed and summarized.

Hypotheses were developed by the researcher from the information gathered during the interviews and from the data collected by the use of the questionnaires.

The final step of the study was the preparation of the research report.

Definition of Terms

Gregory and Van Horn's definitions of terms were used in this report inasmuch as they were written for people without special training in data processing occupations.¹

Applications Study. Design of a system and related procedures plus development of equipment specifications to perform a certain data processing job.

Business Application. A closely related set of activities that are treated as a unit--for example, each of the following: customer accounting, inventory control, or order entry and sales may be treated as a unit for conversion to automatic data processing and operation.

Business Data Processing. Processing of data for actual transactions--purchases, sales, collections--involving file processing, calculations, and reporting; also included processing planned transactions for budgeting and operating control purposes. Characterized by large volumes of input and output with limited amounts of computation during processing.

Card Punch. A device for punching data in cards. Examples are simple hand punches, keyboard print-punches, paper-tape-to-card converter punches, and high speed punches for magnetic-tape-to-card conversion, or for direct output from the processor.

COBOL. Common Business Oriented Language; an English-like programming language designed primarily for business-type applications and implemented for use with many different data processors.

¹Robert H. Gregory and Richard L. Van Horn, Automatic Data-Processing Systems, Principles and Procedures, (2nd ed.; Belmont, California: Wadsworth Publishing Co., 1968), pp. 746-777.

Computer. Any device capable of accepting data, applying prescribed processes to them, and supplying the results of these processes. The word "computer" usually refers to an internally-stored-program data processor; the term "processor" is preferable for business applications.

Digital Computer. A computer capable of accepting and operating on only the representations of numerals or letters coded numerically. More broadly, a digital computer handles numerals, letters, or symbols represented as discrete items of data, as opposed to measurements.

Control Unit. The portion of the hardware of an automatic digital processor that directs the sequence of operations, interprets coded instructions, and initiates proper commands to the circuits to execute instructions.

Data. Figures, words, or charts that refer to or describe some situation.

Data Processing. Rearrangement and refinement of data into a form suitable for further use; often involves file processing to update files for transactions that occur.

Debug. To test a program by running it with test, simulated, or live data on a processor to find whether it works properly, and, if mistakes are revealed either in the final answer or at various stages of processing, to discover the source and make corrections.

Disk. A circular metal plate with magnetic material on both sides, continuously rotated for reading or writing by means of one or more read-write heads mounted on movable or fixed arms; disks may be permanently mounted on a shaft or, as a package, they may be removable and others placed on the shaft.

Electronic Data-Processing System. A machine system capable of receiving, storing, operating on, and recording data without the intermediate use of tabulating cards. The system is also able to store internally at least some instructions for data-processing operations, and to locate and control access to data stored internally.

Flow Chart. A systems-analysis tool consisting of a graphical representation of a procedure.

FORTTRAN. Formula Translating system; consists of a language and translator designed for programming problems expressed in a mathematical-type language.

Hardware. The electric, electronic, and mechanical equipment used for processing data; consists of cabinets, racks, tubes, transistors, wires, and motors.

Input. The process of introducing data into the internal storage of the processor.

Keypunch. (noun) A typewriter-like machine for recording data on punched cards by punching a code into them, and, often printing the same data on the cards.

Output. Process of transferring data from internal storage of a processor to some other storage device. A specific output area may be used for organizing data prior to the output operation.

Program. (noun) A plan for the automatic solution of a problem. A complete program includes plans for the transcription of data, coding for the processor, and plans for the absorption of the results into the system. The list of coded instructions is called a "routine."

Programming. The process of creating a program; includes applications analysis, design of a solution, coding for testing to produce an operating program, and development of other procedures to make the system function.

Software Package. The programming aids supplied by the manufacturer to facilitate the user's efficient operation of the equipment. Includes assemblers, compilers, generators, subroutine libraries, operating systems, and industry application programs.

Sorting. The arranging of records so that they are in ascending or descending sequence for some data element used as a key.

Storage. A device capable of receiving data, retaining them for an indefinite period of time, and supplying them upon command.

System. Any regular or special method or plan of procedure. In a broader context, a system consists of an organization, people, hardware, and procedures that operate together to perform a set of tasks.

System Analysis. An orderly study of the detailed procedure for collecting, organizing, and evaluating information about an organization with the objective of improving control over its operations.

Systems Design. Formulation and description of the nature and content of inputs, files, and outputs in order to show how they are connected by processing procedures and for the purpose of developing a new or improved system.

Tape Unit. A device for reading data from magnetic tape and writing new data (after erasing prior data) on tape. Some tape units read in either direction, although they write in only the forward direction. The device also rewinds tape ready for removal and replacement by another reel.

CHAPTER II

BACKGROUND LITERATURE

The background literature for this study includes the computer history, the computer trends, and the curricula. The section on curricula includes information pertaining to skills and knowledges needed for occupational competence in the area of business data processing.

Computer History

The history of data processing represents man's efforts to find a faster and more efficient way to process data. Many methods were devised to help man calculate from the abacus to the key driven calculating machines. Through the efforts of Jacquard in 1801, a punched card machine was designed. Although built to weave intricate designs into cloth, this machine was the forerunner of Hollerith's machine designed to process the 1890 census. The digital computer originated with Charles P. Babbage. His better known contribution was the difference engine. While working on the difference engine for quite some time for the British government, Babbage became interested in building

an analytical engine that would be capable of performing more calculations. Babbage died without completing the project; his son did complete his work later. About 100 years after the work of Babbage, the first generation of computers appeared. In 1945 the first all-electronic computer was developed and named the ENIAC (electronic numerical integrator and calculator). In 1951 the UNIVAC (universal automatic computer) was delivered to the Bureau of Census and was used for the next twelve years. Since the early 1940's, during the time of the first-generation computers, hundreds of large and small computers have been made available for business and scientific purposes. Now third-generation computers are capable of commercially operating several projects simultaneously.¹

With the development of the computer, office procedures have been changed. Better methods were made possible by mechanization. Because of this mechanization, curriculum changes were necessary to prepare business workers and business teachers for the new developments in the business world.

Computer Trends

Computers are now invading every phase of American life. Bruce Gilchrist, Executive Director of the American

¹Elias M. Awad, Business Data Processing (2nd ed.; Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1968), p. 45.

Federation of Information Processing Societies, says that he expects the computer to be almost a universal tool for educated professionals who handle either numbers or data. He thinks that providing 75 per cent of college students with some computer knowledge by 1975 is not an unreasonable goal.¹ Industry forecasts a shortage of about 250,000 qualified computer programmers and operators by the early 1970's. RCA's vice president, James R. Bradburn, believes that the computer education gap is one of the large threats to overall growth of industry.²

Computers have become a part of many phases of industry. They control manufacturing processes, guide missiles, and even keep inventory control and payrolls for large companies. Computers are used in medicine, business, social sciences, and education, as well as their earlier mathematical applications. The quality of education can now be increased through the use of computers. The faculty member must now be able to use the computer in his teaching regardless of his area of specialization. Many colleges are well equipped with computer hardware and software; yet many will not be able to provide the equipment necessary for the student in

¹"How Computers Are Changing Your Life," U. S. News and World Report, November 10, 1969, pp. 96-98.

²Ibid., p. 98.

this computer age. Many students who are educated in the 1970's may be poorly equipped for the world of the 1980's and 1990's.

Computers are becoming more widespread in use by both students and faculty in the colleges of today. Although not yet so important as English and history in our curriculum, computing is becoming more and more important in undergraduate programs. Many college graduates go out into the business world where they will need to use computers. In 1965 about \$2.4 billion were spent for new computers, and the salaries of the people who operated these computers more than equaled that amount. These figures become even more impressive when the rapid growth of the computer industry is considered. The freshman who enrolled in 1966 will be working in 1970 in a world using more than twice the computing capacity available in 1967.¹

Understanding and skill in the use of the computer are extremely necessary in the analysis of data in business today. Students who have not learned to use the computer will be handicapped when they begin to do their graduate work at colleges and universities. Undergraduate education in computing seems to be deficient at the

¹Science Advisory Committee, Computers in Higher Education, Report of the President's Science Advisory Committee (Washington, D. C.: Government Printing Office, 1967), p. 9.

present time. Recommendations have been made that the business student should take an introductory programming course at an early stage in his education so that he can make use of the computer during the rest of his undergraduate years.¹

The computer seems to have opened a new field for women. The computer area shows the greatest growth of all the technological fields in the employment of women.² This trend is a boon for women who once thought that they would not be able to enter technological fields.

Proper use of the computer presents a challenge to mankind. Colleges and universities should train capable people for future managers, analysts, and teachers. Many colleges have made significant strides in this area; however, much remains to be done.

The President's Science Advisory Committee Report indicated that many undergraduate students need some knowledge of computing. This committee report estimates that about 75 per cent of all college undergraduates are enrolled in curricula in which some computer training would be very beneficial.³ The larger part of the computing

¹Ibid., pp. 11-12.

²Ibid., pp. 28-29.

³"Curriculum 68, Recommendations for Academic Programs in Computer Science," Communications of the ACM, II, No. 3 (March, 1968), 165.

world deals with business data processing, which is very different from the scientific computer science courses of a few years ago. Business problems are not easily defined, and many times the solution to the problem is not defined at all, as opposed to the checks one can use in solving equations. Business problems deal with large amounts of data. These problems are seldom very small. The teaching of business computing is difficult to find in college curriculums, although it seems to be found more readily today than a few years back.¹ Those responsible for academic programs should recognize the current need for courses in business data processing.

Guerrieri has compiled suggestions for a university curriculum in business data processing to meet the needs of industry. Until recently, there has been little concern as to the development of a university curriculum for two reasons:

(1) Until recently, industry has been generally able to meet its requirements through internal training programs. (2) Industry, on the whole, does not believe that a formal educational program can adequately prepare an individual to perform the business-computer systems function. It is generally recognized that the first point is no longer true. The demand for business-computer systems analysts is now significantly in excess of the available supply of prospects. As for the second point, I think an industry view point is growing that formal academic training in business

¹Fred Gruenberger, "The EDP People Problem," Data Processing Digest, XVI, No. 1 (January, 1970), 2.

computer systems is not only possible, but will produce a competent and knowledgeable supply of analysts.¹

Guerrieri stipulates that the college and university programs in business data processing are becoming more acceptable to industry as a means of training data processing employees.

Curricula

Studies in data processing that are pertinent to the problem of teacher preparation in this area have been reviewed. Information is presented here from related studies regarding subjects currently being taught and recommendations for improvement of curriculums.

The Gibson Study

Gibson sent questionnaires to 135 colleges to determine what the schools of business administration were doing to get ready for the approaching era of automation. Gibson concluded the following:

1. Graduates of schools of business administration should receive training in the following areas:
 - a. Logical Thinking--this area is considered so vital by many businessmen that they would sacrifice all other business training, if necessary, in order to obtain persons who think logically.

¹John A. Guerrieri, "A Suggested University-Level Curriculum For Business-Computer Systems," Computers and Automation, (September, 1969), 31.

- b. Systems--Since the heart of I-EDP is systems operation, future business office changes must first be made according to good systems principles. More than one course is probably needed to provide an adequate minimum of knowledge.
 - c. Statistics--The ability to handle statistical relationships is vital to correct interpretation of factual material. More than one course is probably needed to provide business graduates with an adequate minimum of knowledge.
 - d. Math relationship--There is a broad area of mathematical knowledge needed in the solution of many business situations, which include such things as linear programming, matrix algebra, and even some calculus functions. Every business graduate should be well grounded in these concepts and be able to apply them to business situations.
2. In addition to skills in logic, math, etc., business graduates need training in viewing the business as a whole. I-EDP is going to make it once more possible, and necessary, to consider business as a single entity, and the making of decisions on the same basis.¹

Gibson was concerned with a college level curriculum in data processing. He found that background courses in integrated electronic data processing should be required for all business graduates, due to the fact that they will be increasingly involved in working with people who have knowledge in this area.

Adaline D. S. Jones Study

The purpose of this study was to determine the knowledges and the skills needed by high-school graduates for

¹E. Dana Gibson, Integrated and Electronic Data Processing in Relation to Schools of Business Administration, Monograph C-6 (Cincinnati, Ohio: South-Western Publishing Company, 1957), p. 49.

entry level jobs in digital computer installations. A questionnaire was used to survey 69 enterprises of various sizes and types. The implications for business education derived from this study were as follows:

The characteristics of the rapidly developing computer technology are significant for business education because they create a dilemma for educators who are responsible for preparing workers for employment in the labor market

A worker must be able to take employment in several occupations, partly because there are relatively few workers needed in any given occupation, and partly because those occupations which exist today may be replaced by occupations with entirely different employment requirements.

Thus, the type of education or training program that is needed is one that will provide the student with flexibility when he enters the labor market. The program should emphasize to the student the fact that the rapidly developing digital computer technology causes changes in the duties and operations he will perform from time to time and that, if he is to be able to retain his employment, he will have to be involved often in programs of continuing education.¹

Jones found that a student should have a broad general knowledge of computer operations because of the rapid changes that take place in the development of computer hardware and software.

The Laurie Study

Laurie investigated the current status and the future applications of digital data processing computer systems

¹Adaline D. S. Jones, "The Knowledges and Skills Needed by Clerical Workers in First-Level Entry Occupations in Digital Computer Installations," The Delta Pi Epsilon Journal, VIII, No. 4 (August, 1966), 27.

as they were being developed in American Businesses and in American colleges and universities. Laurie used a questionnaire to study this problem. His findings in regard to the collegiate schools of business and other colleges and universities are stated as follows:

1. One-third of the colleges included in this study had at least one digital computer on the campus. The members of the American Association of Collegiate Schools of Business had a higher percentage of computers available than non-association schools.
2. About 60 per cent of the total responding schools note that they visit computer installations in their own areas. About 30 per cent report that they use an off-campus computer for faculty research, student instruction, and the like. Very few business divisions actually house the computer they use, and very few actually have complete jurisdiction over such equipment.
3. Over half of the schools report that they include programming and general data processing problems in their current course offerings. This covers courses offered for credit only.
4. The two sources of future computer personnel mentioned most frequently by collegiate respondents are the manufacturers of computer equipment and the firms operating the computers. In this regard the collegiate respondents are in agreement with the business firms who responded to the questionnaire.
5. Over half of the colleges responding indicate that they believe it is easier to train present employees to program than to teach trained programmers a particular business. About one-third of the college respondents believe that people with mathematical aptitude will prove to be the best programmers. Forty per cent of the respondents

thought computer personnel could be selected through the use of aptitude tests.¹

Laurie was concerned with collegiate programs in data processing. His study had implications for data processing curriculums since a majority of colleges reported that it was easier to train students in programming than to train programmers for a particular business.

The Niemi Study

Niemi studied data processing to determine (1) the training and education needed by people who head electronic data processing systems in various organizations; (2) the training and educational needs that arise in electronic data processing experiences of other managers; and (3) who should provide the training and education that is needed.²

Niemi was concerned primarily with the educational needs of electronic data processing personnel in the management level. He surveyed governmental agencies, public utility companies, insurance and banking firms, computer

¹Edward J. Laurie, Digital Computing Systems in Businesses and Schools of Business, Monograph C-7 (Cincinnati, Ohio: South-Western Publishing Company, 1960), p. 1.

²Leo Niemi, "Electronic Data Processing and Its Implications for the Collegiate Business Curriculum" (unpublished Ph.D. dissertation, Ohio State University, 1959), p. 17.

manufacturers, colleges and universities, and public accounting and management consulting firms. A questionnaire was used to determine which type of electronic computer was being used and the extent and the nature of the computer applications. He thought that his knowledge would be helpful in determining a college curriculum in electronic data processing courses.¹

A program of four years of college was recommended by 97 per cent of the respondents to the questionnaire. Their recommendations as to curricular content, based on the modal and median points of the response, are listed as follows:

1. The modal and median responses for business courses were 40 per cent of the curriculum, which placed business courses first.
2. Mathematics was next with a median response of 30 per cent and a modal response of 20 per cent of the curriculum.
3. Liberal arts was third with a modal and median response of 20 per cent of the curriculum.
4. Electrical engineering was in fourth place with a modal response of zero and a median response of 10 per cent.²

The courses that management recommended for prospective programmers encompass the uses that can be made of the

¹Ibid., p. 9.

²Ibid., p. 167.

computer rather than the physical aspects of the computer itself.¹

1. Computers are being installed at an unprecedented rate to provide managers with more and better data faster and at lower cost.
2. Personnel need to be trained in the knowledge, skills, and understandings of computers and electronic data processing.
3. Electronic data processing managers should receive, as a minimal requirement, training in the following specialized courses highly recommended by the respondents:
 - a. General Orientation to Computers and EDP. This is an introductory course which lays the foundation for more advanced work.
 - b. Business Systems Analysis and Design for EDP. Since electronic data processing must be incorporated within the paper work and communications systems, they should be devised according to accepted systems principles for the greatest efficiency.
 - c. Business and Other Applications of Digital Computers. Electronic data processing managers should know the possibilities and limitations of the equipment.
 - d. Digital Computer Programming. Flow charting a sequence of operations in a particular application and coding it into machine language is an essential phase of electronic data processing.
4. Electronic data processing managers, to increase their competence, should receive training in the following courses:
 - a. Digital Computer Operation. The electronic data processing manager should know how to

¹Ibid., p. 171.

operate the computer as he supervises, and may have to train the operators.

- b. Advanced Programming Techniques. This course is desirable especially for the manager who has charge of a large computer system. As these systems are more complex and costly, additional training helps assure optimal utilization of the computer.
 - c. Numerical Analysis. Quantitative methods are becoming increasingly more important in management decision making. This course provides background in topics such as the numerical solution of algebraic and ordinary differential equations, numerical differentiation and integration, and preparation of problems for large scale computation.
 - d. Operations Research. Operations research techniques are being applied to business and industrial problems at an accelerated rate. These techniques are more reliable than rule-of-thumb measures for management decision making.
5. General Orientation to Computers and EDP and Business Applications should be made available to all business administration students. The fact that the computer is an efficient data processing and operations research tool for all areas of business and industry accounts for this recommendation. Accountants and office managers, as they are very much involved with data processing, should be required to take these two courses.
 6. General Orientation to Computers and EDP, Business Systems Analysis and Computer Applications should be taught in departments of business. College professors, in teaching these courses, have the advantage of being able to take a broad, detached viewpoint in each subject. They would not be hindered with the necessity for promoting a certain kind of computer or limiting themselves to computer applications of a certain kind of business as would the computer manufacturer or the computer user.

7. Numerical Analysis and Operations Research Techniques should be taught in departments of mathematics because of their content. Operations Research Applications could very well be taught in business departments, however.
8. Digital Computer Programming, Advanced Programming Techniques, and Digital Computer operation should be taught by the equipment manufacturer. The manufacturers have the advantage of having the equipment and qualified instructors available for instructional purposes. It would also seem reasonable that the electronic data processing manager take these courses on equipment his company uses.
9. The data processing manager should have a minimum of four years of college education. A large percentage of the respondents had graduate degrees and recommended the same level of accomplishment for prospective electronic data processing managers. The feeling is that in today's complex dynamic economy, the manager needs greater levels of competence.
10. Business competence is the major requisite for success for the prospective head of an electronic data processing unit.
11. Mathematics is becoming increasingly more important to electronic data processing and other managers. The use of operations research, which employs some sophisticated mathematical techniques, is gaining in popularity as a more effective approach to business problems.¹

Neimi had concern for the four-year college program. He found that general data processing courses should be available for all business students and should be taught in the departments of business. Both business competence and mathematical ability were found to be desirable traits that should be possessed by the data processing manager.

¹Ibid., pp. 173-76.

The Davis Study

Davis interviewed computer programmers of business applications for the purpose of determining (1) the nature and amount of education that business applications programmers have received; (2) the conditions that surround the activities of the programmer that would influence the content of a business applications curriculum; and (3) the degree of frequency selected activities are encountered by business programmers.¹ His conclusions were:

1. There is evidence that should encourage any interested individual to seek college training in order to become a business programmer. Eighty-three per cent of the 100 programmers interviewed had received college training
2. Apparently, employers of business programmers prefer an employee who possesses a degree in mathematics or business or a combination of mathematics and business. This conclusion is based on the fact that 64.04 per cent of the degrees possessed were in mathematics. A little more than 88 per cent of all bachelors' degrees held by the programmers involved in this study were in business or mathematics.
3. Accounting seems to be the first preference of employers for a major concentration in business.
4. The analysis of technical training seems to indicate that specialized training, closely associated with the computers involved, is inevitable for a newly employed programmer. It is clear that this specialized training is

¹James B. Davis, Jr., "Factors Which Should Influence a Model Curriculum for Programmers of Business Applications" (unpublished Ed.D. dissertation, Oklahoma State University, 1966), p. 5.

taken regardless of the amount of formal education an employee has experienced. There is doubt, therefore, that any curriculum for programmers will provide learning experiences that will train the programmer to the extent that he will be fully qualified to hold a programming position immediately following his graduation.

5. The technical learning experiences provided in a formal curriculum should be such that the future programmer will develop a well-rounded background concerning the field of data processing and a technical vocabulary which will enhance intelligent conversations regarding the use or operations of data processing equipment. The learning experiences should also provide for meaningful practice in writing programs which would solve a variety of practical business problems. These technical learning experiences should accelerate the progress of the programmer in his post-employment training programs.¹

Davis found that data processing employers prefer a person who possesses a degree in business or mathematics or a combination of the two. The programmer should have a well rounded background in data processing operations and should be able to converse intelligently using the technical vocabulary for this area.

The Bangs Study

Bangs and Hillestad studied data processing to determine the implications of integrated data processing for the preparation of office workers as it affected the development of curricula in public secondary and post high school

¹Ibid., pp. 142-44.

institutions offering less than a baccalaureate degree.¹

A portion of the findings of this research is listed as follows:

Findings Concerning Teachers of Data Processing

1. A greater proportion of the high school data processing teachers hold degrees than post high school data processing teachers, but post high school teachers had had more advanced training in data processing.
2. More high school data processing teachers received at least some of their data processing background by attending manufacturers' schools than did the post high school data processing teachers.
3. More of the post high school data processing teachers had had work experience, data processing work experience, and on-the-job training than had the high school data processing teachers.
4. More high school data processing teachers are getting business experience in the summer than are post high school data processing teachers.

Findings Concerning Data Processing Curriculum

1. The educational institutions are not preparing enough persons to meet the demands of business. More emphasis must be placed on the preparation of more teachers so that more young people may have the opportunity to be trained in data processing.
2. Communication skills, both oral and written, are demanded of data processing personnel. Both the management personnel and the employees in data processing recognize a weakness in this area which is not being remedied by our educational institutions.
3. Data Processing personnel need to be oriented to the total systems approach in business. The

¹Bangs and Hillestad, Automated Data Processing, p. 14.

educational institutions have not been satisfying this need for the persons in data processing positions.

4. Because the field of data processing education is so relatively new, the programs in the high school and post high school institutions are somewhat similar except that more concentration in data processing courses is found at the post high school level. The major objective of the courses at both levels was vocational training.
5. Mathematics is considered a pre-requisite for data processing courses at the post high school level whereas it is not for the high school level programs in data processing. Managers felt that mathematics should be included as part of a data processing program for its logic values rather than as mathematics per se. Several managers suggested courses in logic be included in the curriculum.
6. Relatively few schools operate a cooperative part-time training program in data processing. Only 50 schools out of 176 schools surveyed had such a program.
7. Three-fourths of those high schools with a cooperative program in data processing require up to six weeks of on-the-job training.
8. Half of the cooperative programs in the post high schools (nine out of a total of 18 programs) have no set amount of time required for the on-the-job training phase of the cooperative part-time program.
9. No opportunities are available in data processing for workers with no specialized training. Persons must either have some specialized training before being placed on a data processing job or may transfer from a job within the firm and receive on-the-job training in data processing resulting in specialized training. Some companies may hire persons without specialized training and give that training to the new employee before putting him on the job.

10. Because the need for data processing employees is so much greater than the number of people being trained in our educational institutions, industry currently is willing to hire persons who have a specialized skill regardless of where they have received their training.
11. Computing machines will be more and more internally programmed, with the result that wiring will become less important in business. However, these persons still will be needed in the technical positions with the computer manufacturers. Many of the programs (particularly in post high school programs) devote a considerable amount of time on wiring boards. This is a skill development that needs less emphasis in training for business data processing jobs.¹

From the findings of the study, recommendations were made for further action. In view of the fact that the schools were not meeting the needs of business in providing data processing employees, more effort needs to be exerted by those in charge of implementing school programs. Teacher-training institutions must train more data processing teachers through either summer institutes or in-service training. Businesses should also make data processing jobs available to teachers in the summer to provide them with practical experience. Further research is needed in studying course offerings in the field of data processing and in the development of adequate teacher training programs for teachers of data processing.²

¹Ibid., pp. 10-12.

²Ibid., pp. 12-13.

Summary

Although the computer dates back to the early 1800's, the tremendous interest in computers by business began only in the 1950's. Electronic data processing is comparatively new in the business area in relation to other subjects such as accounting, management, and office skills. Some business curricula have been revised and others are in the process of revision to prepare business workers for the age of automation.

Industry forecasts a tremendous growth in computer usage by business and a shortage of qualified employees. The computer education gap is one of the current obstacles in industrial growth. Computer usage is becoming more widespread in the educational environment of today. The President's Advisory Committee Report estimated that approximately three-fourths of our college students could benefit by some computer training.

Research studies indicate a need for business data processing courses to be included in the curriculum. Niemi found that respondents from business and industry recommended business courses first over mathematics and liberal arts as pre-requisites for programmers in the management level. Davis found accounting applications to be the most prevalent type of business application. Bangs' study indicated a need for the preparation of

more business data processing teachers to prepare more students for employment in industry. His findings regarding curriculum indicate that not enough colleges are preparing teachers in business data processing. Also, communication skills were recognized as a weakness in data processing employees. Mathematics was considered a prerequisite at the post high school level in business data processing for its logic values rather than as mathematics per se.

Research studies and current periodicals both point out the need for more and better qualified business data processing personnel in the area of applications rather than mathematical theory. There is a difference in the business data processing and the scientifically oriented computer science programs. The business data processing deals with applications and not mathematical theory. The qualified person in business data processing must have a portion of both mathematics and business to succeed in the world of the 1970's and 1980's.

CHAPTER III

METHOD AND PROCEDURE OF THE INVESTIGATION

The problem of this study was primarily to investigate the circumstances surrounding the selection and the preparation of business data processing teachers. The best method for such an investigation was believed to be a questionnaire sent to ten out-of-state four-year colleges and a case study method with the use of an interview guide for the state of Oklahoma. A personal in-depth interview was conducted with each teacher in Oklahoma. Each case report in the Appendix of this study is a detailed account of each particular teacher's own background and preparation for teaching data processing, in addition to particular problems encountered in teaching this subject.

Data Processing in Other States

To provide more background information in the area of teacher preparation for business data processing, a questionnaire was prepared and sent to ten out-of-state schools selected arbitrarily by the researcher. Schools selected were those that were believed to have some type

of data processing program. The questionnaire was designed to obtain information about two areas--curriculum and school policy. The researcher was interested in gathering information about the courses in data processing now offered at the college level, the department in which these courses were offered, and the specific course titles. In the area of school policy, the researcher sought information about when data processing was introduced in that particular school and how the curriculum had been changed since then. The researcher sought information about course requirements in business data processing. Questions relating to the location of equipment and prerequisites for business data processing courses were included on the questionnaire. Space was provided on the questionnaire for the respondent to indicate the level of offerings and the type of emphasis, either computer science or business data processing. A specimen questionnaire is attached to this study as Appendix D.

Data Processing in Oklahoma

The interview guide is an aid to the interviewer in helping him to gather homogeneous data from each person interviewed. Considerable time was spent by the researcher in studying the problem of teacher preparation in data processing before the interview guide was developed so

that questions asked would be relevant. The questions used in the interview guide were broad, so that the respondents could answer in any way that they chose and, thereby, perhaps give spontaneously additional information that would not have otherwise been received. The interview guide was criticized in a graduate education class and then revised for use in this study.

The interview guide included five general areas. The first area of the guide was devoted to questions concerning the subject matter and the equipment. The researcher sought information regarding subjects being taught in data processing and the specific phases that were being emphasized. Questions were asked about the types of equipment being used to teach data processing and the teacher's guidelines for equipment-student relationships. The use of textbooks currently available on the market was discussed with each teacher. Also, the teacher's objectives in a specific course or subject area were included in this section.

The ~~second part of~~ the interview guide was devoted to the students. The interviewer asked for information regarding the types of students enrolled in data processing courses, the types of background the students possessed, and the selection procedure for enrollment in the course. The subject of student placement both after graduation and

while still in school was discussed with the interviewee to ascertain whether his school was placing students on jobs. The teacher was asked to list the particular characteristics that were believed to enable students to succeed in data processing courses.

The third part of the interview guide was concerned with teacher preparation. In this section, questions delved into the background and the preparation for teaching of each respondent. Evidence was sought regarding which college courses taken by the teacher had benefited him most. The number of years and the types of teaching experience were recorded by the interviewer. The relationship between the teacher's work experience and the subjects he taught were also investigated. The teacher was asked to evaluate his own preparation for teaching data processing, giving the strengths and the weaknesses. To aid in future teacher selection, each teacher was asked how he became either interested or involved in data processing. Each participating teacher in this study was asked which professional organizations were most helpful to him and if he were a member of those particular organizations.

Part four of the interview guide dealt with problems and anticipated changes in business data processing. Each teacher was asked to discuss any particular problem that

he had encountered in teaching data processing and changes that he would like to make in his own program.

Part five was concerned with recommendations for teacher preparation. The place of data processing in the overall program of teacher preparation was discussed with each teacher. The teachers were asked how they planned to keep their own knowledge updated in the rapidly changing area of computer technology.

Selection of Interviewees

The researcher made an attempt to contact each school offering business data processing during the academic school year of 1969-1970. Appointments were set up with the individual teachers and an in-depth interview was conducted with each teacher who was willing to be interviewed. The interviews were conducted during the period, September, 1969, through February, 1970. Teachers were interviewed at the high school, junior college, private business school, and four-year college levels.

The researcher personally conducted all of the interviews, which varied in length from a minimum of one hour to a maximum of two and one-half hours. The average interview lasted from one and one-half to two hours. Twenty-seven schools were visited, and a total of thirty-four teachers were interviewed.

Procedure for Analysis of Data

The data were analyzed by making tabulations on out-of-state schools and those in Oklahoma. The tabulations were then summarized and presented in the findings of the report.

Procedure for Reporting Analysis of Data

Answers to questions in five specific subject areas were sought to help effect solutions to the problem of teacher preparation. Information was gathered pertaining to the following: (1) What is the subject matter content, and what equipment is being used to teach this subject matter? (2) What type of students are enrolled in data processing courses and how are they selected? (3) What was included in the teacher's preparation for teaching? (4) What problems have teachers had in teaching data processing, and what changes do they plan to make? (5) What recommendations and comments do teachers have regarding the place of data processing in the overall program of teacher preparation.

The data gathered through the use of the interview guide and the questionnaire are analyzed in Chapter IV, "Analysis and Interpretation of Data."

CHAPTER IV

ANALYSIS AND INTERPRETATION OF DATA

This section of the report contains the analysis and the interpretation of data from (a) the questionnaires that were mailed to the ten out-of-state schools and (b) the in-depth interviews that were conducted with the data processing teachers in the state of Oklahoma.

Out-of-State Schools

The results from the ten questionnaires sent to out-of-state schools were tabulated and the findings are presented in this section of the report.

Curriculum

Of the ten out-of-state schools reporting, all had data processing programs. There were four certificate programs, six baccalaureate degree programs, five master's degree programs, and one summer teacher-training institute in business data processing. Within non-degree programs, four schools listed courses in business data processing and two schools listed courses with computer science

emphases. One school listed both a baccalaureate and a master's degree program in computer science. See Table I.

Nine of the schools surveyed were offering courses in programming, and seven of the ten schools were offering courses in systems analysis. Six of the ten schools offered courses in unit record systems, computer theory, and data processing systems. Four of the ten schools were offering courses in programming systems, data processing applications, accounting systems, and introduction to data processing. See Table II.

All ten schools offered data processing courses in the business department. Two of the schools also had data processing courses offered in the mathematics department, and one school had data processing courses offered in the computer science department.

School Policy

The majority of schools began their offerings in data processing during 1964-1965. One school began as early as 1958, while the latest addition of data processing courses to the curriculum by a school was in 1967. Since the introduction of data processing courses into the curriculum, all schools but one indicated that they had added equipment and courses. Two schools indicated the addition of new programs. One school had changed the

TABLE I

PROGRAMS OFFERED IN DATA PROCESSING DURING
THE 1969-70 ACADEMIC SCHOOL YEAR

Level	Emphasis	
	Computer Science	Business Data Processing
Certificate Program	0	4
Baccalaureate Degree	1	6
Master's Degree	1	5
Doctoral Degree	0	0
Courses offered in Non-Degree Program	2	4
Summer Teacher-Training Institute in Data Processing	0	1

TABLE II

COURSES OFFERED AT OUT-OF-STATE SCHOOLS DURING
THE 1969-70 ACADEMIC SCHOOL YEAR

Course Title	Number of Schools Offering the Course
Accounting Systems	4
Computer Theory	6
Data Processing Applications	4
Data Processing Concepts	1
Data Processing Seminar	2
Data Processing Systems	6
Information Storage & Retrieval	1
Introduction to Data Processing	4
Key punch	2
Management Information Systems	1
Market Research	1
Operations Research	1
Programming	9
Programming Systems	4
Systems Analysis	7
Unit Record Systems	6

emphasis in data processing to more study of the third generation computers with less emphasis on unit record equipment.

The educators were asked whether their school required any data processing courses for persons obtaining a degree in business teacher preparation. Seven of the ten educators indicated that some data processing was required for business teacher preparation. The number of hours required varied from a maximum of nine hours to a minimum of three hours. Only one educator indicated a requirement of nine hours. Two of the schools required six hours, and four of the schools required three hours in data processing for business teachers. All ten of the educators replied that they encourage students who plan to receive a degree in business teacher education to take data processing electives.

An attempt was made through the use of the questionnaire to ascertain the location of equipment in the ten schools. Several of the schools had equipment located in more than one place. Four schools have equipment located in their own department; and, two of these four also have equipment located in a computer center. Five of the schools had equipment located in the school administrative offices. The computer center, the college of engineering,

and the mathematics department contained the computer equipment in three instances.

An effort was made to learn what prerequisites are involved in data processing programs. College algebra was required by four schools. One school required other mathematics beyond college algebra. Four schools had no prerequisites, while two schools reported that the only prerequisite for data processing courses was either junior or senior standing.

Summary

Business data processing was offered during 1969-70 by all ten out-of-state schools surveyed. Programming and Systems Analysis were the two courses being taught by the majority of schools. Other courses being offered by more than half of the schools receiving the questionnaire were Unit Record Systems, Computer Theory, and Data Processing Systems. The majority of schools began their offerings in 1964-1965, so that data processing in the business teacher curriculum was relatively new. The majority of schools indicated that, since data processing courses were initiated, additions of equipment and new courses had occurred. Seven of the ten schools reported that business data processing was a requirement for business teacher preparation. The number of hours required varied from a maximum of nine to a minimum of three.

Equipment was located in various places. The majority of schools had their equipment located either in their own department or in the school administrative offices. The schools were evenly divided in prerequisites for data processing. Four schools required college algebra while four schools had no prerequisites. Business data processing was strongly recommended as an elective by all ten schools that were sent questionnaires.

Oklahoma Schools

The 30 case studies in the Appendix of this report constitute the data relative to the recruitment, the selection, and the preparation of data processing teachers. The findings of this report, which result from the analysis and the interpretation of data contained in the case studies are divided into six specific subject areas. These subject areas are: (1) general information about the data processing teachers, (2) subject matter and equipment, (3) information about the students, (4) teacher preparation, (5) problems and anticipated changes, and (6) recommendations for teacher preparation in business data processing.

General Information About the Data Processing Teachers

Personal data secured from the 30 interviewees is presented in this section. All information presented

relates to conditions as they existed at the time that each educator was interviewed.

Of the 30 educators interviewed for this study, 24 were male and six were female. Six were single and 24 were married.

None of the individuals interviewed were under 25. Fifteen of the interviewees were between the 25 and 34 age category. Nineteen of the respondents were 35 years of age and over.

Twenty-one of the teachers interviewed held masters' degrees. Six teachers had bachelors' degrees. Two of the teachers interviewed held doctoral degrees. One teacher had data processing experience only without a degree.

Subject Matter and Equipment

The material presented in this section was derived from the analysis and the interpretation of data in the case studies concerning the subject matter taught at the time of the study in high schools, area vocational schools, junior colleges, four-year colleges, and private business schools. The equipment that was used to teach these data processing subjects is also discussed in this section.

High School Level.--Unit record data processing is being offered to students at the high school level. This course is offered in one high school in Oklahoma and is

available to high school students in a number of area vocational schools. Computer programming was offered to small classes of high school students in only two cities in Oklahoma. The high school program in unit record data processing is a vocational program and is supervised by the state Division of Business and Office Education. The content of the course consists of basic knowledge of and skill development in the use of the keypunch, verifier, sorter, reproducer, interpreter, collator, and accounting machines. Wiring techniques for the reproducer, interpreter, collator, and accounting machines are also taught in the vocational unit record course. In addition to unit record data processing, some accounting, business mathematics, business English and spelling, and human relations are taught in this course.

The objective for the high school data processing course is primarily to provide students with a skill that will enable them to obtain initial employment in data processing occupations.

The number of students in this type of program usually ranges from 30 to 35. Ordinarily, half of these students take the course in the morning and half in the afternoon. This arrangement works out well for the amount of equipment involved. Each student engages in "hands-on" use of the equipment when the class is divided into two sections.

The number of keypunch machines in use in the vocational programs varies from a minimum of three to a maximum of seven. Most schools have approximately the same amount of equipment; i.e., a sorter, a reproducer, a collator, and an accounting machine. One school has an interpreter, while other schools have an interpreting keypunch.

The teachers interviewed commented that "textbooks are getting better." They continue to experience difficulty with finding a textbook that fits the IBM equipment and that includes everything that they want to teach. IBM manuals are still in use as textbooks in many of the schools. One teacher reported difficulty in finding any textbook for unit record that included material for business applications.

Area Vocational School Level.--The area vocational school has a two-year program in data processing at the post-high school level. Most of the computer programming courses are very similar in the area schools in the state. A typical curriculum for an area vocational school is shown in Illustration 1.

Business applications are emphasized at many of the area vocational schools. One instructor has his students write a payroll system, a filing system, and an inventory

Electronic Data Processing Computer Programming
Two-Year Curriculum

First Semester

	Hours
Math 123 Algebra	3
EDP 123 Intro. to Electronic Computers	3
EDP 113 Electric Accounting Machines	3
Bus 145 Accounting I	5
Eng 113 Communications I	3

Second Semester

Math 133 Algebra and Trigonometry	3
Bus 154 Accounting II	4
EDP 125 Computer Programming I	4
(Lab Programming I)	1
EDP 133 Data Processing Applications	3
Eng 123 Communication II	3

Third Semester

EDP 223 Computer Programming, FORTRAN	3
EDP 222 FORTRAN Lab	2
Bus 243 Cost Accounting	3
Math 232 Statistics	2
EDP 213 Computer Programming II	3
Econ 213 Economics	3

Fourth Semester

EDP 233 Business Systems Design & Development	3
EDP 243 Programming Systems	3
EDP 245 Computer Programming, COBOL	5
EDP 254 Programming III	4
Hist 213 American History	3

Illustration 1.--Tulsa Area Vocational-Technical
Education Center curriculum for the academic school
year 1969-1970.

system. In many schools, students also get practical experience in data processing by working for the school administrative offices.

The objective of the two-year program at the area vocational schools is to train a student over the two-year period so that he will be employable in the programming field.

The equipment used in the area vocational schools is much the same. The RCA 301 system in each school is tied into the RCA Spectra 70 model at the State Capitol. In addition to the RCA equipment, most schools also have IBM unit record equipment. Classes are small so that all students get "hands-on" experience.

Textbooks are good for some areas of the program and lacking in other areas. The textbooks seem to be adequate in the area of programming languages, with the exception of assembly language for the RCA equipment. A few teachers stated that they did not have a really good book for systems analysis.

Junior College Level.--The junior college curriculum is very similar to the curriculum of the area vocational school, because it also is a two-year program in electronic data processing.

The emphasis of the program at Northeastern Oklahoma Agricultural and Mechanical College at Miami, Oklahoma, is

on business data processing. The educators at this college believe that a knowledge of accounting principles, augmented by competence in basic logic, the number systems, and the use of computers, should prepare the graduate for employment in a variety of positions in the field of business data processing. The curriculum offered at Miami is shown in Illustration 2.

The overall goal of the junior college program is to develop programmers. The program is subsidized by the Federal government in most junior colleges and is supposed to be terminal; however, many students transfer to a four-year college and earn a degree.

The equipment in most of the junior colleges consists of the RCA 301 computer system and IBM unit record equipment. The junior colleges have access to the RCA Spectra 70 in the State Capitol in Oklahoma City.

Classes are small in most of the junior colleges and students can have "hands-on" experience with the equipment. Laboratory size is usually limited to 20 or fewer students.

Textbooks were considered to be too general by one educator. He stated that most of the textbooks covered the whole field of data processing. Textbooks, as a whole, were considered to be adequate. There is still a need for adequate textbooks in systems analysis and design.

IBM Business Data Processing Curriculum

First Semester

	Hours
Math 103	3
D.P. 102 Basic Computing Machines	2
D.P. 104 Electro-Mechanical Machines	4
Acct 113 Elements of Accounting	3
Eng 113	3
P.E. 111	1

Second Semester

Math 124	4
D.P. 122 Data Processing Applications	2
D.P. 123 Introduction to Programming Systems	3
Acct 123 Elements of Accounting	3
Eng 123	3
P.E. 121	1

Third Semester

D.P. 234 Computer Programming I	4
Govt 113	3
Hist 213	3
Bus 113 Introduction to Business	3
D.P. 274 Adv. Programming Systems	4

Fourth Semester

D.P. 266 Computer Programming II	6
D.P. 264 Systems Development & Design	4
D.P. 262 Data Processing Field Project	2
D.P. 243 Data Processing Statistics	3

Illustration 2.--Northeastern Oklahoma Agricultural and Mechanical College, Miami, Oklahoma, curriculum for the academic school year 1969-1970.

The Four-Year College.--The curriculum varies more at the four-year college level than at any other level. Some colleges are not offering courses in business data processing. Among those offering courses in business data processing, there is a wide range of offerings. Some colleges were getting started in their business data processing curriculum, while others offered a wide range of courses. Table III excludes the colleges that offered courses in the mathematics departments.

The courses at Northwestern State College and Southwestern State College are offered in Computer Science Departments for business students. The courses at Cameron State College are taught in the data processing department and count on a business major following an Associate Degree in Data Processing. The courses taught at Tulsa University, Oklahoma State University, Phillips University, Bethany Nazarene College, Southeastern State College, and Central State College are offered in the business departments.

The objectives vary with the type of program offered at the various colleges. The objective at Cameron State College is to train people to enter the field of data processing somewhere in the programmer to systems areas. The objective of the colleges that offer only an introductory course in data processing is simply to

TABLE III

COURSES OFFERED FOR BUSINESS STUDENTS
IN OKLAHOMA COLLEGES 1969-1970

Course Titles	Northwestern, Alva	Southeastern, Durant	Phillips Univ., Enid	Cameron, Lawton	O. S. U., Stillwater	Tulsa Univ., Tulsa	Southwestern, Weatherford	Central State, Edmond	Bethany Nazarene, Okla. City
Advanced Computer Concepts							X		
Adv. Programming Problems				X					
Business Computer Prog. I							X		
Business Computer Prog. II							X		
COBOL				X					
Computer Organization & Prog.	X								
Computer Programming		X							
Computer Programming & Information Processing	X								
Computer Science Seminar							X		
D. P. Mathematics				X					
Electronic Data Processing					X				
FORTRAN				X					
Intro. to Computer Languages				X		X			
Intro. to Computer Prog.			X			X	X		
Intro. to Computing	X					X			
Intro. to D. P.		X	X	X					X
Intro. to Problem Oriented Languages	X								
Machines (Computer Emphasis)								X	
Machine & Assembly Language				X					
Management Inform. Systems					X				
Programming IV				X					
Punched Card D. P.						X			
Seminar I in D. P.									X
Seminar II in D. P.									X
Systems Analysis & Design	X			X					
Systems Programming	X								
Unit Record Equipment				X					

acquaint the student with the field of data processing-- to make students aware of the computer. Students are taught what they can do with the computer and how to do it. Students may become interested in data processing by taking an introductory course and may decide to continue their education in this area.

The equipment in the four-year colleges varies more than that in the junior colleges. Most four-year colleges are teaching data processing courses that fit the equipment that they now have. Equipment ranges from the IBM model 1130 to the RCA 301. Some schools do not have access to "hands-on" experience for the students because they operate under a "closed-shop" policy. Other schools have access to unit record equipment only, so their introductory course is geared to fit the unit record equipment. Most colleges do not limit their enrollment in data processing courses, although they would like to do so. Laboratory classes, however, are usually limited.

Most educators at the four-year college level agreed that finding adequate textbooks had been a problem in the past, but that textbooks were getting better. Comments by educators related to the problem of finding textbooks to fit the equipment that they already had.

The Private Business School.--The private business schools offer courses in computer programming from 592

clock hours to 900 clock hours in length, depending upon the type of training desired. The languages taught in most private business schools are COBOL, RPG, and PL/1 plus basic computing. The objective of the private business schools is to train professional computer programmers to fill the programming positions in industry.

The private business schools that were visited had excellent equipment. The majority trained students for programming the IBM 360. The typical equipment included an IBM 360, plus unit record equipment. All students had "hands-on" experience with the computer. Classes were small in most cases, and usually there were no more than 16 students using the equipment at the same time so that each could become qualified in operations.

The majority of private business schools visited used IBM manuals and IBM programmed textbooks. Inasmuch as the students must refer to the manual for a particular machine on the job, the experience of using manuals in class was thought to be valuable.

In summary, the respondents agree that "hands-on" experience is important in a learning situation in data processing. Those schools that did not provide "hands-on" experience would prefer to do so. The objectives of the two-year programs and those of the private business

schools are similar, because both are preparing students for occupations in data processing. The objectives of the four-year college will vary with the type of program offered. Most educators agreed that although there has been a problem of obtaining adequate textbooks in the past, the situation is improving.

Students

This section of the report deals with the type of students enrolled in data processing courses, selection of students, and student placement. Particular characteristics that enable students to succeed are also discussed in this section.

High School Students.--Students in the high school program are selected by their teachers and their counselors. At the area vocational schools, each student must confer with a counselor at his particular school and with the counselor at the area school. Most schools give the IBM Punched Card Machine Operators Aptitude Test and select students from those who make above a certain score on the test. At the one high school in Oklahoma that offers unit record data processing, students are placed on jobs and work half a day while attending school. Students are not placed on jobs in the area vocational schools but attend laboratories instead. Most schools have no student placement program. When students leave the program, they

fill out a form stating that they are interested in jobs. If a job opening comes to the attention of the school, the school will try to place the student.

When asked what particular characteristics enable students to succeed, one teacher replied,

A person that can organize his thoughts and has a logical mind can succeed at data processing. People that like games and puzzles usually succeed, therefore, a person with just average intelligence can succeed. As to a mathematics prerequisite, I do not think there should be one for unit record data processing; for computer programming maybe Algebra I. The trend now is for computer companies to put out business oriented hardware. The new System 3 will not have a mathematics generated language.

This comment is indicative of those received by teachers at the high school level.

Area Vocational School.--The two-year computer programming course in the area vocational schools has all types of students enrolled. Some students have no college background and others have had two or three years of college and have come to the area school so that they can obtain training for employment in data processing occupations. The age of the students in the area school programs ranged from 18 to 50. The area schools have both day and night programs for these students. Most schools attempt to place students if possible, but do not have formal placement programs. Most students in the area schools get no work experience while in school, with the

exception of Tulsa. The area school in Tulsa works through the Data Processing Management Association, and places its students on jobs for six weeks' training. Personality traits frequently mentioned as necessary for success were ambition, creativity, and a basic attitude of the student to accept challenge.

Junior College Level.--Most of the students in the junior colleges come from communities in close proximity to the colleges. Some colleges have no selection process at all, while others select students on the basis of ACT scores. One junior college will not accept students unless they score 18 or better on the ACT test. Another college has no selection procedures but tries to counsel students who are having difficulties.

Most junior colleges have no formal placement programs. Some have representatives of business firms come to the campus to interview students for jobs. Many of the students in two-year programs either transfer to a four-year college or enter the military service.

One of the most frequently mentioned characteristics that enable students to succeed at the junior college level was ability to think logically. Other factors mentioned were curiosity, and a desire to learn. Students must also be dedicated and not avoid studying.

The Four-Year College.--Most four-year colleges have no selection process but take whoever enrolls in the course. Because most colleges do not offer enough courses in business data processing to constitute majors, there is no placement program especially for data processing majors. Characteristics reported that enable students to succeed were logical thinking and academic ability. One educator stated: "A person who succeeds in data processing must be concerned with details and be able to analyze a situation."

The Private Business School. Some schools have no selection process, while others use the IBM Programmers Aptitude Test with scores ranging from 0 to 80. A student must score 40 or above to be admitted to the computer programming course in one private business school. This particular school will for a while train some students on a provisional basis. If successful, they can continue in the program. The private business schools have all types of students--vocational rehabilitation individuals, blind persons, high school graduates, high school drop-outs, college graduates, and college drop-outs. The typical student was about 25 years of age, had worked at a few jobs, and wanted to improve himself. The majority of students enrolled in the computer programming course in the private business school are men; however, women make good

programmers if they have the aptitude and desire to learn. Most private business schools do have some type of placement program. Characteristics mentioned that enable students to succeed in data processing programs were imagination, average intelligence, and curiosity. One educator stated: "They must have a temperament for detail. Programming can be very frustrating--they must be able to live with frustration."

In summary, most schools have some process for selection of students. The IBM Aptitude Tests are used by many schools, and recommendations by counselors are sometimes required. The type of student varies with the type of school program. However, most students enrolled in data processing programs are interested in the employment opportunities available in this field. The majority of students do not have on-the-job experience before completion of the school program. Many schools do not have formal placement programs but try to help students by informing them of available jobs. Characteristics that enable students to succeed in data processing that were mentioned most frequently by educators were ambition, creativity, the ability to think logically, curiosity, and imagination.

Teacher Preparation

This section of the report deals with the individual teacher's background in preparation for teaching data

processing. The amount of teaching experience, the amount and the kind of work experience, and the undergraduate courses completed that have helped him most are included in this section. Each teacher was asked to evaluate his own preparation for teaching data processing and to mention those courses that he did not complete but that would have been helpful in his teaching. The professional organizations that are considered by the educators to be most helpful in data processing are mentioned in this section.

High School Level.--The majority of the educators at the high school level had bachelor's and master's degrees in business education and business administration. The educators mentioned that accounting was probably their most helpful course at the undergraduate level to prepare them for teaching data processing.

The teaching experience of the educators at the high school level varies from a minimum of two years to a maximum of seven years. No teacher had been teaching data processing longer than four years.

Most of the teachers had had work experience before beginning their teaching career. The men had worked with data processing while in the armed forces, while the women had several years of office and public accounting experience.

Teachers at the high school level have become interested in data processing for different reasons. Some learned data processing while in the service. Others have had contact with persons working in the field of data processing and, through these contacts, have become interested in data processing. Others have learned of job opportunities in the area of data processing and have attended institutes to become qualified to teach.

The majority of the educators at the high school level feel that their preparation for teaching data processing courses was inadequate. Many had to learn data processing through self-study. One teacher replied that, although she now felt well equipped to teach unit record equipment, she needed further study. Others responded that they would have liked to have taken college courses in data processing.

The organizations mentioned most frequently as being helpful to data processing teachers were the Data Processing Management Association and the Data Educators Society. All high school teachers interviewed felt that the DPMA was the more helpful. Many teachers do not have the opportunity to attend DPMA meetings because there is no chapter available in the community in which the teacher lives. Those without membership in DPMA recommended the literature published by the organization.

Area Vocational School.--The teachers interviewed in the area vocational schools had degrees in both mathematics and business. The teachers with majors in mathematics were usually teaching the FORTRAN courses, while the teachers who had majored in business subjects usually taught the COBOL courses. Teachers listed mathematics, statistics, and accounting as the subjects they had taken as an undergraduate that were most helpful to them in teaching data processing.

The teaching experience of the teachers in the area schools ranged from a minimum of six years to a maximum of 30 years. No individual teacher had more than four years' experience in teaching data processing.

Many of the vocational school teachers have not had data processing experience in industry. One programming teacher interviewed had had two years of industrial experience. Others had not had any data processing experience but had spent their summers either attending summer school or working at various jobs to earn extra money. One teacher felt that he had an equivalent of industrial experience through his data processing work for the school administration.

Educators in the area vocational schools have become interested in data processing for various reasons. One teacher attended the summer institute in data processing

at Oklahoma State University and became interested in data processing as a career. Another became interested in computers while teaching classes in mathematics, while another was simply selected by the school administration to teach data processing.

Most teachers felt that their preparation for teaching data processing was lacking in some way. One felt that he needed a stronger accounting background, while another felt that his education was adequate for the subject matter he was presently teaching but that he needed more education for teaching higher-level courses. Most educators agreed that they would like to have experience in industry. Industrial experience was felt to be necessary for teachers to develop meaningful business applications.

The professional organizations that were considered to be most helpful to the data processing teacher were the Oklahoma Technical Society and the Data Processing Management Association.

Junior College Level.--Teachers at the junior college level had undergraduate majors in business education, physical education, mathematics, technical education, and psychology. There was a wide range in undergraduate preparation.

The teaching experience of the educators in the junior colleges varied from a minimum of three years to a maximum

of 19 years. None of the educators had taught data processing subjects for more than five years.

Some educators have had work experience in data processing installations in industry. Others have had general office experience, while one instructor had some experience in an accounting firm.

The means by which teachers have become interested in data processing varied. One teacher was encouraged by a friend to attend the data processing institute; a second teacher became interested in data processing while attending a Saturday course in Computer Science on the University of Oklahoma campus. Others have become interested in the field through employment in part-time jobs with data processing equipment.

Most of the teachers felt that their preparation for teaching data processing subjects was lacking in some respect. One educator who had learned data processing in industry felt that he should have some courses dealing with motivation and communication skills. Those teachers with college background and without industrial experience felt that they needed either more experience in writing programs or more college courses in data processing.

The professional organizations recommended by educators as beneficial to data processing teachers were the Oklahoma

Technical Society, the Association for Computing Machinery, and the Data Processing Management Association.

The Four-Year College.--Eleven educators were interviewed in four-year colleges in Oklahoma. Of the eleven interviewed, two had degrees in engineering; four, in mathematics; and five, in either business administration or business education.

The teaching experience of the four-year college faculty ranged from a minimum of one year to a maximum of 16 years in data processing.

Ten of the eleven interviewed had some work experience in data processing. About half of the teachers had industrial experience, while the other half received their experience by working with data processing equipment in the school administrative offices.

Seven of the eleven respondents became interested in data processing while working with it on a particular job. Four of the respondents became interested in data processing while in school. They either took undergraduate courses in computer science or became interested while attending an institute in data processing.

When asked to evaluate their own preparation for teaching data processing, the mathematics majors felt that they were lacking in business subjects and the business majors felt that they could use another course in mathematics.

Many replied that their preparation was inadequate because the formal academic preparation in this area is non-existent. Others felt that their preparation was inadequate when they started to teach but was adequate for the courses that they were teaching when interviewed.

The professional organizations mentioned most frequently as being helpful to the data processing teacher were the Data Processing Management Association and the Association for Computing Machinery.

The Private Business School.--There is a wide range of formal teacher preparation in the private business school. Some instructors have college degrees, while others without degrees have learned data processing on the job.

The teaching experience of the respondents ranged from one year to five years; and the work experience ranged from nine to several years for industry.

When asked how he first became interested in data processing, one instructor replied, "While I was a technical writer, I was taking a night class in data processing when I became interested in the subject--I later followed up this interest." Another teacher said that he became interested in data processing after enrolling in data processing courses as a result of aptitude testing.

Professional organizations recommended by educators in the private business schools were the Data Processing

Management Association and the Association for Computing Machinery.

In summary, the majority of respondents at all levels had both a bachelor's and a master's degree. The teaching experience of the respondents varied from a minimum of one year to a maximum of 19 years. The teaching experience in data processing varied from a minimum of one year to a maximum of 16 years; the majority of respondents taught data processing from three to five years. About half of the teachers had work experience in industry in data processing occupations, while the other half had office and accounting experience. Educators became interested in data processing through college classes and institutes in computer science, as well as part-time jobs. Most of the educators interviewed felt that their college preparation for teaching data processing was inadequate because of the lack of formal academic preparation. Those educators who learned data processing in industry were well prepared in the subject matter area; however, they lacked education in communication skills, educational psychology, and student motivation. Those educators with mathematics majors felt a need for additional knowledge in accounting. Most business majors have had some mathematics, but some would like to have an additional course. Those professional organizations that were thought to be most helpful to data processing

teachers were the Data Processing Management Association and the Association for Computing Machinery.

Problems and Anticipated Changes

This section of the report deals with problems the data processing teachers have had in teaching data processing. The teachers' suggestions for changes in their own programs are included in this section.

High School Level.--At the high school level, there is a communication problem. The administrators and counselors do not understand data processing and what is taught. Data processing is a special interest area, and students should be interested in this subject if they are to enroll in it. Student selection is also a problem--getting a student who is interested and also capable.

Textbooks were a problem three or four years ago. Teachers had difficulty in finding adequate textbooks. Although more textbooks are available now, some areas are still lacking.

Three of the schools visited plan to change their high school unit record program next year by putting in the IBM System 3. The respondents believed that they could teach everything that they are now teaching on the unit record equipment, plus the electronic principles of data processing, with "hands-on" experience. They feel that they can teach more and better with the System 3.

Area Vocational School.--In the area vocational schools the computer programming teachers had difficulties in finding appropriate textbooks to fit the RCA equipment. Most textbooks were written for IBM equipment and must be adapted for use with the RCA equipment. Student selection is also a problem in the area vocational school. The schools take into their programs most of the students who apply. Some students are capable, but others have to work very hard to improve their deficiencies to learn how to program.

When asked what changes he would like to make in his own program, one educator replied, "I would like to see our program college accredited so that education could be open ended and fulfill the requirements for a degree." Other educators did not recommend any changes for their programs.

Junior College Level.--One problem at the junior college level is that of preparing students for jobs in industry without knowing what industry wants. One educator stated: "If we ask 99 different people from industry what they are looking for in employees, we get 99 different answers." Another problem mentioned was that of having too many students to give them the quality of education necessary. Some educators mentioned a shortage of equipment; they do not have enough equipment for the number of students enrolled.

Educators at the junior college level would like to see their courses accepted toward a four-year degree at other colleges.

The Four-Year College.--One problem in the four-year college courses is that students in the classes have such diversified backgrounds; the teacher will usually lose a few and bore a few. When asked about his problems in teaching data processing, one educator replied, "Originally there was a lack of textbooks. Now the problem is finding time to organize textbook material--because of the demand for textbooks everybody has published one and they are not always well done. There is a tremendous amount of interest in this field." Another educator replied that his problems were: "Priorities and time scheduling of the computer where the computer is under an administrative head of the department. Facilities are also inadequate." Teacher preparation was considered by some to be the greatest problem. Because no college in Oklahoma is preparing data processing teachers, schools must get them from other states.

When asked what changes he would like to make in his own program, one educator said, "Have one introductory course for both mathematics and business students and after this course divide the curriculum into two areas. After learning the fundamentals in the beginning course, there

is a distinct difference in the mathematics courses and the business courses." Another educator would like to see better usage of the computer in the general education program. One Oklahoma college plans to increase its offerings to ten courses in business data processing, while another Oklahoma college is planning to increase its offerings to offer a minor in data processing.

The Private Business School:--Student frustration was one problem mentioned by an educator in a private business school. Students want to learn data processing and, when unsuccessful they become very frustrated. Another problem is getting adequate turnaround on the programs that the students write. Textbooks were mentioned as a problem by one educator, while others considered the present textbooks adequate. Most private business schools have added new equipment and expanded their programs in data processing.

In summary, the most common problems at the high school level were those dealing with student selection and communication between (a) teachers and (b) administrators and counselors. Textbooks were a problem at all levels three or four years ago but more and better textbooks are now being published. Other problems were inadequate facilities and equipment, as well as priorities and time scheduling of the computer. Teacher preparation in data processing was considered by some to be the greatest single problem. The

fact that junior college credits are not always accepted by the four-year colleges on a degree seemed to be the major single problem of the junior colleges.

Anticipated changes include changing some of the unit record programs to the IBM System 3. The changes at the four-year college level are primarily expansion of course offerings.

Recommendations for Teacher Preparation

This section of the report will present suggestions for teacher preparation in business data processing. Also included in this section will be methods for keeping knowledge updated in the field of data processing. Teachers were asked to include comments and suggestions for improving data processing curricula.

High School Level.--Teachers were asked about the role of data processing in the overall program of teacher preparation. One educator stated: "It is essential that anyone in a teacher preparation program be required to at least have a course in Introduction to Data Processing to prepare them for today's world." Another educator replied, "Any citizen needs an understanding of the levels of sophistication in data processing." Other comments were that teachers should have a course in business data processing rather than a mathematics data processing course.

Some of the methods for keeping knowledge updated in the field of data processing were reading current periodicals, attending workshops and summer institutes, and obtaining information from equipment manufacturers' representatives. Attendance at conventions and conferences was considered to be important in keeping up on new developments in data processing. In-service training in industry was considered to be one of the best methods for updating knowledge.

Area Vocational School.--In the area vocational schools, one educator commented, "I do not believe that data processing is for everyone. Every teacher, however, should have an introductory course in data processing. There is a big future for computers in education." Another educator stated:

Let's face it--we are in a computer oriented world and becoming more so every day. No one but the private institutions seems to be taking any responsibility. We have to go to industry to get trained people in this area, and these people have had no teacher training. Knowledge alone does not make a teacher. It is about time for some university or college to start training data processing teachers. If the prediction holds true that computer classrooms will come into being, then every single teacher needs some knowledge of data processing.

Other comments were that every teacher needs a course in introduction to computers just as every teacher needs a course in curriculum development. Teachers need to know what the computer can do, and business teachers need to know what business can do with the computer. One educator-administrator made the following comments:

There is a critical need for a teacher education program that is business oriented. Computer science as it exists today across college campus after campus is simply a program where they are using the computer as a tool to teach math--this is honorable--however, it does not help us. One industry here in our community hires about 100 programmers. Eighty per cent of the work is in business and 20 per cent is scientific programming. The business center runs 24 hours a day, and the scientific center runs five days a week, one shift per day. The universities are primarily training mathematicians and engineers--they have ignored the big field of employment. Twenty years ago, you did need mathematics for programming, however, this just isn't true today. We must sell the fact to teachers that the average student with a good grade in high school algebra is a good student in data processing.

Various recommendations were offered for keeping their own knowledge updated. One educator plans to take time out from teaching to return to work for industry if the school system does not provide some type of in-service training. He would like to see data processing teachers placed in industrial jobs during the summer months. Others plan to keep their knowledge updated through continuing their education and reading current periodicals.

One educator commented that it was up to the business department in the colleges and universities to train business data processing teachers. Another educator said, "We should go out to industry and recruit teachers. We should give these people some background in teaching ability and use these people to train other teachers." Another educator had just the opposite opinion of people from industry; he replied, "We must train career teachers because we cannot

staff our schools with people from industry." He believed that people from industry were usually attracted to teaching because of salary or other benefits, and that these people would not stay with teaching.

Junior College Level.--At the junior college level, teachers believed that a computer orientation course should be offered for all teachers. Data processing teachers need courses in languages and applications in addition to the general courses in data processing. One educator felt that, with the increase in automation in industry, all business students should have some data processing. Business students need to know what is involved in the gathering of facts that can give an output that can be used as a tool for management. Another educator felt that data processing should be integrated into other business courses. The problem with this suggestion is that teachers without a preparation in data processing cannot integrate data processing into their courses. When asked what he thought the place of data processing should be, another teacher replied,

Data processing is a tool for communication. Anything that can be written with a pencil can be put on a computer. If an educator believes that business students need communication skills, then he needs data processing. The business student and/or teacher should be familiar with the input and output of data processing--what kind of source data and data organization is necessary to get it to the computer and familiarization with the reports used for decision making.

Many teachers recommended a business background for teacher preparation because so many jobs performed by the computer are business applications. Accounting teachers, especially, should know what the machines are capable of doing.

Plans for keeping their knowledge updated included enrolling in summer school courses, reading current literature, and gathering information from equipment manufacturer representatives. Summer experience in industry for teachers was mentioned by several respondents.

The educators in the junior colleges commented that they would like to see the colleges offer a degree in business data processing without the rigid mathematics requirements. They would like to see this program offered so that their two-year transfer students could get a degree and continue the education that they had begun in the junior college.

The Four-Year College.--Most of the educators at the four-year college level felt that some knowledge of the computer is a part of general education for the teacher. One educator replied,

Basically, no one will be educated unless he knows something about computers. In teaching, you are going to be a user of computers so you will need to know more about computers in order to solve problems. Eventually, at the secondary and elementary level, teachers will need to know something about computers.

Another educator stressed the importance of data processing knowledge by stating:

I think every elementary, secondary and college teacher should be introduced to the fundamentals of data processing and computer programming. They need to be aware of data they could gather which could help them to be a better teacher.

Some educators felt that there were two places for data processing in teacher preparation. When asked how he felt about the place of data processing in teacher preparation, another educator replied,

In view of the fact that our world is more and more computerized, everyone should have a basic background in data processing. Teachers should know how computers relate to their field. It is a tragedy if every teacher doesn't have a fairly sound background. We cannot integrate computers into our courses unless the teacher has a background.

Another educator stated his opinion on the subject by saying,

Data processing is almost as important as learning to read and write. It is a tool, and no teacher can be proficient in his occupation unless he can use the computer. One of the important tools of discovery is the computer. To say that everyone doesn't need to know something about data processing is like saying a chemist doesn't need to know how to conduct a laboratory experiment because he can hire a graduate assistant to do this for him. Knowledge of the computer will give you something that you will never see if you depend on someone else to be your eyes.

The importance of a data processing course being required for all business teachers was stressed by all respondents. The students that our current teachers are training are coming up in a generation in which computers are more prevalent; consequently, more importance is attached to the need for having the teachers know data processing.

Most educators plan to update their knowledge by reading journals and attending institutes. Some plan to work with industry during the summer, if possible. Summer institutes were suggested for those teachers who must attend summer school. Attending conventions and obtaining information from equipment suppliers were other means that were suggested.

Getting more data processing to the college of education in the state universities was one suggestion that was mentioned. Students working on advanced degrees come in contact with the computer and need to know how to use it. The majority of educators expressed concern about the lack of teacher preparation in business data processing. They believed that many colleges were trying to pretend that the problem did not exist.

The Private Business School.--The private business school stresses data processing in preparation for occupations in business and industry. The majority of teachers believed that industrial experience was of prime importance for the teacher of data processing.

The updating of knowledge by the private business school teachers can be accomplished by reading, self-teaching, and attending seminars offered by organizations and industry.

In summary, the majority of educators at all levels agreed that introductory data processing courses should be

taken by all teachers. Business teachers particularly should have data processing courses, and the data processing teacher needs even more instruction in programming and business applications.

Teachers plan to update their knowledge in data processing by reading, attending summer school and institutes, attending conventions and workshops, and keeping informed through contacts with the equipment manufacturer representatives.

Several suggestions were offered for data processing teacher preparation. Most educators believed that a business data processing degree program should be offered by some college or university in the state. Junior colleges wanted such a program for their college-bound graduates in order that students would have a four-year college to which they could transfer. Two areas seem important in data processing teacher preparation--academic teacher preparation in colleges and universities and industrial experience in data processing occupations.

The general information secured about data processing teachers showed them to be a group of well-educated individuals. The majority had master's degrees. More men than women were teaching data processing. The age groups were evenly divided between the 25 to 34 and the 35-plus age group. No individual interviewed was under 25.

Equipment and subject matter vary with the type of school. All respondents indicated that "hands-on" experience is desirable, even though all schools did not operate an "open-shop." The objectives of the courses are job oriented in the two-year programs and vary with the four-year programs, depending on the course offerings. Most educators agreed that there had been a problem of obtaining adequate textbook material during the past three or four years but that the situation is rapidly improving.

The type of student varies with the type of program. All schools except the four-year colleges have some type of student selection. Many schools use IBM Aptitude Tests, while others base entrance requirements on ACT scores. Most schools do not have formal placement programs but try to place students on the job whenever positions are available. Characteristics mentioned most frequently by educators for success in data processing jobs were ambition, creativity, the ability to think logically, curiosity, and imagination.

Teachers lacked formal academic preparation in data processing other than the summer institutes offered by Oklahoma State University. About half of the educators had some experience in industrial work in data processing occupations. Those professional organizations considered to be most helpful to data processing teachers were the

Data Processing Management Association and the Association for Computing Machinery.

The high schools have had a problem of student selection--getting a student who is interested and also capable. Another problem at the high school level dealt with communication between (1) teachers and (2) administrators and counselors. Finding adequate textbooks was a problem three or four years ago, but now more data processing textbooks are being published. Other problems were inadequate facilities and equipment, as well as priorities and time scheduling of the computer. Teacher preparation in data processing was considered by many teachers to be the greatest single problem.

The changes at the four-year college level are primarily expansion of course offerings. Some schools are planning to replace their unit record equipment with the new IBM System 3.

The majority of educators at all levels recommended that an introductory course in data processing should be taken by all teachers. The data processing teacher should have courses in programming and business applications.

Those teachers who are required to attend summer school preferred to keep their knowledge updated by

attending summer institutes or workshops. Others plan to keep informed of new developments by reading, self-teaching, and attending conventions.

The majority of respondents commented that a college or university in the state should be training business data processing teachers. Two areas seem important in data processing teacher preparation--academic teacher preparation and industrial experience.

Both out-of-state schools and Oklahoma schools have increased their offerings in business data processing. All out-of-state schools with one exception indicated that they had added equipment and new courses since the introduction of data processing courses into the curriculum. Many of the four-year colleges in Oklahoma are revising their course of study and are planning to add courses in business data processing.

Seven of the ten out-of-state schools indicated that some data processing was required for a degree in business teacher preparation. As yet, data processing is not a requirement in the majority of four-year colleges in Oklahoma.

Prerequisites for data processing courses in Oklahoma follow closely the pattern of the out-of-state schools. College algebra was required by four out-of-state schools,

and four out-of-state schools had no prerequisite for business data processing. Some colleges in Oklahoma require college algebra for data processing while others have their own data processing mathematics in the data processing program.

Business data processing was strongly recommended as an elective by all ten of the out-of-state schools. Oklahoma colleges that offer courses in business data processing also recommended them as electives for business teachers.

CHAPTER V

SUMMARY

The data collected in this study through the use of a questionnaire submitted to ten colleges over the country and the 30 interviews conducted in Oklahoma substantiates the need for teacher education programs in business data processing.

There are two major areas of concern regarding the preparation of business data processing teachers: (1) What kind of education does the business data processing teacher need? (2) How should the education necessary to prepare business data processing teachers be provided? The answers to these questions as provided in this study represent thoughtful evaluations by individual teachers.

Restatement of Problem

The problem of this study was to delineate the circumstances in which the recruitment, the selection, and the preparation of data processing teachers are accomplished. The intent of this study was to reveal aspects

of the preparation of data processing teachers. From the data drawn from 10 questionnaires and 30 interviews, certain hypotheses were formulated relative to the future of teacher preparation.

This study consisted of four major phases: (1) a search of the literature in teacher preparation, (2) the accumulation of data about the data processing programs in other states, (3) the accumulation of data about teachers of data processing in Oklahoma, (4) the formation of hypotheses and the interpretation of the data gathered from the out-of-state questionnaires and the in-depth interviews.

Summary of Findings

Significant findings based on the analysis and the interpretation of data were drawn from the case studies and the questionnaires.

1. There appears to be two distinct areas of emphasis in data processing. One is the scientific mathematics oriented program and the other is the business application oriented program. There appears to be a need for increasing emphasis today on business applications in the data processing programs, rather than scientific data processing, because a majority of graduates go to work in business.

2. The subject matter being taught consists of punched card data processing, programming languages, systems

analysis and design, and data processing applications. Either part or all of these courses are being taught in the two-year programs, the four-year colleges, and the private business schools. Most of the schools have IBM unit record equipment, and computer equipment varies with the type and the size of school.

3. The data collected indicate that both junior colleges and four-year colleges are offering courses for business students in data processing. There was no program for business teacher preparation in data processing in the state of Oklahoma. Seven of the 10 out-of-state schools indicated that data processing was a requirement in the teacher education programs, and three of the out-of-state respondents indicated that business data processing is a strongly recommended elective.

4. All types of students are enrolled in data processing courses. The characteristics that are considered necessary for success in this type of curriculum include: ambition, creativity, logical thinking, curiosity, imagination, and average or better intelligence.

5. The preparation of teachers interviewed seem to fall in these two categories: (1) those who had gone through formal college teacher preparation programs but had no industrial experience, and (2) those who had some

type of college degree and learned data processing in industry, but had no professional education courses. The majority of teachers interviewed believed that their preparation to teach data processing was inadequate because they had no college courses in data processing. The subject area considered by educators to be most helpful in data processing was accounting.

6. The professional organizations that were considered to be the most helpful to data processing teachers were the Data Processing Management Association and the Association for Computing Machinery.

7. Teachers have become interested or involved in data processing through college courses, learning data processing on the job, and through being informed of existing openings for employment in this field.

8. Problems mentioned by educators dealt with communication, student selection, textbooks, and facilities and equipment.

9. Anticipated changes include the replacement of unit record data processing in some schools with the new IBM System 3 and the revision of curriculum in other schools. Several of the teachers interviewed are planning to offer core courses in data processing for all students in their particular schools, and then branch into specialized areas, such as either business or computer science.

10. The majority of respondents believed that because of the rapid development of computers in education an introductory course in data processing should be taken by all teachers. Data processing teachers should study programming, systems analysis and design, and business applications.

11. Inasmuch as this field is rapidly changing, educators must keep their knowledge updated in data processing by reading, self-instruction, and attendance at workshops, conventions, and institutes. Equipment manufacturers' representatives are relied upon to keep the educators informed of new developments.

12. The majority of respondents recommended that a program for educating business data processing teachers be developed by some college or university in Oklahoma.

Hypotheses Developed From the Study

The hypotheses presented here were drawn from the information obtained by the use of the questionnaire and the interview technique. The hypotheses are stated in the null so that future research may be designed for testing the hypotheses.

Hypothesis 1. There is no significant difference in the computer science programs and the business data processing programs in colleges and universities.

Hypothesis 2. There are no significant differences in the teaching methods of the teachers who have had professional education courses and those who have learned data processing in industry.

Hypothesis 3. There are no significant differences in the preparation of teachers who teach business data processing and those who teach computer science.

Hypothesis 4. There is no significant difference in the programming subjects taught in the junior college and those taught in the four-year college.

Hypothesis 5. There are no significant differences in teaching data processing to students with a mathematics background through calculus and teaching data processing to business teachers with a limited mathematics background.

Hypothesis 6. There are no significant differences in the individual qualities possessed by teachers of data processing and those qualities possessed by other teachers.

Recommendations

The recommendations listed here are based on the data gathered in the questionnaires with other states and the interviews conducted in the state of Oklahoma. The author recommends that:

1. Those persons who are responsible for business education should resolve the problem of teacher education in business data processing. An adequate program for the education of business data processing teachers should be established in the state of Oklahoma.

2. Further study should be undertaken in the curriculum required to prepare business data processing teachers and research needs to be undertaken in methods of teaching data processing.

3. Business teachers should be made aware of data processing and the capabilities of the computer if they expect to effectively teach business subjects. To that end, the researcher recommends an introductory course in business data processing for all business teachers.

4. Hypotheses that were developed in this study should be tested in order to provide more information to those interested in business data processing programs.

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APPENDIX A

INTERVIEW GUIDE

INTERVIEW GUIDE

Personal Data _____ Date _____

Name _____

Sex: Male___ Female___ . Marital Status: Single___ Married___

Age Group: Under 25_____ 25-34_____ 35 and above_____

Name of school where employed _____

Position _____ School address _____

Education

<u>Degrees Earned</u>	<u>Institution</u>	<u>Year Received</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

Approximate number of semester hours beyond highest degree

_____.

Part I. Subject Matter and Equipment

What courses does your school offer in data processing,
and how many sections of each? (Number of students, etc.)

Subject matter (What is taught in your particular course?
What is emphasized?)

What are your objectives? (general knowledge, skill building, etc.)

What equipment are you now using to teach data processing?

What are your guidelines for equipment-student (hands-on) relationships?

Place of textbooks (adequacy)

Part II. Students

Type of student in data processing (student selection, background, etc.)

Student placement (Do students have work experience? Do you help students find jobs after they finish the program, etc.?)

In your opinion, what particular characteristics enable students to succeed in data processing courses?

Part III. Teacher Preparation

What was your own preparation for teaching? (major, minor, and other courses which have helped prepare you for teaching data processing) (mathematics background?)

Teaching experience (how many years, subject taught, number of years in data processing)

Work experience (relationship between work experience and subjects now teaching)

How did you first become interested or involved in data processing? (What and/or who led you into teaching data processing?)

What is your opinion of your own preparation? _____

Professional organizations (Which do you believe to be most helpful, and are you a member?)

Part IV. Problems and Anticipated Changes

Problems in teaching data processing (curricular, administrative, etc.)

What changes would you like to make in your own program?

Part V. Recommendations for Teacher Preparation

What is the place of data processing in the overall program of teacher preparation? (recommendations for teacher preparation)

Because data processing is a rapidly changing area, what do you believe is the best method for teachers to update their knowledge in this field?

Suggestions and comments

APPENDIX B

TEACHERS INTERVIEWED IN THIS STUDY

TEACHERS INTERVIEWED IN THIS STUDY

(Listed in the order interviewed)

- Mr. James F. Herndon, East Central State College, Ada
- Mrs. Dorothy Hicks, Altus Junior College, Altus
- Mr. Ed Forsberg, Northwestern State College, Alva
- Mr. John Pryor, Southern Oklahoma Vocational Technical School, Ardmore
- Mr. Ken Phelps, Tri-County Tech, Bartlesville
- Mr. Lorin Vogeding, Tri-Country Tech, Bartlesville
- Mr. Harper Cole, Bethany Nazarene College, Oklahoma City
- Mr. Virgil Smith, Area Vocational Technical Center, Duncan
- Mrs. Ethel Fritze, Area Vocational Technical Center, Duncan
- Dr. Janie Jones, Southeastern State College, Durant
- Mr. Noel Smith, Phillips Univeristy, Enid
- Mr. Bob Cruce, O. T. Autry Area Vocational-Technical Center, Enid
- Mr. Doug Morgan, O. T. Autry Area Vocational-Technical Center, Enid
- Mr. Joe Kinzer, Cameron State College, Lawton
- Mr. Jim Grover, Northeastern Oklahoma Agricultural and Mechanical College, Miami
- Mr. James L. Reese, Northeastern Oklahoma Agricultural and Mechanical College, Miami
- Mrs. Mary Jo McKinney, Norman High School, Norman
- Mrs. June Goss, Oklahoma City Area Vocational-Technical Center, Oklahoma City
- Mr. Tony Beadles, Oklahoma City Area Vocational-Technical Center, Oklahoma City

- Mr. Robert Slate, Lear Siegler, Inc., Oklahoma City
- Mr. Don Floyd, Oklahoma School of Banking and Business,
Oklahoma City
- Mr. Donald Pate, Oklahoma Christian College, Oklahoma City
- Mr. Daugh Howard, Oklahoma State Tech, Okmulgee
- Mr. Louis Zimmerman, Oklahoma State University Technical
Institute, Oklahoma City
- Mr. Fred Black, Oklahoma State University, Stillwater
- Mrs. E. L. Lyle, Oklahoma State University, Stillwater
- Mr. Wayne Day, Murray State College, Tishomingo
- Mr. John Hawkins, Northern Oklahoma College, Tonkawa
- Mr. Tony Krehbiel, Tulsa Area Vocational Technical Educa-
tion Center, Tulsa
- Dr. Walt Smith, Tulsa University, Tulsa
- Mr. George Atkins, Southwestern State College, Weatherford
- Mr. Woodfin C. Garrett, Eastern Oklahoma State College,
Wilburton
- Mr. Kenneth Duff, Eastern Oklahoma State College, Wilburton

APPENDIX C

30 CASE STUDIES

CASE 1

General Information About the Respondent

At the present time, this educator is serving as an instructor in a four-year college in Oklahoma. He is married and is in the 25-34 age group. His education consists of a Bachelor of Science degree and a Master's degree. He has approximately 35 college hours beyond his Master's degree.

Subject Matter and Equipment

This instructor is teaching the following courses: Beginning Fortran, Computer Mathematics, and Computer Programming for Business Applications. A course entitled Introduction to Computers is listed in the college catalog, but has not been taught yet. This course is to be a computer appreciation course for non-computer type people. He is in the process of setting up two additional courses which will be in computer languages. They will possibly be assembly language and RPG. The equipment at this school consists of three keypunch machines--one of these is an interpreting keypunch--the 082 sorter, and the 1130 IBM computer.

The objective of the curriculum at this school is to offer computer science as a tool for other majors. This school has utilized the computer in the past for sociology research, management games, and marketing. The computer science department does the enrollment for the administration. The instructor is not given extra pay for this duty, but is given a reduced teaching load (10 hours). He does regents reports, student payroll, ACT scores processing, etc.

Laboratories are set up for the beginning courses in data processing. The laboratory is limited to about 12 students at one time. An "open-shop" is operated at this school--anyone can come in at any time--it is just on a first come, first serve basis.

The textbooks being used this semester are: Beginning Fortran--Programming the IBM 1130 by Hughes, a Wiley publication. Computer Mathematics--Numerical Methods and Computers by Shan S. Kuo, an Addison Wesley publication. Computer Programming for Business Applications--IBM manual. He has not found an appropriate textbook yet for the Introduction to Computers course yet. He stated that textbooks were getting better, but that he still has trouble finding adequate textbooks for the advanced classes.

Students

Since data processing is taught on this campus in the Computer Science Department, the students in these courses come from all departments. College algebra is a prerequisite for the beginning course in data processing. Two courses in calculus are required for the computer mathematics course. When asked what particular characteristics that he had noticed that enable students to succeed, he replied, "I ran a little study on this one time, and I found that a grade of "C" or higher in college algebra was the best indicator of success."

Teacher Preparation

In his undergraduate work, he majored in mathematics. He was a physics minor. He has done graduate work in mathematics education. He has had three years of teaching experience. He has taught mathematics and computers during this time. He worked for five years for IBM before entering the teaching profession. He classified his work experience with IBM as being the one thing that had helped him most in his teaching career. He said, "I am terribly lacking in a good business background. Even while working for IBM in different installations they would refer to such items as 'accounts payable' and I didn't know what they were talking about since I had not had accounting." He first became interested in data processing during his career with IBM. When asked how he felt about his own preparation, he replied, "It is better than someone who has been trained in college as far as work experience goes; however, my background is still very lacking in business and business terminology." As to professional organizations, he stated that he was not a joiner. He attends only the Computer Center Directors of Colleges in Oklahoma meetings. These meetings are held three times a year.

Problems and Anticipated Changes

This educator stated: "Right now, I have curriculum problems. I don't know what courses to set up and what textbooks to accompany these courses. We are trying also, in addition to the two new courses, to set up a minor in computer science. I would like to have someone with a business background to help me in teaching these courses. I will not be able to teach all of them, and I definitely think that a business person would be the best type to hire." He has not had any problems at all with the administration over the use of equipment, and he does not anticipate any.

When asked what changes he would like to make in his program, he replied, "We plan to offer a minor--and when we do, we will acquire a new objective in preparing people for work in the field of data processing. This is where the business person fits in, since so much of data processing has to do with business applications."

Recommendations for Teacher Preparation

This educator believes that any teacher of any subject should have at least an introductory course in data processing. He recommended that the business education people especially should have a course in data processing. A two-hour course in Beginning Programming is required at this college for a degree in general business, but is not as yet required for business education majors.

This educator plans to take additional courses in computer science to keep his knowledge updated. He also plans to attend workshops, conferences, and seminars.

His comments included the following: "There is not much standardization among colleges as to what constitutes computer science. This is true in the four-year and the two-year programs. Some places a Fortran course is a five hour course and other places it is a two-week course in the afternoons." He also mentioned the problem of transfer students who have already had two-years of data processing.

CASE 2

General Information About the Respondent

This educator is female, over 35 years of age, married, and is currently teaching data processing in a junior college in Oklahoma. She has a Bachelor of Science degree and a Master's degree. She has approximately 18 hours of graduate work beyond her Master's degree.

Subject Matter and Equipment

This teacher is teaching courses in Cost Accounting, Programming I, and Programming IV during the current semester. The equipment in use at this junior college consists of seven 026 keypunch machines and one 029 model keypunch; a 402 accounting machine and a sorter; and the 301 RCA computer installation which is on direct line with the 301 Spectra 70 at the State Capitol. One high school class is being taught just as a service to the high school. All of the rest of the courses taught at this school are on the junior college level. Students who enroll at this college cannot enroll in just one course in programming, they must be enrolled in the two-year program. The objective of this program is supposed to be terminal, however, students are urged to continue their education while they are working. The textbooks are really not adequate for the RCA equipment used at this school. Most of the textbooks that have been published are for use with IBM equipment.

Students

Various types of people are enrolled in this two-year program. "We had one or two people that didn't graduate from high school who took this program after completing the high school test. We have older people who are retired from the service. We have people who want two years of education and then a job, and we also have OSU and OU drop-outs who come back to this program. We have no selection of students, and most of our students have a high school

diploma." This year the program has 24 freshmen enrolled and nine sophomores. Equipment-student relationships are no problem at this school since classes are small. This school has no formal type of placement program, but they try to help students find jobs if they know of any openings. When asked what particular characteristics enable students to succeed in data processing, this educator replied, "Students must be dedicated--they must not be afraid of studying. The type student who succeeds will become so wrapped up in the subject matter that he may not know the time of day."

Teacher Preparation

This teacher has an undergraduate major in business education and a minor in speech. She has a Master's in business education. She has attended two summer institutes in data processing--one in 1966 at O.S.U. and the other in 1967--for a total of 18 hours credit. When asked about her preparation for teaching data processing she replied, "I had nothing in undergraduate work that helped prepare me for teaching data processing other than accounting. Our first summer institute was a 'cram session.' They had to prepare these teachers to teach data processing, and I suppose this was the only way that they knew to do it. Many of us were lost. They did not start out teaching the basics, such as terminology. Just now--four years later--I am beginning to understand many of these things. I think that a unit record course would be very vital to a teacher education program--to get them acquainted with the machines, the card, and information processing."

This educator is in her fourth year of teaching data processing and has had ten years teaching experience at the high school and junior college level in teaching business subjects. She has had office work experience while attending college. She was encouraged to teach data processing by a mathematics teacher at the junior college. The mathematics teacher encouraged her to attend the institutes in data processing in order to teach in the program with him. He is now retired and she is in charge of the program. The interviewee disliked data processing when first she was exposed to the subject matter, however, it was a challenge to her and she was determined not to give up. She really began to like the subject about the second semester that she taught it. She is a member of the OEA, NEA, Delta Pi Epsilon, and the Oklahoma Technical Society. She states that none of these organizations are particularly helpful in teaching data processing.

When asked her opinion of her own preparation, she replied: "I did not get to start out the way I should have started because we did not begin with the basics and I had no concept of data processing and data processing terminology. I love it now, but there must be a better way of preparing teachers than the way I received my preparation, but I really do not know what it should be. For one thing, I had no foundation work. We need to be put in institutes with people of our own kind. In the first institute, business people were in with mathematics people who knew nothing of accounting, and mathematics people were in with business people who had not had higher mathematics. Another thing--programming can not be taught just over night--it takes time."

Problems and Anticipated Changes

Her problems include those that are associated with a small school in a fairly isolated area. She sometimes worries about enrollments. When she first started teaching data processing, there was a definite textbook problem, however, the situation is better now. She is now using the RCA manuals plus the Self-Instructional Manual for the RCA by Saxon, published by Prentice Hall.

When asked what changes she would like to make in her program if she were free to make some, she replied that she would make no changes. She said, "We are not presently engaged in administrative work for the school, and we could do some of this type of work. Since this is an expensive program in the school, we feel that we could be of some help."

Recommendations for Teacher Preparation

This educator believes that all business teachers should have a course in unit record data processing. She also believes that they should know something about programming--perhaps an introductory course to computers and programming. She stated: "As for the teacher of data processing, I still think that a business background is better--so much of the work done on the job pertains to business applications." When asked how she planned to update her own knowledge in data processing, she replied that she planned to read. She also recommended that data processing teachers get together for common learning and discussions. "Perhaps a meeting where data processing teachers could view all of the current textbooks would be helpful," she said.

CASE 3

General Information About the Respondent

This educator is male, married, over 35 years of age, and is a teacher in a four-year college in Oklahoma. He has a Bachelor's degree in Electrical Engineering and a Master's degree in Business Administration. He has completed his course work for an Ed.D. degree and plans to have his dissertation finished at the end of the current semester.

Subject Matter and Equipment

The following courses are currently being taught at this four-year college: Computer Science 203--Introduction to Computing, Computer Science 303--Computer Organization and Programming, Computer Science 313--Introduction to Problem Oriented Languages, Computer Science 332--Systems Programming, Computer Science 323--Computer Programming and Numerical Methods, Computer Science 403--Compiler Construction, Computer Science 333--Computer Programming and Information Processing, and Computer Science 413--Systems Analysis and Design. The 203, 303, 313, and 332 courses are taken by both mathematics and business students. Computer Science courses 323 and 403 are for mathematics students. Computer Science courses 333 and 413 are designed for non-mathematics students. The curriculum is constructed so that all students could take the basic core courses, then depending on whether the student's emphasis is on mathematics or business (scientific or non-scientific) the student could choose one of the two options. The amount of mathematics required for a prerequisite for business students is just whatever the business department requires which is now college algebra; however, they are trying to upgrade the system, so it may be more in the future. The equipment at this school consists of an IBM 1130 computer system, an 1132 printer, a card reader punch, a 548 interpreter, an 082 sorter and two 029 keypunch machines. This equipment is shared by the registrar's office, however, there have been no conflicts.

They are planning to get another keypunch machine for the registrar's office. The enrollment in computer science courses this semester is about 75. The objectives in this course are to take a stated problem, analyze it, flow chart it, and write the program. Once the program has been written, the student will then debug the program and document the program. This college program is designed so that the student will master the syntax of the language and then apply it to the problem. In the introductory courses the syntax is emphasized. There are really two areas for objectives. The mathematics student is a computer scientist and he may design languages and design computers themselves. The business student is more application oriented--he uses the computer as a tool, a means to an end. All of the students in this college have "hands-on" experience and run their own programs. As for textbooks, this educator replied, "Some areas are getting better and approaching acceptability. In the basic courses things have settled down. We still need good textbooks for Systems Programming, Compiler Construction, and Information Processing."

Students

This particular school has no student selection policy. They take whomever enrolls in the program. Right now they are trying to build their program. There is no formal student placement program. When asked what particular characteristics enable students to succeed in data processing, this educator replied, "The student must be a stickler for detail--he must be able to sit down and concentrate on a problem and stay with it until it is solved. He must be highly structured in his thinking. He must have the aptitude for the kind of logic involved in computer programming."

Teacher Preparation

This educator stated: "I have not gone through a teacher preparation sequence. I believe that I have mastered the subject matter, but I am not prepared to teach. By this I mean that I have not had any education courses for teacher preparation. If I had time, I would take some educational psychology, because I feel this is helpful to a teacher. I have had adequate preparation in content for the subjects I am teaching. I learned Fortran in industry.

We need a teacher in the education program in computer science. I learned data processing in industry and I taught electrical engineering at a University for one year after my Bachelor's degree. I could not afford to starve any longer so I went to work for industry as a development engineer in applied electronics. When an opportunity opened up in data processing, I took it. I then went back to college and started teaching again. I taught at a junior college before I went back to school to finish the requirements for my doctoral degree." When asked how he first became interested in data processing, he replied, "I have always been interested in computers. I was interested in computers during my undergraduate work--they looked like something that would be nice to work with. I really became interested in the analog computer in engineering school."

He belongs to the Association for Computing Machinery which he believes to be a "must" for computer science people. He is not a member of the Data Processing Management Association, but believes that this is a good organization for the business person. This teacher has had a total of nine years teaching experience--four years in the Air Force and five years of college teaching.

Problems and Anticipated Changes

When this educator first started teaching, he had too many hours to teach. Textbooks were also a problem; however, this problem is slowly being overcome. The system as a whole has a problem in preparing teachers, he stated. He said, "I suppose my number one problem is that usually you can not get the equipment that you need--maybe this is because we are in education. You have a hard time justifying what you need. Industry has a different basis for comparison. In industry, you simply have to show how you can cut costs, and how much you can cut costs, and you get the equipment--this is not true of education. The biggest problem today is that people are trying to teach something without formal preparation. Most people teaching today should go through some teacher training."

As for changes, plans are currently underway at this school for a complete revision of the computer science curriculum. They plan to start with a minor in computer

science with two options and work up to a degree program. One instructor is currently being used from the business department to teach data processing and another instructor is needed from computer science.

Recommendations for Teacher Preparation

This educator believes that data processing has two places--a teacher could major in data processing or minor in data processing. When asked how he planned to keep his own knowledge updated, he replied, "Attend summer institutes or one or two conventions a year. The equipment supplier can do a great deal. I am also thinking about going back to school and picking up new courses. There is a need at the master's level for somebody other than mathematics and science people. There is a need in teaching for education people and in industry for business and business administration people."

His suggestions for teacher preparation were: "Somehow get the people in the education department interested in the data processing curriculum. People working on advanced degrees come in contact with the computer. Perhaps a research course. I attended one in which we had to take a short course in Fortran the first nine weeks--the educator needs to be exposed to the methodology of computers. I would suggest that we have more data processing in the college of education. All educators should go through a data processing or computer appreciation course because it is becoming an inherent part of our society so they ought to know some of the language involved and be exposed to the terminology." His last suggestion was that he believed that the greatest need for improvement in data processing is in the need for teacher education--he believes that it should be in the college of education.

CASE 4

General Information About the Respondent

This educator is male, married, and is in the age group 25 to 34. He is currently teaching unit record data processing to high school students. He has a Bachelor's Degree in Business Administration and a Master's Degree in Business Education. He has approximately 30 hours beyond his master's.

Subject Matter and Equipment

The equipment used in this unit record course consists of seven keypunch machines, three verifiers, the 083 sorter, the 548 interpreter, the 514 reproducer, the 085 collator, and the 407 accounting machine. This course taught by this educator is primarily unit record; however, in addition to unit record equipment, the instructor also teaches some accounting and business mathematics. He teaches some introduction to computers.

His objective is to prepare students for job entry. He stated: "We run a five year follow-up on our students. The girls either go into keypunch work, go to college, or get married. Many of our boys go on to college. The ones that do not go on to college usually go to a metropolitan area and find employment. Our primary objective, of course, is to prepare students for job entry."

This instructor has approximately 35 students. These 35 are divided into two groups--half of these attend class in the morning and half in the afternoon. This works out well for the amount of equipment involved.

"The textbooks seem to be getting better," he commented. He has no adopted textbook now for unit record equipment, but uses his own materials that he has developed. In addition to his materials, he uses the 3M transparencies for instructional purposes.

Students

The type of students in this school consists of all high school seniors. The students are selected primarily by the counselor. Each student must go through his own counselor at his particular school and then he must also go through the counselor at the area school.

This school has no student placement as such. When students leave the program, they fill out a form stating what type of job they are interested in, and if any job opening occurs, the school will try to place the student. When anyone calls the school, the school will pull the student's file, and if they believe the student is qualified, the school will set up an interview for the student with the particular company.

When asked what particular characteristics enable students to succeed in data processing, he replied, "A person that can organize his thoughts and has a logical mind can succeed in data processing. IBM didn't put out the "think" sign without a reason. People that like games and puzzles usually succeed. You don't have to be a brain, a person with just average intelligence can succeed. As to mathematics, as a prerequisite, I don't think there should be one for unit record data processing. For computer programming maybe Algebra I should be required. The trend now is for computer companies to put out business oriented hardware. The new System 3 will not have a mathematics generated language."

Teacher Preparation

This educator has a Bachelor's Degree in Business Administration and a Master's degree in Business Education, but has learned most of his data processing outside the degree programs. He worked with data processing at the Air National Guard Base, and the last two summers has taught data processing for the Air National Guard. He has attended two institutes at Oklahoma State University in data processing. He would like to have more data processing instruction, because he feels that you can not get too much. He has a total of six years teaching experience, and four of these years have been in teaching data processing. Besides his data processing experience with the Air Force, he has had two summers work experience for industry in data processing departments.

This educator first became interested in data processing in the Air Force. The Air Force taught him data processing, and he discovered that he liked the subject.

He is a member of the Data Processing Management Association, but does not get to attend the meetings often because there is no local chapter. He belongs to many educational organizations, but DPMA is most helpful in teaching data processing.

Problems and Anticipated Changes

This educator feels that there is a lack of good reference material in data processing. He also feels that there are no good practice sets in data processing. He had to prepare his own visuals when he first started teaching, however, there are some good ones on the market today. He commented that there is a lack of textbooks to fit the particular type of course that he is teaching.

Changes that he plans to make in his own program include replacing the unit record equipment with the new IBM System 3. He does not believe that the System 3 will take over the unit record field. He believes that there has been a gap between the user of unit record equipment and the small user of the 360 model 20 series. The price range was too great between the two. He believes that IBM is establishing a market between the two. The System 3 is compatible with the 360. The System 3 people can adjust readily on the 360 series. He believes that this will open up more job opportunities for the students. The only thing the students will lose in the program is the control panel wiring. Even then, the students will learn how to wire the panel for the interpreter, since they plan to keep the interpreter and some keypunch machines. Learning to wire the interpreter, they can learn all the principles that apply to column splits and selectors. "The computer programming course at this school will probably be dropped. Since it is offered at the post high level, there has not been a demand for it. The post high school students will usually go to a school where they can get college credit," this educator stated.

Recommendations for Teacher Preparation

When asked what is the place of data processing in the overall program of teacher preparation, this teacher replied, "It is essential that anyone in a teacher preparation program should be required to at least have a course in introduction to data processing. Anymore it is just a world of data processing. Any teacher needs this and the business and the mathematics teachers particularly. A course in data processing should definitely be in the teacher preparation program."

This educator plans to keep his own knowledge updated by attending summer school and working in data processing installations in the Air National Guard. He will keep his knowledge updated also by reading periodicals and new texts. He strongly believes that teachers should be allowed to go to various conferences, conventions and workshops across the nation just to visit with other data processing teachers and find out what is going on.

His suggestions and comments for teacher preparation are as follows: "I believe that we need to convince the administration of the need for the program in data processing. People that already have a degree in business education should have institutes and workshops available to them. Courses should be developed and incorporated into the college curriculum for those who have not yet graduated. We need to take the scare out of data processing for the people that are teaching now, so that they will be interested in learning something about it."

CASE 5

General Information About the Respondent

This educator is married, male, and in the 35 and above age category. Although this educator is now in an advisory capacity, he has attended the institutes in data processing, and has taught in the area of data processing.

Recommendations for Teacher Preparation

This educator was very concerned that no one seems to be doing anything about teacher education in data processing. He made the following comments:

There is a critical need for a teacher education program that is business oriented--digital computer oriented. We teach machine operations to people from industry in our community. An assembly language and COBOL are prerequisites for any teacher hired in this system. The teachers should have had two five-hour courses in COBOL. One of these five-hour courses could be an applications course. I receive complaints from industry that people are not machine oriented. I believe that a data processing teacher should have a three-hour course in unit record equipment, one course in systems, an assembly language, and two five-hour courses in COBOL. Students should be involved in learning experiences where they can learn to work with three or four files. The concept of working with several files is very important, and this is where people get lost.

The central system is overloaded at Oklahoma City. We have approximately 90 students in our program. If we limit our programs to one day a week

(sending them to Oklahoma City) this will kill the program. Night students should have at least two turnarounds a week.

This educator continued by explaining the computer science program as it is taught today. He stated:

Computer science as it exists today across college campus after campus is simply a program where they are using the computer as a tool to teach mathematics--this is honorable--however, it does not help us. For example, the industry in our community hires about 100 programmers. Eighty per cent of the work is in business and about twenty per cent in mathematics. This industry has two separate centers. The business center runs 24 hours a day. The scientific center runs five days a week, one shift a day. The salaries of the scientific programmers are lower because of volume. The good jobs today in terms of business are in the management and business data processing areas. The universities are primarily training mathematicians, engineers, etc., and they have ignored the big field of employment. Twenty years ago, you did need mathematics for programming; however, this just is not true today. Emporia State Teachers College has the best program I know of in business data processing, and it is not heavy enough in computer orientation.

Our school cannot get any college graduates as teachers in the state of Oklahoma. A good combination is a business administration major with a data processing minor.

We must sell the fact to teachers that the average student with a good grade in high school algebra is a good student in data processing.

CASE 6

General Information About the Respondent

This educator is male and is in the 24 to 35 age group. He has a bachelor's degree, and is a computer programming instructor in an area vocational school in the state of Oklahoma.

Subject Matter and Equipment

The courses offered in this area vocational school are similar to those offered in computer programming at other area schools. The courses this educator is teaching this semester are: Introduction to Machine Language, and COBOL and BASIC.

The objective of this program is to turn out a programmer that can pull his own weight in industry in business data processing.

The equipment at this school consists of the RCA 301 computer system, twelve IBM keypunch machines, one verifier, and one reproducer. Most of the unit record equipment was taken out of this school last year.

As for textbooks, this educator stated: "There is none on the market worth anything. None are relevant to the RCA computer and to a teaching situation. They make nice crutches for some teachers."

Students

This school has 50 high school students enrolled in the computer programming course. Data processing concepts are emphasized in this program. The students run the shop and operate the equipment--especially the first and second quarters. After this, they are working on more advanced programs. Night classes are held for people from industry.

This is only the second year of operation for this program and they have not graduated a class as yet. Therefore, there is no placement program, however, the school will try to help in placing students.

This educator believes that the one characteristic which enables students to succeed in data processing is a basic attitude that makes them accept challenge.

Teacher Preparation

This educator has a bachelor's degree with majors in psychology and sociology. He had no particular course in his undergraduate work which helped him prepare to teach data processing. He has worked eight years in industry. He has had a variety of work experiences in data processing. He has done programming systems management, had his own consulting business, worked in aircraft and manufacturing industries, and recruited for industry and management. He has had nine months of teaching experience. He is starting his second year of teaching data processing.

He became interested in data processing when he taught himself to program in college. When he went to work for industry, one of the first jobs he had was in a data processing department.

When asked to evaluate his own preparation for teaching data processing, he replied, "My own preparation is excellent. I can program in twenty different languages."

This educator feels that both the Data Processing Management Association and the Association for Computing Machinery were excellent organizations to help the data processing teacher. He is a member of both.

Problems and Anticipated Changes

When asked what problems he had encountered in teaching data processing, he replied, "None."

As to changes he would like to make in his own program, he would like to double in size, add two teachers, and get some third generation equipment.

When he was asked what he believed the place of data processing should be in the overall program of teacher preparation, he stated:

Business teachers should have an elementary knowledge of data processing. It is not feasibly possible to adequately train data processing teachers for business data processing. We do not have the staff and training must be relevant to industry. The colleges would have to pay higher salaries for qualified people and they are not going to do it. Twelve weeks of training is just not adequate. Teachers should know programming such as RPG, COBOL, FORTRAN, and a teacher should be an expert in one field.

Since each teacher is at a different level, this is a problem in having workshops to update knowledge.

This educator was asked for suggestions for a teacher preparation program. He made the following comment:

We should go out in industry and recruit teachers--a person with a specific technical background. Give these people some background in teaching ability and use these people to train other teachers. Here again, the colleges would not pay the salaries to hire the people from industry.

CASE 7

General Information About the Respondent

This educator is male, married, and in the 35 and above age group. He is a data processing instructor in a four-year college in Oklahoma. He has a bachelor's degree and a master's degree.

Subject Matter and Equipment

This college offers four courses in business data processing in the management department. These are: Introduction to Data Processing, Electronic Data Processing, and two seminar courses. Students do not have "hands-on" use of the machines in the first course, however, the course is machine oriented. The second course is more management oriented dealing with selection of equipment, management of a data processing center, and feasibility studies. The seminar courses are programming seminars. Students are encouraged to develop practical programs--something that could be used where they work, or some business application in Seminar I. Seminar II is a continuation of Seminar I.

Students

There is no type of student selection at this college. They take all students who enroll in the data processing classes. This school has a completely student operated computer center--every employee is a student. Students learn and also develop new programs for the college. This college plans to eventually do all administrative work at night, and this will leave the day open for instructional purposes and for developing new programs. Students can use the computer from 5:00 until 10:00 at night.

Teacher Preparation

This educator worked for twelve years in an administrative capacity and used data processing machines. He has learned data processing on his own. He has had no data processing courses in college. He has a Bachelor's Degree in Business Administration, and a Master's Degree in Management.

He believes that textbooks are better now than they were three years ago. The major drawback that he has found has been in the organization of the chapters. He believes that it is still appropriate to start out with instruction on unit record equipment.

This educator has had twenty-nine years of administrative experience. This is his fourth year to teach data processing.

He believes that the two most helpful organizations for data processing teachers are the Data Processing Management Association, and the Association for Computing Machinery. He is not a member of these organizations, but he would like to be a member.

Problems and Anticipated Changes

He feels that originally there was a lack of textbooks, but now the problem is in finding time to organize textbook material. Because of the demand for textbooks, many have been published and they have not always been well done. He believes that textbooks will improve because of the tremendous amount of interest in this field.

This school plans to increase course offerings in business data processing to about eight or ten courses. He would like to require fundamentals of computer science for all people. Students today are living in a computerized society, and will be engaged in a computerized world of work.

Recommendations for Teacher Preparation

He believes that in view of the fact that our world is more and more computerized, everyone should have a basic background in data processing, and teachers should know how

computers relate to their field. He feels that it is a tragedy if every teacher does not have a fairly sound background in data processing, because this is the only way that computers can be integrated into business courses.

CASE 8

General Information About the Respondent

This educator is male, married, and in the 35 and above age group. He is a computer programming instructor in the area vocational school in the state of Oklahoma. He has a bachelor's degree and a master's degree. He has approximately 168 graduate hours.

Subject Matter and Equipment

The program offered in this school is a two-year program in computer programming for post high school students. During the first year of the program, machine language and assembly language on the 301 is taught. The second year students take COBOL and FORTRAN. The program in this school is a little bit different to other area school programs, since in this program students work independently on their own deficiencies. They may work all day on a program or all day on an accounting problem. They work on what they need to work on at the time, and what they are most interested in that particular day. The main thing is what the students can do at the end of the program and not what they can do in one particular period. This school has 21 students this year--twelve in the first year program and nine in the second year program.

The objective of this program is to train programmers for business applications. This educator considers FORTRAN to be a scientific language; however, some of the graduates of this program do work in this area. The emphasis in this school is on the business applications rather than scientific.

The equipment consists of the RCA 301 computer system, and some unit record equipment. The unit record equipment consists of keypunch machines, and the 407 accounting machine. These machines are also used to do attendance and grade reporting for the school system.

This educator believes that textbooks are satisfactory, however, he has not found any one real good mathematics book yet. At the present time, he is using Elements of Data Processing Mathematics by Price and Miller; the RCA manuals for FORTRAN and COBOL; and Introduction to Electronic Computers by Gordon B. Davis.

Students

The type of students enrolled in this program are the ones that cannot go to college either for financial reasons or academic reasons. Most of the students come from the surrounding area. Students in this program sometimes become isolated because they cannot talk to others who do not know the vocabulary for data processing.

This school does not have a formal placement program. If the school is informed about jobs, they will try to help the students get a job.

This educator believed that logic was the characteristic that students should possess to succeed in data processing. He believed that a logical mind could be developed through basic mathematics.

Teacher Preparation

In his undergraduate work, this educator had a double major--mathematics and social science. He has attended several institutes for modern mathematics and he believes that this has helped him in the program. He has attended both summer institutes held by Oklahoma State University in data processing, and has attended various seminars. He has had a lot of experience in writing programs for the computer for the school system where he works. He has taught school for thirty years. Twenty-six of these years he taught mathematics. He is teaching computer programming for the fourth year.

When asked how he became interested or involved in data processing, he said, "I was simply selected by the administration--they pointed the finger at me and it was an accident. I think they selected me because of my qualifications as a teacher. I am an enthusiastic instructor, and I like to teach. I am very happy in what I am doing, and would probably not be attracted away by industry--even though I could make more money--I simply like to teach."

When asked to evaluate his own preparation for teaching, he replied, "It has been adequate to this point, but it has not been easy. There has been a communication problem, due to the vocabulary. The institutes which I attended did not teach any of the basics. A lot of self-teaching on my part was involved in my preparation. If I taught my own classes like the institutes were taught, I would not have a class after the third day--they would all drop out."

He felt that the Oklahoma Technical Society was the most helpful organization in data processing. He is a member of this organization.

Problems and Anticipated Changes

This educator believed that his major problem was in getting the right kind of students. This particular school has no student selection procedure, so this educator must take most of the students that apply for the program. Some of the students are capable and some have to work very hard to improve their deficiencies in order to learn how to program.

This educator would not make any changes in his program. The setup at this school has worked out fine.

This educator believes that mathematics is desirable, but students can learn how to program without any mathematics. He encourages students to take mathematics as an elective.

Recommendations for Teacher Preparation

This educator recommended that every teacher should have an introductory course in data processing. He believes that there is a big future for computers in education.

This respondent plans to keep his knowledge updated by going to school, reading manuals, and self-study. He tries to keep up with the changes in data processing by visiting industry. He finds that most people that object to COBOL do not really know what it is.

This educator made the following closing comments:

I believe that we can teach someone a technical skill at a high level and he can succeed in life without a degree. In all of my experience, I have not seen anything as exciting as data processing, and I wish that all people could have a chance at it.

I believe that teaching is personal. We must train career teachers because we cannot staff our schools with people from industry. People from industry are usually attracted because of salary or various reasons. They usually do not stay with it, because teaching is not what it appears to be. Just because you know something, it does not mean that you can teach it.

CASE 9

General Information About the Respondent

This educator is female, single, and in the 25 to 34 age group. She teaches in a two-year data processing program in an area vocational school in Oklahoma. She has a Bachelor's Degree in Business Education, and plans to complete her master's degree in the summer of 1970.

Subject Matter and Equipment

This educator teaches accounting, business communications, and technical report writing in the two-year computer programming course. The objectives of the courses she teaches relate to giving the students enough polish and communication skills to help them in their career as a computer programmer. She feels that students must have other knowledge rather than just being able to program. They must have the communication skills--written as well as oral. She feels the textbooks are adequate in the subject areas in which she is teaching.

When asked what particular characteristics that she felt would enable students to succeed in data processing, she replied, "Maturity--they must be able to discipline themselves."

Teacher Preparation

This educator has a bachelor's degree with a major in business education and a minor in accounting. She felt that one of the courses that was most helpful to her in teaching data processing was a methods course she had in undergraduate work. She has taught a total of five years. She taught business subjects for four years, and this year is her first year to teach in the two-year program. She has had one year's experience working in an insurance office.

She first became interested in data processing while being around the computer and seeing it in operation at Oklahoma State University. She also took a course in data processing at Oklahoma State University and became interested in the field.

She feels that her preparation for teaching is adequate in the subject matter she is now teaching, but is not adequate for teaching computer programming.

When asked what professional organizations she thought were most helpful, she replied, "None of them are too helpful."

Problems and Anticipated Changes

She felt that most of the problems she has had in teaching data processing were personal--she has had a problem in adjusting from college teaching to the area vocational set-up where she is with the students all day.

When asked what changes she would like to make, she replied, "I would rather not comment on that at this time."

Recommendations for Teacher Preparation

She believes that data processing courses should be required for business teachers. She feels that they should have an introductory course in unit record, computers, and programming.

She plans to keep her own knowledge updated in data processing by taking more course work.

CASE 10

General Information About the Respondent

This educator is married, female, and in the 35 and above age group. She is a data processing instructor in a four-year college in Oklahoma. She has a Bachelor's and Master's degree in Business Education, and a Doctorate in Vocational Education with a major in supervision and administration.

Subject Matter and Equipment

She is teaching two courses in data processing for business students. The courses are Introduction to Data Processing and Computer Programming. Since this school does not have unit record equipment, the first half of the first course is lecture and demonstrations. The students are able to run their own programs so the instructor gets into programming quite early in the first course. There is no scheduled laboratory. The laboratory is open all day and usually one night a week. The equipment at this school consists of the IBM 1130 disk system, five key-punch machines, one sorter, and an interpreter.

The purpose of the courses in business data processing is to acquaint students with the field of data processing. The three-hour introductory course is required for business education majors, and will eventually be required for all business majors.

She commented that there are quite a few good books for the introductory courses, but nothing very good for the programming course. The IBM manuals would be good if the students could understand them.

Students

There is no student selection for the data processing courses in this school. She believes that logical thinking

is the most important characteristic for a student to possess for success in data processing.

Teacher Preparation

Her undergraduate and master's degree majors were in business education. She has a doctorate in vocational education with a major concentration in supervision and administration. She has attended three summer institutes at Colorado State University in data processing. She has no industrial experience, but has helped set up data processing systems and convert records in schools. She has taught school for nine years. She has taught data processing for six years.

She first became involved in data processing when the school where she was employed asked her if she would like to have a computer. She then attended a summer institute at Colorado State University. She was very pleased with the institute and has been teaching data processing since that time.

She belongs to many organizations, but no data processing organizations.

Problems and Anticipated Changes

In the introductory course, this educator feels that the part on unit record equipment does not get through to students because students do not have access to the equipment. It is difficult for the students to look at a picture of a machine and visualize what it will do.

The only change that she would like to make is that she would like to have time to really examine materials that are available. The students in this school have all the time they want on the computer which is a big advantage of this program.

Recommendations for Teacher Preparation

This educator believes that we should not let people graduate without some knowledge of how the computer effects our daily lives. She does not feel that everyone should be a programmer, but she does believe that teachers should be able to tell students something about data processing.

She believes that summer institutes are effective for training teachers if handled correctly. She believes that this is the best method for training teachers, since most of them attend summer school anyway.

CASE 11

General Information About the Respondent

This educator is male, married, and in the 35 and above age group. He is a data processing instructor in a four-year college in Oklahoma. He has both a bachelor's and a master's degree.

Subject Matter and Equipment

He is teaching Introduction to Systems, and Programming Languages. In the Programming Languages course, FORTRAN is taught the fall semester, and COBOL and RPG are taught in the spring. The equipment at this school consists of unit record equipment, and the IBM 1410 with four tapes and two disks.

He believes that most textbooks generally are too machine oriented, by this he means that not more than one manufacturer is represented. He believes that paper backs are good textbooks since we have obsolescence so fast. He has his own set of problems for data processing that he has developed over the years that he has been working in data processing. For the Introduction to Systems course, he is using Computers in Business by Sanders and Business Data Processing by Awad for class lecturers, and the students purchase Fundamentals of Punched Card Data Processing by Fengold.

Students

There is no student selection for enrollment in data processing courses at this school. This educator believes that one of the most important characteristics that a student should possess for success in data processing is imagination. He said,

Students should be able to express their own ideas and what can be done to management and to

their teacher. High schools should mention to students that they are always going to have a boss. The day and age of being your own boss is about over. Students should be able to explain their every move--learn to justify reasoning for expansions, etc., which they will have to do in business.

Teacher Preparation

This educator has a Bachelor's degree in Mechanical Engineering and also a Master's degree in Mechanical Engineering. He has been a director of computer centers in Oklahoma, Texas, and Indiana. While he was director of the computer center in these various states, he was also teaching data processing. He has taught in both the mathematics and business departments. He became interested in data processing after he graduated from engineering school and held down a job as director of a computer center for the summer. He liked the job and has stayed in this area ever since. He has been working with computer centers and teaching data processing for eight years.

He is a member of both the Data Processing Management Association and the Association for Computing Machinery. He feels that both of these organizations are helpful to data processing teachers.

Problems and Anticipated Changes

One of his problems is that he hates to discourage students to continue in data processing. He hates to admit that he cannot interest students. Another problem is that he hates to say "no" to people, therefore, he sometimes overextends himself and his staff.

As for changes, he would like to see some training of the faculty in other disciplines. He would like to teach programming to the man who teaches economics so that some of the work in economics could be done on the computer.

Recommendations for Teacher Preparation

When asked what he believed the overall place of data processing in the program of teacher preparation should be, he replied,

I think every elementary, secondary, and college teacher should be introduced to the fundamentals of data processing and computer programming. They need to be aware of data they could gather which could help them to be a better teacher. Some will be administrators and will need more. The "why to" we need to know. The manufacturer will take care of the "how to." All teachers should have an introductory course and following it, have a course in research methods to help them do a little more. I am so convinced that any graduate should be aware of the impact and advisability of using a computer.

His comments for preparing business data processing teachers are as follows:

We have to get computer programming into the business department. Business educators are going to be forced to challenge some of the statements such as "the computer is a mathematical device," and "business teachers are not qualified to teach computer programming," and be prepared with facts and figures from the business world. There is a much larger demand for business type programmers than for scientific programmers. So much of data processing is business problems such as rate, hours, gross pay, etc. Ninety per cent of the rental coming in from computers is from the business world. Business and banks in particular are using computers overwhelmingly in contrast to scientific. I can see the problem from both sides of the fence so to speak, since I have taught in both the mathematics department and the business department. It must be proven that having computer science mathematics oriented courses and having business data processing courses is not duplication. The business people are not teaching differential equations--they are teaching applications not mathematical theory. We are going to have to say, look, here are the facts, they have been misrepresented too long. We need to have more business people as computer center directors.

CASE 12

General Information About the Respondent

This educator is male, married, and in the 25 to 34 age group. He is a data processing instructor in an area vocational school in Oklahoma. He has a bachelor's degree and plans to complete his master's degree in the summer of 1970.

Subject Matter and Equipment

This educator is currently teaching FORTRAN, COBOL, and Assembly languages. He is teaching in a post high school program. The school has IBM unit record equipment and the RCA 301 computer system. The RCA system is tied in with the Spectra 70 at the State Capitol in Oklahoma City.

The primary objective of this course is to train a computer programmer, with the ultimate goal being to develop a systems analyst. This school has 18 students in the first year program and 12 students in the second year program. A night program is offered for adults.

This instructor believes that there are no really good textbooks for systems analysis. He is using several books to prepare his lectures. He is using the RCA manuals to accompany the equipment.

Students

In order to enroll in the program at this school, the student must pass the IBM Programmers Aptitude Test. Since students are selected for this program, the instructor feels that he has above average students. This school tries

to help in placing students by preparing resumes sent in a school brochure to prospective employers. The resumes are typed by the office practice class. Twelve students were placed last year in programming jobs.

In order to succeed in data processing, this educator felt that the student should possess the following characteristics:

The student should have a logical mind in order to break down the statement of the problem into a sequential flow. He should be willing to work long tedious hours at programming and debugging. He must have self discipline.

Teacher Preparation

This educator has a double major in mathematics and physics. His master's will be in technical education with computer science emphasis. He has had some business courses, but not enough for a minor. He has had accounting, economics, and statistics. He has taught eight years. He taught mathematics for five years, and this is his third year to teach data processing courses. He has had no work experience in data processing occupations.

He became interested in data processing through teaching mathematics. Data processing was a new and expanding field, and he became interested.

When asked to evaluate his own preparation, he replied, "My preparation from O.S.U. has been excellent instruction. I plan to go out and get some work experience this summer so that I can relate the instruction to industry."

He feels that the Data Processing Management Association is probably the most helpful organization for data processing teachers. He is not a member, but plans to join.

Problems and Anticipated Changes

This educator has had no major problems. As for changes he would like to make, he would like to be more departmentalized. He would like to have a programmer

teaching the language, mathematics people teaching the mathematics, accounting people teaching the accounting, and English people teaching the report writing.

When asked what he believed the place of data processing to be in the overall program of teacher preparation, he replied,

Every teacher should have had a course in computer programming, just as every teacher should have a course in curriculum development. They should study something on the social implications of electronic data processing. They should know what the computer can do, and what business can do with a computer. They should all take a language. The best language is assembly, however, FORTRAN is the easiest to understand for any one.

This educator plans to keep his own knowledge updated through reading periodicals, and visiting industry. He would like to work in the summers in industry, and he would also like to continue his education at some institution of higher learning.

CASE 13

General Information About the Respondent

This educator is male, married, and in the 25 to 34 age group. He is an instructor in data processing in a four-year college in Oklahoma. He has a bachelor's degree and approximately eighteen graduate hours on his master's degree.

Subject Matter and Equipment

This school has the RCA 301 computer system, and IBM unit record equipment. This college has extensive offerings in data processing since they did have a two-year certificate program in data processing before they became a four-year college. They offer about 30 hours of data processing. They can provide the student with a one-, two-, or four-year program in data processing. This educator is teaching the Introduction to Data Processing, and the Introduction to Programming and Punch Card Equipment courses. The class size is limited to 20 people in order that all students can have "hands-on" experience with the machines.

He feels that there has been an improvement in textbooks. He still uses RCA manuals for some areas, since there are no appropriate textbooks in some areas for the RCA equipment.

Students

There is no student selection process in this school. The data processing staff helps with student placement by helping the students secure employment after they have finished school. Only a small percentage of the students in this school go to work. Most of the students either

go on to school or go into the service. He believes that the most important characteristics a student should possess in order to succeed in data processing are maturity, attitude, and interest.

Teacher Preparation

This instructor has a Bachelor's degree in Business Administration with a major in management. He has not had any education courses, and he feels that a few would have been helpful to him. He has four years of teaching experience in data processing. He worked for two years in office work and was in the office supply business for two years.

He became interested in data processing when he worked with it some at Oklahoma State University. He heard about the summer institute program at Stillwater, and applied for it and was accepted.

He feels that his business background is good for teaching data processing, but he would have liked to have had a few more hours in mathematics. He feels that mathematics is helpful in data processing; however, the requirements in mathematics for a data processing major have been reduced at this school. The analytics and calculus requirement for a business data processing major has been made an elective.

He believes that the Data Processing Management Association is the most helpful organization for data processing teachers, however, he is not a member. He is a member of the Oklahoma Technical Society.

Problems and Anticipated Changes

When he first started teaching data processing, his main problem was a lack of experience. He believes that teacher preparation is probably the biggest single problem. He thinks that teacher preparation should be on the graduate level. He would like to do more in the area of student motivation in his own school.

Recommendations for Teacher Preparation

He believes that anyone who graduates from college today without experience in data processing is being

cheated. He feels that business teachers need some experience so that they can know what the computer will do and not fear the machine.

He plans to keep his own knowledge updated by attending seminars and workshops.

He believes that a lot of collegiate business schools are too slow in beginning their offerings in business data processing--they are pretending the problem does not exist.

CASE 14

General Information About the Respondent

This educator is male, married, and in the 25 to 34 age group. He is a data processing instructor in a junior college in the state of Oklahoma. He has both a bachelor's and a master's degree.

Subject Matter and Equipment

This educator is teaching the following courses: Assembly Language, Basic Computing, and COBOL. He is using the RCA manuals for the RCA equipment. The equipment at this school consists of the RCA 301 computer system, the IBM 1620 computer, and unit record equipment. The unit record equipment consists of a sorter, an interpreter, a reproducer, a collator, a 407 accounting machine, a verifier, and 11 keypunch machines. This school also has access to the RCA Spectra 70 in the State Capitol in Oklahoma City.

The primary objective of this program is to train students so that at the end of the two years they can get a job as either an operator, a programmer, or a systems analyst. He would like to have the program set up so that students in the two-year program could transfer to a four-year college. The program at this junior college is supposed to be terminal, however, he does encourage students to continue their education while they are working, if possible. This school has 34 hours in the data processing curriculum. There is a problem in finding a four-year college that offers a major in computer science in a business school. About the only place the students at this school can transfer is to Oklahoma State University in technical education.

The textbook materials used in this school seem to be adequate. The instructor has plenty of problem material.

Students

Most of the students in this junior college are from the surrounding area, and most are in school full time. There is no type of student selection at this school, they take those students who enroll in the program. If the instructor notices that a student is having difficulties in the program, he will try to counsel with the student.

As for placement, companies come to this campus to interview students for jobs. Many of the students; however, go into the service or go on to college. Only a few go directly out on the job.

When asked what particular characteristics he thought would enable students to succeed in data processing, this instructor replied,

The ability to think logically is most important; however, I would have to say that desire is also an important factor. I wrote my master's thesis on this very subject, and I found that high school grades are apparently the best indicator, and of the high school grades, the algebra grade is the best indicator of success.

Teacher Preparation

This educator has a major in technical education at the undergraduate level, and a master's degree in technical education. He is in his third year of teaching. He has taught computer science, electronics, and mathematics in the computer science curriculum. As to the mathematics requirements for computer science programs, he made the following comment:

For business programming, I believe college algebra is sufficient mathematics. If you were going into engineering, then I believe you should have more mathematics, probably through differential equations.

This educator has had work experience in the field of electronics.

He became interested in data processing by taking courses in computer science at Oklahoma State University.

He had planned to go to work for industry, when he heard about the teaching position in this junior college. He decided to stay in this area and not go to a large city.

When asked to evaluate his own preparation for teaching data processing, he replied,

I had a summer institute in computer science. I believe that I should have had more hours of computer science before starting to teach--not necessarily programming, but basic terms of all computers. Experience in industry in programming and systems analysis would have also helped.

He is a member of the Oklahoma Technical Society and the Oklahoma Education Association. He believes the Oklahoma Technical Society to be most helpful in data processing.

Problems and Anticipated Changes

The problem this educator had in teaching data processing was that when he first started teaching, he had too heavy a load. He taught about 23 contact hours and he now teaches 14 hours. He also teaches six hours at night, but this is for extra pay. He has quite a lot of administrative work to do, since the instructors at this school take care of enrollment, the library, the business office, and registrar's work. He does not get extra pay for the administrative work.

Changes that he plans to make include making the current COBOL course a five hour course instead of the six hours of credit that it now carries. He is changing the applications course to a tape and disk course. He has changed from the RCA 301 to Spectra 70 language which is a basic assembly language.

This instructor plans to keep his knowledge updated by going to summer school and reading current literature. He would like to see a summer institute developed for teachers in the field now, that would teach new languages.

Recommendations for Teacher Preparation

When asked what he thought the place of data processing should be in the overall program of teacher preparation,

he replied that he thought all teachers should have an introductory course which would include the terminology of data processing. He also felt that they should probably have one programming language, such as COBOL since it is a business oriented language.

He feels that accounting teachers should know what the machines are capable of doing. The course in applications at this school applies business applications to computers. Accounting teachers should be aware of business applications.

When asked to comment on teacher preparation in the area of business data processing, he stated:

I would like to see colleges set up programs so that our people here at the junior college level could transfer into these programs. Something more in a business line rather than mathematics. Business programs seem to be lacking.

CASE 15

General Information About the Respondent

This educator is male, married, and in the 25 to 34 age group. He is a data processing instructor in a junior college in Oklahoma. He has a bachelor's degree and a master's degree.

Subject Matter and Equipment

This school has the RCA 301 computer system, the IBM 1620 computer and IBM unit record equipment. This educator is currently teaching courses in unit record equipment. He is using Electric Accounting Machine Fundamentals by Micallef.

The objective in this particular course he is teaching is to give the student an acquaintance with data processing through the use of punched card equipment. The overall goal of the two-year program is to develop programmers.

This instructor finds that most of the textbooks are too general and try to cover the whole field of data processing. Otherwise, he thought the textbooks were satisfactory. He has plenty of problem material.

Students

This instructor gets about average students in the data processing program. Out of the 116 students that he has in class this fall, he figures that about half will become programmers. His real objective is to train programmers for business applications.

Teacher Preparation

This educator has a major in physical education and a minor in science. He took some undergraduate courses in

data processing and attended one summer institute in data processing. His master's degree is in data processing. When asked what course he would have liked to have had in his preparation for teaching, he replied that he would have liked to have had a systems course or something in the area of systems analysis.

This educator is beginning his fifth year in teaching data processing. He teaches unit record through programming. He has worked in data processing installations in administrative offices during his graduate work.

He became interested in data processing when he was offered a job in data processing. He liked the job and has stayed in this area.

When asked to comment on his own preparation for teaching data processing, he said, "I spent too much time in history and philosophy of education, and not enough time on practical applications."

He believed that the Oklahoma Technical Society was the most helpful organization to him in data processing.

Problems and Anticipated Changes

One problem he mentioned was the problem of not knowing exactly what industry is looking for. He stated:

If we ask 99 different people from industry what they are looking for in data processing graduates, we get 99 different answers. We ran a survey on this very problem. Another problem we have is that of having too many students to give them the quality of education that they need. We do not have enough equipment.

As for changes he would like to make, he replied that if he had his choice and enough money for equipment, he would prefer to have an IBM 360.

Recommendations for Teacher Preparation

When this educator was asked to comment on what he believed the place of data processing to be in the overall program of teacher preparation, he replied,

Business is headed in the direction of more automation, so there is a great need to stress data processing to the business students. They need to know what is involved in gathering facts that can give an output that management should use. Students of business and teachers preparing to teach business subjects should know what data processing really is. A business language would be helpful--but too much data processing is just programming in the curriculum. I'm a programmer--big deal! So what are you going to program? Students should know more about data processing that just being able to program.

He feels that data processing should be integrated into all courses, but the problem is that teachers who have not had courses in data processing cannot integrate this into their courses.

He feels that it is up to the individual to keep his own knowledge updated, since classes are not yet available in which people can enroll. To actually learn data processing, you must do it yourself. The individual should do a lot of reading and working on his own.

CASE 16

General Information About the Respondent

This educator is female, married, and in the 25 to 34 age group. She is teaching a high school program in unit record data processing. She has a Bachelor's Degree in Business Education, and has 18 hours of graduate work beyond her degree.

Subject Matter and Equipment

A unit record course in data processing is being offered at this school. The equipment being used to teach the course consists of three keypunch machines, one verifier, a sorter, a reproducer, an interpreter, a collator, and a 407 accounting machine. In addition to the unit record equipment, this school is also equipped with selectric typewriters with simulated keyboard.

The objective of this program is to enable the students to enter employment in data processing occupations. Human relations is stressed in this course, also spelling, accounting concepts, personal hygiene, and machine wiring principles are emphasized. This course is strictly unit record--no computer concepts are taught.

As for equipment guidelines, this educator feels that she does not have an ideal situation. She has 30 students and only three keypunch machines. For an ideal situation, she believes that she should have from six to ten keypunch machines for this number of students.

She has found no one textbook which she considers to be adequate for the unit record course. There are a lot of books available that you can use a part of. This year she is using a book entitled Punched Card Data Processing by Gustave J. Rath, published by Science Research Associates, Chicago. She also uses the IBM manuals to accompany the

equipment, and the 3M textbooks and transparencies. Students have difficulty in understanding the textbooks, and she has not found one that is easily understood.

Students

The students in this program are all high school seniors. The majority of the students are selected by the teacher, however, some are placed in the program by the administration. Students are placed on the job in this program. They attend class for two hours and work in the afternoons.

When asked what particular characteristics she felt enabled students to succeed in data processing, this teacher replied, "Knowledge of a basic skill and the ability to apply this skill and get along with other people."

Teacher Preparation

This educator has a major in business education and no minor. She would have liked to have had a course in unit record equipment while in college. She had to learn unit record data processing on her own. She has had 12 hours of accounting, and believes this to be the most helpful area of subject matter she had in her undergraduate work. She took one FORTRAN programming course in the mathematics department which helped her with card familiarization. She stated that she would have liked to have had more guidance and counseling courses because she thinks these courses are beneficial to vocational teachers. She has taught school for two years, and both of these years have been teaching data processing. She has had eight years of experience in office work.

She was already interested in data processing before she started teaching the subject because her husband was working in this area. She really became interested in data processing when she heard of a job opening to teach in the area.

Her opinion of her own preparation was that it was not very good. She feels that she was not properly prepared to teach data processing. She would have liked to have had some college courses in data processing.

She belongs to the Oklahoma Vocational Association, the American Vocational Association, the Oklahoma Education Association, the National Education Association, the National Business Education Association, and Delta Pi Epsilon. She feels that none of these organizations are very helpful in data processing. She sometimes attends the Data Processing Management Association with her husband. She feels that the DPMA is probably the most helpful organization.

Problems and Anticipated Changes

One problem this educator has had is the problem of placing students on jobs while they are learning data processing. She finds it difficult to find data processing jobs for all of her high school students. Another problem has been the lack of communication or understanding between vocational teachers and the administration. This lack of communication or understanding has led to problems.

This educator would like to change the arrangement of her unit record program. She would like to have a program where the students did not work on the job. She would rather have the 30 students in three small groups rather than one large group. There is not enough space in her classroom to accommodate 30 students.

Another change that is anticipated in this high school program is the change from the unit record equipment to the new IBM System 3. This change is planned to take place in January, 1971.

Recommendations for Teacher Preparation

She commented that business teachers should have a course in data processing in the business department rather than in the mathematics department. She believes that there should be some course where the basic concepts in data processing could be taught and applied. Students should have an overall view with "hands-on" experience. She feels that this course should be made available in the business teacher education program. She suggested that if no other way is possible, maybe some data processing could be taught in the collegiate office machines course.

This educator plans to keep her knowledge updated by reading professional journals and keeping in touch with the equipment manufacturers representatives.

CASE 17

General Information About the Respondent

This educator is male, married, and in the 35 and above age group. He is an instructor in a junior college in Oklahoma. He has a bachelor's degree and a master's degree. He has approximately 85 hours beyond his master's degree.

Subject Matter and Equipment

This school offers the following courses: Introduction to Computer Programming, and RCA 301 Machine Language; Introduction to Operation of Punched Card Equipment; Introduction to Computer Programming, and Assembly Language; FORTRAN; Data Processing Applications; Systems Design and Development; COBOL; Data Processing Field Project; and Key punching. A two-year program is offered in Computer Programming and a one-year program in Machine Data Processing or Unit Record. Some of the students who enter the one-year program do continue and stay for the computer programming courses. This educator recommends eight to ten hours of mathematics for the computer programming courses. This requirement consists of Data Processing College Algebra, Intermediate Algebra, and Statistics. No students are accepted in the two-year computer programming course unless they score 18 or above on the ACT test. Students who score less than 18 on the ACT can enter the one-year program and if they succeed, they may then transfer to the two-year program. This fall 38 students are enrolled in the two-year program and 27 students in the one-year program. This school has primarily boys in the two-year program and about 50-50 girls and boys in the one-year program. They only take 15 students in the keypunch classes since they just have ten keypunch machines. They train primarily for employment, however, they do encourage their students to continue their education and obtain a degree from a four-year college.

The two-year programming course includes five languages. They are RCA 301 Machine Language, RCA 301 Assembly Language, Spectra 70/35 Assembly Language, FORTRAN, and COBOL. The Spectra 70/35 Assembly Language, which is the same as the IBM 360 Assembly Language, has just been added this year. FORTRAN and COBOL are languages which can be used on most computers.

The objective of this program is primarily to train students for employment in data processing occupations; however, students are encouraged to continue their education and attend a four-year college.

The equipment used in this program consists of ten keypunch machines, three of which are IBM 024's, four are IBM 026's and three are IBM 029's. One of the 029 models is an interpreting card keypunch. This school also has a 402 accounting machine, an 082 sorter, and an 085 collator. The unit record class is also instructed in board wiring for the 514 reproducer and the 548 interpreter, even though the department does not have these machines. The RCA computer system includes a RCA 303 Processor, a RCA 323 Card Reader, a RCA 334 Card Punch, and a RCA 333 Printer. The system has a RCA 381 six-deck tape station and a RCA 376 communications controller which connects the system here in this school with the RCA Spectra 70 system in Oklahoma City. The department is a computer installation as well as a terminal for the Spectra 70 installation in the State Capitol building in Oklahoma City.

The size of the class for lecture periods is not limited. Laboratories are limited to 10 to 12 students. The laboratories are open for students to use all day and until 11:00 at night.

RCA manuals are used for textbooks in most of the courses. Most of the textbooks that are available are written to accompany IBM equipment, so the textbooks have to be adapted for the RCA equipment.

Students

Most of the students in this junior college come from the surrounding area. Many of them take jobs after one year of training. Students are not placed on the job, and there is no formal placement program. Most of the students work when they finish the program--even while continuing their education.

When asked what particular characteristics enable students to succeed in data processing, this educator replied, "I believe that it takes an inquisitive mind, some curiosity, and a desire to learn. I try to make the course as interesting as possible so they will like it."

Teacher Preparation

This educator has a major in mathematics and a minor in biological sciences. The last twenty-eight hours of course work he has taken has been in data processing. He believes that some of the best programmers are business teachers. His background gives him a different point of view. He assigns scientific type problems for his programming students where the instructor who teaches COBOL will assign problems with accounting or business applications. He said that it was not necessary to have a mathematics background for COBOL, but it would be necessary to have a mathematics background for FORTRAN.

This educator has 19 years experience as a high school mathematics teacher. He has taught data processing for four years. As for work experience, most of his summers have been spent in going to summer school. He engaged in some manual labor jobs in order to supplement his income.

This educator first became interested in data processing when he took a Saturday course in computer programming at the University of Oklahoma in 1959-60. He was a high school mathematics teacher at the time and was the sponsor of the mathematics club, so he attended this class and brought a few of his students. In 1962-63 he took another FORTRAN course at the University of Oklahoma on Saturdays. In 1963-64 he taught a course in programming at the University of Oklahoma on Saturdays. After this experience, he took other courses in data processing and four years ago, began to teach data processing full time.

When asked to evaluate his own preparation for data processing, he replied that it was inadequate. He said, "Machine language as it is taught in college did not really help prepare me for teaching. One course I took in programming, I only wrote one program. The instructor talked about the internal parts of the machine the whole semester. Some of this is fine, however, I feel a programming course should give you more experience in writing programs. If the

catalog description of this course had been 'internal parts of the computer' which in essence it was--I would never have enrolled in it. My idea is for the kids to have 'hands-on' experience--students can come in and stay all day if they want to here."

When asked what professional organizations were most helpful to him in data processing, he replied, "I belonged to many as a mathematics teacher. I still belong to the OEA and the Higher Education Alumni Council, and the Oklahoma Technical Society. I believe the Oklahoma Technical Society is most helpful to me. At these meetings, we divide up into groups and the data processing teachers meet together. I feel this helps me in my teaching."

Problems and Anticipated Changes

Textbooks are the main problem at this school--textbooks for machine language and assembly language for the RCA system. Other than this one problem, this teacher feels that the setup in this school is working out fine.

When asked what changes he would like to make, he replied that he would like to see his college's courses accepted at other colleges on a four-year degree.

Recommendations for Teacher Preparation

He recommended that an orientation course in data processing be offered for all teachers. Data processing teachers need courses offered at the college level in languages and applications, in addition to the general courses in data processing.

This teacher plans to update his knowledge in the area of data processing by studying and reading. He already has 85 college hours beyond his master's degree so he is not interested in just taking additional courses. He believes that short workshops for data processing teachers would be helpful. He made the following comment: "I would like to see colleges offer a degree in business data processing without the rigid mathematics requirements. I would like to see this program offered so that our two-year transfers could get a degree and continue their education in data processing which they have been prepared for in our program."

CASE 18

General Information About the Respondent

This educator is married, female, and is in the 35 and above age group. She has a Bachelor's Degree in Business Education and a Master's Degree in Business Education. She has approximately 18 hours beyond her master's degree.

Subject Matter and Equipment

This educator teaches two sections of unit record data processing to high school students. She has approximately 16 to 18 students in each section. One group is taught in the morning and another group in the afternoon. The equipment used to teach this subject consists of five keypunch machines, three verifiers, five simulated typewriters, the 082 sorter, the 514 reproducer, the 085 collator, and the 407 accounting machine. In this particular course, automated business applications are emphasized. Her objective is to develop a saleable skill and to enable students to have an understanding of business applications. She also wants her students to develop confidence when they are working. In her particular course she teaches manual, mechanical, electro-mechanical and electronic data processing. She does have some introduction to computers and the students usually write a program in COBOL and RPG. She feels that she cannot justify the program on the basis of the amount of placement she has in the program. The students are young, and there are not enough places in which to place students. She is teaching very little board wiring this year. She feels that the understanding of the business processes will transfer into the computer programming if the students want to continue in the program. She has been making her own practice sets this year from actual business data. She has taken a personal bank account and automated it. She has also made her own practice set using medical records. As for

textbooks, she feels that there are adequate textbooks available now for unit record, but no really good textbooks for business applications.

This teacher is teaching a personal course this year--doing more in individual instruction. Some students will work on filing this year, while others will not, depending upon their occupational objective. Her class keeps a notebook of want ads for jobs offered in data processing by the week. By this means, the student knows what is available in the field and what he must do to qualify for this job. In addition, he will also know the salary that is paid for this type of work.

Students

The students are tested by the counselors at the various schools. They are given the IBM Punch Card Machine Operators Test. This educator has all types of students. This particular school has no formal placement for students after finishing the program. When this educator was asked what particular characteristics students should have to succeed in data processing, she said that she felt initiative was the most important.

Teacher Preparation

This educator has a major in business education and a minor in economics. Accounting was thought to be the most helpful course she had had to help her prepare to teach data processing. She has learned data processing through the institutes that were held at O.S.U. two different summers. In the institute, she learned how to teach herself; consequently, she has learned a lot on her own. She feels that Oklahoma should have some type of in-service training for teachers.

As for teaching experience, she has taught for seven years. She has been teaching data processing three years. Before she started teaching, she had twelve years experience in public accounting work, and three years experience as a medical office assistant. She felt that her public accounting experience definitely helped her in teaching data processing.

She became interested in data processing when she attended the first institute at O.S.U. She feels that she is adequately prepared to teach unit record equipment, but to teach anything more advanced, she would need more preparation.

Problems and Anticipated Changes

The greatest problem she has had in teaching data processing has been in informing counselors and administrators of needs--a communication problem. The administrators and counselors do not understand the area and what is taught in data processing. Students must be interested in data processing to enroll in this course.

In the past, she had problems in getting textbooks. There have been textbooks available, but usually you would just happen on to them by accident. Another problem in the past has been selection of students--getting a student that is capable but also interested.

When asked what professional organizations were most helpful to her, she said that probably the Data Processing Management Association. She is not a member and does not attend the meetings; however, she finds their published materials very helpful.

This particular school has decided to change to the new IBM System 3. This educator feels that she can teach everything that she is now teaching on the unit record equipment plus the electronic principles of data processing with "hands-on" experience. She feels that she can teach more, better. She would like to have a data processing department in her particular school, the core subjects being keypunch, unit record, and computers. From these core courses and from performance, interest, and testing, the student could specialize at different levels. Next year the name of the course will be changed from Unit Record to Business Data Processing.

Recommendations for Teacher Preparation

This educator believes that any citizen needs an understanding of the levels of sophistication in data processing. This could be taught in one course. She feels that the best method for data processing teachers to keep updated is in-service training, reading periodicals and textbooks, and keeping in contact with industry.

She suggests that there should be more standardization of curriculum at various levels. She thought that probably the state office should do this. New teachers, especially, need guide lines as to what should be taught and equipment that should be used. She also feels that we need to have some teachers teach data processing to teachers. Most of the workshops and institutes have been taught by non-teachers and she believed that there was a communication break down. She believed that someone should do some study in methods of teaching data processing. She commented,

We need to have a recognized and established program for teachers who want to teach data processing that will be accepted at the state level. We need some way to create an awareness of business data processing. Business data processing and mathematical computer science are not one and the same. We need an established program. There should be some place for improving teachers so that present teachers can continue their education. Somebody should do something.

CASE 19

General Information About the Respondent

This educator is married, over 35 years of age, and is male. He has a Bachelor's Degree in Economics and is an educator in a private business school.

Subject Matter and Equipment

The equipment at this school consists of an IBM 360, model 25 with two tapes and two disks. They also have 12 keypunch machines, a collator, special recording equipment for a blind class, and overhead slide equipment. The languages taught at this school include: ALC, COBOL, RPG, PL/1, and Basic computing. Eight instructors are teaching the programming courses.

The objective of this program is to train professional computer programmers to fill the programming positions in industry. They have on the average of 16 students per instructor, so there is no problem with student equipment relationships.

The textbooks in use at this school during the school year 1969-70 are the IBM materials and IBM Programmed Instruction Manuals. This educator believes the students should know how to use the IBM manuals for a particular machine, since they might have to refer to these manuals on the job.

Students

All types of students are enrolled in the computer programming course at this business school. There is an age limit of 40 in order to be admitted to the computer programming course. The school has this policy because teachers feel that the students do not do as well in the program when they are over 40 years of age. They have

veterans, vocational rehabilitation people, blind students, high school graduates and drop-outs, and college graduates and drop-outs. Their typical student is about 25 years of age and has worked at a few jobs and wants to improve himself. Eighty per cent of the students enrolled in programming courses at this school are men, however, women do well in this type of work if they have the desire and aptitude to learn.

Student placement is very good at this school. Ninety-five per cent of the students in this school are placed on jobs. About three weeks prior to graduation, the instructors begin to look over their students in regard to placement. Interviews are set up and most of the students obtain jobs.

Characteristics that were mentioned by this educator that enable students to succeed in data processing were: imagination, curiosity, and general intelligence. This educator stated:

They must have a temperament for details. Programming can be very frustrating, and they must learn to live with frustration. There is a flow-charting trend developing in industry today whereby you correct errors before you get on the machine. It takes a great effort to be a programmer. We try to make them want to do this work, you cannot force them.

Teacher Preparation

This educator has a Bachelor's Degree in Economics, and a minor in political science. He has no graduate hours, but has about 180 undergraduate hours. He learned programming in two courses in his senior year at college. He received most of his data processing education on the job. He worked for a large aircraft firm in the data processing department for five years. This is his first year to teach in a private business school. His other teaching experience was one year of experience in industry.

He first became interested in data processing while taking a night class during the time he was employed as a technical writer. He later followed up this interest. He believes that his own preparation was better than four years of training.

This educator is a member of the Association for Computing Machinery. This organization was primarily for

scientific programmer, however, they are now extending it more to the commercial field. He mentioned that the Data Processing Management Association is also helpful.

Problems and Anticipated Changes

Student frustration is the biggest problem with this instructor. "Students want to learn data processing, and when they can't they become very frustrated," he replied. Another problem is getting adequate turnaround on the programs the students write. Well written textbooks are another problem that he mentioned.

As for changes, he would like to have an environment which promotes student feedback. He would like to be continually stimulating a verbal, conscious response from the students.

Recommendations for Teacher Preparation

This educator plans to keep his own knowledge updated by attending seminars that would be provided by ACM and IBM. He also plans to read extensively, for he believes that after you know two or three languages, you should have the ability to learn new ones on your own. He stated that tele-communications is now a rapidly growing field and that he would like to attend a workshop on this particular subject.

This educator believes that there is a logical way of thinking in programming, but that programming in no way should be limited to mathematics majors. He said that he would just as soon teach computer programming to a lawyer as an engineer.

His suggestions for teacher preparation were as follows: "We find that it is difficult to teach at any depth without field experience, because the material has not been adequately documented. Beginning programming can be taught by any person who has had the course himself."

He would like to make some changes in his own school by providing an executive seminar. He would like to involve management people in flowcharting and teach them the computer terminology. He could do this through seminars for business executives.

CASE 20

General Information About the Respondent

This educator is male, and is in the age group of 35 and above. He is an instructor in a private business school in the state of Oklahoma.

Subject Matter and Equipment

This school is equipped with an IBM 360, model 25, and a 9200 Univac with card reader and serial punch. This school also has unit record equipment which consists of eleven model 029 keypunch machines, ten 026 and 024 model keypunch machines, the collator, the interpreter, and two sorters. The school has a number of IBM Selectric typewriters with simulated keyboard.

The languages taught here are RPG for the Univac and IBM 360, Assembly, COBOL, and PL/1. This instructor uses all of the IBM manuals and IBM Programmed Instruction materials and thinks that they are more than adequate.

Students

This school has a wide range of students. They have more men than women enrolled in computer programming, and most of their students are high school graduates. Classes on the average have about 20 to 25 students enrolled in each section. There is no problem with students getting "hands-on" use of the equipment. The students at this school actually run financial statements for 41 businesses, so in a way this could be considered on-the-job training. This school will try to place students on jobs and many times before the student finishes the course he is enrolled in, he will have a job. This instructor said that he believed the one characteristic which enabled students to succeed in data processing was the desire to succeed.

Teacher Preparation

This teacher does not have a college degree, he is a vocational rehabilitation product. The vocational rehabilitation people sent him to school at this private business school. He completed the course and started teaching. He has been teaching for nine months. Before teaching, he had 15 years experience as a salesman.

He became interested in data processing after he took aptitude tests for the vocational rehabilitation people, and started taking the computer programming course. He feels that he would have liked to have had some actual work experience on the computer.

Problems and Anticipated Changes

When asked what problems he had encountered in teaching data processing, he replied, "The general public thinks the computer is magic. Students should have the ability to think."

When asked what changes he anticipated in their program at this particular school, he replied, "We are already set up so that as other developments occur, we can go right into teleprocessing with our computer, this leaves little to be desired."

This instructor plans to keep his own knowledge updated through various equipment manufacturers.

CASE 21

General Information About the Respondent

This educator is married, male, and in the 25 to 34 age group. He is a data processing instructor in a four-year college in Oklahoma. He has a bachelor's degree and a master's degree. He has approximately 15 hours beyond his master's degree.

Subject Matter and Equipment

The equipment at this school consists of an IBM 1130, a 1442 card reader and a 1132 line printer. They have three model 029 keypunch machines. Unit record equipment is available in this school and is being used by people in the business department for independent study courses.

Two courses are being offered in this school. The computer concepts course is for both business and mathematics students. The language used in this course is FORTRAN which is the language best suited for the model 1130. He is using Programming the IBM 1130 and 1800 by Loudon, published by Prentice Hall, for the text for this course. Cultural aspects of the computer and its effects on society are covered in this course. This school operates a "closed-shop" with student operators running the shop at night. The student operators are usually scholarship students. The equipment is located in the administration building. The second computer science course is a continuation of the first course. This course covers in depth the methods of programming a digital computer.

This educator's objectives are (1) to acquaint students with computing and its effects on society, (2) to acquaint students with the application of the computer with specific areas through programming problems, (3) to acquaint them with a specific computing system, and (4) to help the students learn to utilize a system by actually learning a programming language.

This school has not had to limit enrollment yet. The students write about ten programs during the semester and they get good turnaround.

This educator believes that there are a few good textbooks, but believes that beyond the first course, something should be written.

Students

This school requires a prerequisite of sophomore standing and a "B" average for entering the computer science courses. However, this year, they have let freshman mathematics students take the course. He feels that mathematics students do better in the course than other students. He believes that this is because mathematics students are logical thinkers.

This school has no student placement in data processing, however, they would like to have in the future.

When asked what particular characteristics enable students to succeed in data processing courses, this educator replied,

They must be able to think logically. Maturity is also important. This class is time consuming and the less mature student will not spend the time required for the course. Attitude and interest also play an important part.

Teacher Preparation

This educator learned computers in industry. In his undergraduate work, his major was mathematics. He had a physical science minor. He had no courses in computer science because there just were not any courses available that long ago. He would have liked to have had more experience with systems in general and possibly business systems.

He has had eight years teaching experience. He has taught four years in the public schools, and four years in data processing at the college level.

He worked in industry for two years, and first became interested in data processing while he was working for industry. He was a research engineer, and the nature of the problems he had to solve demanded the use of the computer.

He believes that his own preparation for teaching was inadequate in the beginning, however, since he started teaching he has had work experience in industry and college courses in computer science at Oklahoma State University. He feels that he is now qualified to teach the courses that he is teaching.

He believes that the best professional organization for data processing teachers is the Association for Computing Machinery. He is not a member at the present time, however, he plans to join.

Problems and Anticipated Changes

This educator stated two problems which he had in teaching data processing. They were (1) priorities and time scheduling of the computer where the computer is under an administrative head out of the department, and (2) inadequate facilities. The computer is located in the administration building in this school which causes the students to have to stand in the halls and wait while their programs are being run.

He would like for the computer to be located where it would be available for use by the students. Other changes he would like to make include addition of courses up to about 18 hours in the academic area, and he would like to see better usage of what they now have in the general education program.

Recommendations for Teacher Preparation

When asked what he believed the place of data processing to be in the overall program of teacher preparation, he replied,

Basically, no one will be educated unless he knows something about computers. In teaching, you are going to be a user of computers so you will need

to know more about computers in order to solve problems. Eventually, at the secondary and elementary level, teachers will need to know something about computers.

He plans to keep his own knowledge updated in the field of data processing by working summers in industry. He is also taking courses at Oklahoma State University.

He believes that there should be better communication between various areas in data processing.

CASE 22

General Information About the Respondent

This educator is male, married, and in the 35 and above age group. He is a data processing instructor in a technical institute in Oklahoma. He has a Bachelor's Degree in Business Administration and approximately 60 hours beyond his bachelor's degree.

Subject Matter and Equipment

This school offers a two-year program in data processing. The equipment consists of the IBM unit record equipment and the 301 RCA computer system. Classes are arranged so that each student has a certain amount of laboratory time so that he can have "hands-on" experience with the machines. The objective of this program is to turn out a student who can go into anybody's shop and with a minimum of additional training take over programming. The emphasis in this program is on business data processing. Three accounting courses are required--the two principles courses and cost.

Textbooks have been a real problem to this teacher. He is continually changing textbooks trying to come up with something with which he is satisfied. He finds plenty of textbook material for the introductory classes, but it is difficult for him to find material for the advanced classes.

Students

Until the fall semester of 1969-70, this school took any student who enrolled in the program. This fall they started selecting students on the basis of their scores on the RCA Aptitude Test. The majority of students in this school come from the surrounding area. Most students are just out of high school, however, night classes are offered for adults.

There is no formal placement program in this school for placing students on the job after they finish the two year program. Several large companies come to this school and conduct job interviews.

The characteristics which enable students to succeed in data processing are a combination of many. Students should have a good aptitude for mathematics; however, it is not necessary to have a lot of mathematics courses to be a programmer. The students need to have developed the kind of logical thinking which is necessary to be a programmer. Many things are important; however, if they do not like data processing and have a desire to learn, they will not succeed.

Teacher Preparation

This educator actually has a double major in accounting and mathematics in his undergraduate work. He has attended two of the summer institutes conducted by Oklahoma State University in data processing. He has taught for 15 years, and has taught data processing for six years. He has had no work experience in industry, but has helped set up the local data processing service bureau.

He first became interested in data processing when the equipment was obtained for the school business office. The cheapest way to get equipment for the business office was to qualify for the educational discount. At this time, he started teaching a course in unit record equipment.

He feels that his preparation for teaching data processing could have been better. At the time, he was very dissatisfied with the summer institutes in data processing; however, looking back he believes that they were a help.

He believes that the Data Processing Management Association is the most helpful organization for data processing teachers. He is not a member now, but he has been in the past. He also recommended the Systems Management Association.

Problems and Anticipated Changes

One of the biggest problems that this educator has is making sure that he is keeping his curriculum current.

As for changes that he would like to make in his own program, he would like to drop the unit record equipment and install the new IBM System 3. He believes that the System 3 is the coming thing.

Recommendations for Teacher Preparation

When asked what he believes the overall place of data processing should be in the program of teacher preparation, he replied,

I do not see how a business teacher out in a high school without any knowledge of data processing can be teaching an up-to-date business course, regardless of what subject they are teaching. I believe that all business teachers need a course in the introduction to data processing, and where they would go from there would be up to the individual. They probably should have at least one basic course in programming. I think that it would be real helpful for a business teacher to have six hours of data processing.

When asked how he planned to keep his own knowledge updated, he stated that he believed that every teacher needs at least two months out of the year to get some experience in industry. Professional organizations are some help, but he believes that there is no substitute for industrial experience. He said,

Computers are here to stay and we will have an out-dated teacher pretty fast in this area if they do not get out in industry and find out what is going on. Seminars are helpful. Administrators should let their teachers take advantage of short courses and seminars, and at least every two years, the teacher should be out in industry.

CASE 23

General Information About the Respondent

This educator is male, married, and in the 35 and above age group. He is a data processing instructor in a technical institute in Oklahoma. He has both a Bachelor's and a Master's Degree in Business Administration.

Subject Matter and Equipment

This school has two computers--the IBM 360, model 25, and the IBM 1620. The only unit record equipment that this school has is a sorter, and several keypunch machines. The data processing courses offered at this school consist of the following: Computer Programming I (COBOL), Computer Programming II (PL/I), Programming Systems, Computer Programming III (assembly language), Scientific Programming (FORTRAN), and Systems Development and Design. This educator feels that his program is not enough business oriented and too much mathematics oriented. Most of the business courses that he would like to add are junior and senior level courses at other schools, and since this is a two-year school, these courses would not transfer. His objective of this program is to turn out a competent computer programmer. All of the students in this program have "hands-on" experience.

He believes that textbooks have improved in the last few years. He has no trouble finding textbooks for the programming courses, but he does have trouble finding textbooks for the advanced courses such as Systems Design and Development. He usually combines information from two or three books and supplements this information with the IBM manuals.

Students

The type of student at this school is older and more mature. He ran a study on the type of student attending

this school and found that the average age of students is 26.8 years. The average age of men students is 26, while the average age for women students is 28. The average student at this school works 32.7 hours per week. Students are not selected in any way for the data processing program.

He believes that the most important characteristics that students should possess in order to succeed in data processing courses are: the student must be industrious, and must be a logical thinker. He does not believe that a logical mind can be developed. He believes that you either have it or you do not.

Teacher Preparation

The accounting courses this educator took in his undergraduate and graduate work have been very helpful to him in teaching data processing. He took about 42 hours of accounting. He has taught business subjects for 21 years. He has worked for seven or eight summers in industry.

He first became interested in data processing when he took a temporary job. He had taken some unit record courses in 1947, and he was asked to teach a course in unit record data processing while he was working on his master's degree. He started teaching and has been teaching ever since. Throughout his teaching career he has taught some data processing courses along with the business courses.

He is a member of the Data Processing Management Association, and believes this organization to be the one most helpful to the data processing teacher.

Problems and Anticipated Changes

Two of his main problems have been having classes that were too large and inadequate textbooks. There has also been a lack of understanding on the part of the administration of the problems involved in teaching data processing. The administration thinks of data processing just as another three-hour course just like English or history. Data processing courses take more time.

In addition to the business courses that he would like to add to the curriculum, he would like to change the

program so that students could have two options--business or mathematics. He said,

Some students are real great in everything but mathematics. When they go on the job they will probably be doing business problems, so why keep them out of computer programming because of mathematics.

Recommendations for Teacher Preparation

He believes that every teacher should have some acquaintanceship with data processing. Most business textbooks anymore, have a section on data processing. It is included in management textbooks and the management teachers cannot teach it. He feels that all business teachers should have some work in data processing.

He plans to keep his own knowledge updated by attending workshops and reading current literature. He made the following suggestions for teacher preparation in data processing:

There needs to be special courses set up in the computer area. The typical computer science course does not fit because we need courses where teachers get "hands-on" experience on the equipment that they will be getting to use. It is probably about as necessary to have "hands-on" experience as it is to know programming. The broad curriculum in computer science does not fit the teacher who is going to teach in this area. The teacher must know how to run programs. The teacher is the operator in the area vocational schools. Special courses should be set up for teachers--they should not take all computer science courses.

CASE 24

General Information About the Respondent

This educator is female, married, and in the 25 to 34 age group. She is a data processing instructor in a four-year college in Oklahoma. She has a bachelor's degree and is working on a master's degree.

Subject Matter and Equipment

This educator is currently teaching three sections of COBOL. This is a course in the theory and application of the use of electronic computers in business data processing. The text for this course is A Guide to Cobol Programming by MacCracken, and The Computer Sampler by Boore and Murphy. This college operates a "closed-shop," so students do not actually operate the computer in this course. The students do keypunch their own programs.

Teacher Preparation

She has a Bachelor's degree in Mathematics Education. She has just started working on a master's in computer science. As for preparation to teach data processing, she had none in college, but learned data processing in industry. This is her first year to teach.

She first became interested in data processing while she was in the ninth grade. She had a relative who worked in data processing who showed her the computer center, and she was fascinated. She knew then that she wanted to work in this area.

She is not a member of any professional organization at the present time.

Problems and Anticipated Changes

Her main problem has been that she is teaching everything for the first time. This is also her first year to teach, so she thinks that most of her problems will be solved with the passing of time.

She believes that most people who do not teach data processing do not realize how much time it takes to teach this subject. She has students in her office all of the time. If she does any preparation for teaching, she must do it at home.

She plans to update her knowledge by attending school and reading data processing publications.

She feels that management people should have knowledge of how the computer can solve a problem, and that accounting people should have knowledge of COBOL. She feels also, that teachers should have some knowledge of computers and what they can do. She commented further on the subject, and said,

All business students should have some knowledge of computers and what they can do. So many students do not have any idea of what a computer can do--many of them think that you can pick up a magnetic tape and read it. All students should be familiar with a language and write some simple programs for a computer, whether they are teachers or business administration majors.

CASE 25

General Information About the Respondent

This educator is male, married, and in the 35 and above age group. He is a data processing instructor in a four-year college in Oklahoma. He has both a bachelor's and a master's degree.

Subject Matter and Equipment

This four-year college offers two courses in data processing in the business department. They are entitled Electronic Data Processing, and Management Information Systems. The electronic data processing course is a business applications course using COBOL. The IBM manuals are used and also MacCracken's book for COBOL. The equipment is not located in the business department at this school. It is located in the computer science department. The college operates a "closed-shop" so that the only machine the student operates is the keypunch machine to punch his programs.

Students

There is no student selection at this school. The college takes whoever enrolls in the data processing courses. Students are not placed on the job during their course work in this program. This educator felt that the characteristic which students should possess to enable them to succeed is a logical mind--the type of mind that likes to work puzzles grasps the computer better. There is a challenge to the students of making the computer do what they want it to do.

Teacher Preparation

This instructor has been teaching data processing ever since the program was started by this school 16 years

ago. He has had 19 years of teaching experience--16 of which he has been teaching data processing. He has had some work experience in an accounting firm, but no data processing experience in industry. He is an accounting major and also is a CPA. He obtained his education in data processing by attending IBM schools and by teaching himself.

He became interested in data processing when a vacancy occurred in the data processing teaching staff of the college, and he was offered the job. He believes that after some basic background in computers, one of the best ways to learn data processing is to start teaching.

He is not a member of any professional organizations in data processing. He is a member of several accounting and finance organizations. He recommended the Data Processing Management Association for people in business data processing.

Problems and Anticipated Changes

One problem mentioned by this educator is that data processing is not like other courses. Once a student gets behind in data processing, he can never catch up.

He believes that any educational institution should have at least two people in the College of Business who are principally involved in computer courses. He would like to have another full time person in this field in his school. He also mentioned, that the College of Business in this school is moving to the utilization of computers in other courses--especially management.

Recommendations for Teacher Preparation

This educator believes that all teachers of business education ought to at least be exposed to data processing and write a few simple programs. He believes that you cannot learn too much if you plan to teach in this area. He also stated that it would be helpful to the business teachers to have "hands-on" experience.

CASE 26

General Information About the Respondent

This educator is male, married, and in the over 35 age group. He is a data processing instructor in a junior college in Oklahoma. He has a bachelor's degree and a master's degree.

Subject Matter and Equipment

This school offers the following courses: Introduction to Computer Programming, and RCA 301 Machine Language; Introduction to Operation of Punched Card Equipment; Introduction to Computer Programming and Assembly Language; FORTRAN; Data Processing Applications; Systems Design and Development; COBOL; Data Processing Field Project; and Key punching. A two-year program is offered in Computer Programming and a one-year program in Machine Data Processing or Unit Record. Some of the students who enter the one-year program do continue and stay for the computer programming courses. This educator is teaching the unit record equipment. He teaches an overall introduction to all of the machines. He teaches applications for each machine and includes a project which involves all of the machines.

The objective of this course is to give students a general knowledge and make them employable in unit record installations.

This teacher is using the IBM manuals plus the Anaheim Publishing Company materials to teach unit record. He feels that there is no one adequate textbook for this course. He believes that most textbooks spend too much time on one particular machine, and not enough time on another. He would like to have a textbook for unit record with more applications, and more examples. He particularly likes a new textbook for COBOL entitled Fundamentals of Cobol Programming by Carl Feingold, published by Wm. C. Brown

Company, Dubuque, Iowa. Another textbook which looks good to him is by the same author and publisher, entitled Fundamentals of Punched Card Data Processing.

This instructor teaches some flow-charting, but does not go into this topic in depth. He feels that it is necessary for the students to know how to flow chart, but he does not believe that every program that they write should be flow-charted first.

Students

Most of the students in the unit record program plan to attend one year. He had 26 in the program last year and six of these 26 returned this year to continue in the program. This school has more girls in the one-year program and more boys in the two-year program.

This educator tries to help in placing students, however, the school does not have a formal placement program. All of the two-year students at this school have jobs and some of the one-year students will quit before the end of the year to take a job as a keypunch operator.

When asked what characteristic he believed to be most important for students to possess in order to succeed in a data processing program, he replied, "I believe that logic is most important. After logic, I would say having a desire to learn."

Teacher Preparation

This educator has a major in mathematics and business. He has a double major and no minor. Of the courses that he has taken, he believes that accounting was most helpful in preparing him to teach data processing. He believes that everyone should have a minimum of six hours of accounting and possibly cost accounting. He also recommended six hours of mathematics and business statistics for data processing work.

He has had 15 years of teaching experience. He taught mathematics for 11 years, a combination of mathematics and business subjects for two years, and has been teaching data processing for two years.

He has had several types of work experience. He worked as a billing clerk in the accounting department for an oil company, and he has worked as a salesman. He now owns a business jointly with his wife. He sometimes uses actual business situations which take place in his own place of business for data processing problems.

He feels that his own preparation to teach data processing is inadequate. He believes that he has had enough college courses, but not the right kind. He made the following comments relative to his own preparation.

Teachers have been prepared by short summer institutes and are not adequately prepared to teach. In the courses I have taken, the instructors have not required enough programs to be written in order for me to become proficient in programming. I do not know what the real problem is--they (instructors) just do not seem to communicate in college courses. The instructors are not teaching you what you really need to know in order to teach the course yourself. They are teaching too much technology of what goes on inside the machine and not enough practical applications.

When asked how he first became interested in data processing, he replied, "I became interested in data processing while I was teaching mathematics."

He is a member of the National Education Association, the Oklahoma Education Association, and the Oklahoma Technical Society. He feels that the Oklahoma Technical Society is most helpful in data processing since he is able to exchange ideas with other data processing teachers at the meetings.

Problems and Anticipated Changes

The main problem at this school was in arrangement of classrooms. He would like to have the classrooms arranged together as a department. He felt that the computer system which they operate at this school had worked out fine.

He would like to add a 407 accounting machine to replace the 402 model at some time in the future. He would also like to add a new language to the curriculum. He would like to add PL/1.

Recommendations for Teacher Preparation

This educator believes that all business students should have an introductory course in data processing and COBOL. He feels that all business students should have one programming class. The way business is going now with more and more automation all the time, business students should have some data processing.

He believes that data processing teachers need courses on the machines that really get involved, so that they will have a better knowledge of the machine in order to teach.

He plans to keep his knowledge updated in data processing by relying on company representatives to keep him informed on new developments. He also plans to go back to school to study any new languages.

His suggestions for teacher preparation included the following:

I would like for people in general to be more aware of data processing and realize the importance of it. I also believe that it would help teachers for companies such as IBM to have short workshops and explain the new developments to the teachers.

CASE 27

General Information About the Respondent

This educator is male, married, and in the 25 to 34 age group. He is a data processing instructor in a junior college in Oklahoma. He has a Bachelor's Degree in Business Administration. He has three hours beyond his bachelor's.

Subject Matter and Equipment

This school had an outstanding program in data processing in 1962, and since that time the program has stagnated somewhat. In 1968 the college had 119 students enrolled in data processing courses with 68 majors in the two-year program. Seven courses are offered at this college. The courses are: Basic Computer Concepts, Electric Accounting Machines I, Electric Accounting Machines II, FORTRAN, Assembly Language, COBOL, and Introduction to Systems Design. There is really no mathematics requirement for the data processing students. This program is a business program rather than a scientific program. Students have limited opportunities for employment when they leave the two-year program. He encourages students to take mathematics and those subjects leading toward a four-year degree.

When asked what his objectives were in the two-year program in data processing, this educator replied,

I am interested in doing all that I can within the restrictions of the equipment that I have. The students need to be aware of the unit record, and this should be taught for purposes for introduction to systems. I do not feel that I am training people to go to work in unit record equipment. I feel that it is a rather limited field for the student. The concepts course gives him an overall view of data processing in general and very little in particular.

The FORTRAN course is attended by 15 per cent engineering oriented students so I try to include scientific applications. Other programming courses are taught from a business point of view. I try to go as far and as fast as my capabilities are able to produce. I try to serve the students that I have and hope for an improved caliber of student. I feel I have a lot to learn from the educational point of view as to how to interest and how to motivate the students.

The equipment in this school consists of the 3M set of transparencies, the 402 accounting machine, the 085 collator, the 514 reproducer, and two keypunch machines all owned by the college. The college also purchased a printer on the computer. The 1130 system card reader and punch and central processing unit are leased. The laboratory is open all the time. Students may come in any time to work on problems.

Students

Most of the students come from the surrounding area. There is no type of student selection. The college just takes anyone who enrolls. As for placement of students, last year the school sent a book of resumes of the students to prospective firms.

When asked what particular characteristics students should possess to succeed in data processing, this educator replied,

They should have an attitude which allows them to persist in their efforts. There are many that are smart enough, but just will not put out the effort to do something over and over until it is correct. I am not really close enough to the students to be aware of their study habits.

Teacher Preparation

This educator has a major in marketing, and no minor. He had one "blackboard" course in FORTRAN before he went to work for industry. He worked for industry two years. He wrote new programs about half of the time, and the other

half of his time was spent in maintenance of programs. He received quite a bit of systems training, although he did not realize it at the time. This is his second year to teach.

When asked his opinion of his own preparation for teaching data processing, he replied,

The best people in data processing are not going to stay in teaching, because of salaries and because of repetition in the job. A programmer is usually doing something new that he has not done before, and I miss that. This year I am just doing the same thing that I did last year, although I will probably develop some new problem material. I hope to go back to industry in several years. I wanted to get away from the metropolitan city living costs, and I will sometime get a master's degree. I am happy with my job. I could have had more education courses that dealt with motivation and communication skills, but I would not trade the additional education for my work experience.

He believes that the Data Processing Management Association is the most helpful organization to data processing teachers, although he is not a member.

When asked what type of problems he has had in teaching data processing, he said,

There is a communication deficiency somewhere. I do not know if it is me or the students. The students do not learn as rapidly as I would like.

When asked what changes he would like to make in his own program, he said that he would like to add 4,000 words storage to the computer to handle a RPG compiler. He would like to have an interpreter and do away with the collator and use the sorter for collating. He believes that it will take him about a year to learn what he needs to learn on the new computer they have. He would like to see the two-year vocational program discontinued. He does not believe that it is complementary to industry's requirements. He believes that we should tailor education to fit industry's hiring practices, which is the trend toward a four-year degree.

When asked what he believed the place of data processing to be in the overall program of teacher preparation, he stated:

Data processing is a tool for communication. Anything that can be written with a pencil can be put on a computer. If an educator believes that business students need communication skills, then he should be familiar with input and output of data processing. It would help the programmers and systems analysts if management was more familiar with systems design, and concepts of data processing systems. For every one programmer, there are many people involved. All of these people need educating. (In other words, we teach a lot more general biology courses than we do neural surgery.) Something should be done to reduce the lag time in equipment development and the time when the student can learn about it. Terminal computers will enable some of this to come about. Computers will become common place in the future.

This educator plans to keep his own knowledge updated by reading the Wall Street Journal, and touring data processing facilities. He believes that summer experiences in industry are very important for the data processing teacher.

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CASE 28

General Information About the Respondent

This educator is male, married, and in the 24 to 35 age group. He is a computer programming instructor in an area vocational school in Oklahoma. He has a bachelor's degree and a master's degree.

Subject Matter and Equipment

This educator is teaching Introduction to Electronic Computers, FORTRAN, and Advanced Programming Concepts--Machine and Assembly Language this semester. The equipment at this school consists of the RCA 301 computer system, and the use of the RCA Spectra 70 in Oklahoma City. The school also has unit record equipment consisting of the 402 accounting machine, the sorter, the collator, the reproducer, the interpreter, eight keypunch machines and three verifiers.

The main objective of this program is to take a student and over a two-year period have a student who is employable in the programming field.

He believes that the FORTRAN book that he is using by Anderson is excellent. He does not feel that the textbooks for machine language are adequate. He has not found a good textbook for basic assembly language.

Students

Various types of students attend this school and are enrolled in computer programming. This instructor has several students who have two or three years of college. The age of students ranges from 18 to 50. This school also offers night classes. The program in this school is post high school.

All of the students in this program have six weeks on-the-job training during their last semester. This educator works through the Data Processing Management Association in order to place students on the job for six weeks. Last year this school had three graduates of the day program. Two of these are now working directly in the programming field. (In this type of program many students drop out before completion of the program to take jobs.)

When asked what characteristics the student should possess in order to succeed in data processing, this educator replied, "It takes an ambitious person. They should have at least average intelligence. The person in data processing should be a creative person--a person who can start with a little bit of information and create something."

Teacher Preparation

This educator has a major in mathematics education and a minor in physical education in his undergraduate work. As to courses that were particularly helpful to him in his teaching, he said that mathematics and statistics were most helpful. He said that he wished that he had taken more accounting in college--he would have liked to have had a minor in accounting.

This teacher has worked two years in industry. He had one full year of programming experience in industry in another state. As for teaching experience, this year is his sixth year to teach. He has taught data processing for three years.

He became interested in data processing when he heard about the institute that was going to be held at Oklahoma State University. He applied for admission to the institute and was accepted.

When asked to evaluate his own preparation for teaching data processing, he stated that two things could have been better--a stronger accounting background and more industrial experience.

He is a member of the Oklahoma Technical Society and the Data Processing Management Association. He feels that the Oklahoma Technical Society has not done as much as it

could to help data processing teachers. He feels that this organization should help with textbooks, curriculum outlines, and set standards. He believes that the Data Processing Management Association is very helpful to him in data processing.

Problems and Anticipated Changes

The biggest problem for this educator has been in the development of courses. Some textbooks are good, but they were not available the first year he taught data processing. He did not have a textbook like he wanted the first year, so he had to get what he wanted out of various textbooks and fit it together so that it would be meaningful to the class.

The development of meaningful applications has been another problem. If you have limited industrial experience, you have to work real hard to come up with jobs that would actually be done in industry.

This school has had some problems with technical assistance on the Spectra 70. This is due to the fact that the instructors had no formal training in Basic Assembly Language. They would try to get programs to run on the Spectra 70, and when they would not run, no one knew what was wrong.

This educator would like to see somebody be able to set up a situation where data processing teachers could be placed in industry during the summer months. He feels that he is in a rut. He bases everything that he does on the one year of experience in programming for industry.

The changes that he would like to see happen to his own program include the following: he would like to see it become college accredited, and he would like for education to be open ended so that students in this school could go on and obtain a college degree without losing credits.

Recommendations for Teacher Preparation

When asked what he thought the place of data processing was in the overall program of teacher preparation, he replied,

Somebody has to start thinking about it sometime. Let's face it--we are in a computer oriented world and becoming more so every day. Nobody but private institutions is taking any responsibility. We have to go to industry to get trained people in this area, and these people have had no teacher training. Knowledge alone does not make a teacher. Some of these people can just be ridiculous in the classroom. It is about time for some university to start training data processing teachers.

He said that if the prediction of the computer classroom is the case by 1975 then every single teacher needs data processing. He stated:

The state schools have not shown any interest. At the University of Oklahoma, they want to train a computer scientist and not a computer programmer. There is no one in teacher related fields doing anything about teaching data processing teachers. They should be teaching programming in college to teachers. Not everyone needs to be a computer scientist--this is good, but we do not need a lot of computer scientists.

This educator plans to keep his knowledge updated by going back to work in industry. His final comments included the following:

People need to open their eyes. The leaders in education are not up to date. There seems to be about a ten year lag between industry and education. Eighty per cent of the programming being done is in the business world. Chances are four out of five that programmers will be doing programming for business.

CASE 29

General Information About the Respondent

This educator is male, married, and in the 35 and above age group. He is an instructor in a four-year college in Oklahoma. He has a Bachelor's, a Master's, and a Doctorate in Business Administration.

Subject Matter and Equipment

This educator is teaching two sections of statistics and is the director of the computing systems on the main campus of this college. The college offers courses in Introduction to the Computer, Punched Card Data Processing, and Introduction to Computer Languages. This college has two IBM 1130's. One is located in the business building, and one in the engineering building. This college has recently installed a terminal with Control Data Corporation for time sharing. IBM unit record equipment is used for the instruction of the course in punched card data processing.

This educator stated that the textbooks in data processing range from very good to very bad. Most of the textbooks were considered by him to be satisfactory.

Students

There is no student selection for admittance to data processing courses on this campus. This educator believes that in order to succeed in data processing, the student must be a logical thinker. The student must be capable of giving personal attention to detail.

Teacher Preparation

This educator first learned data processing in the Air Force. He was commander of one of the first Air Force

bases to be computerized. He later did his research for his doctoral dissertation on the computer. He has been teaching for five years in this four-year college. He did a lot of teaching as an officer in the service also. His formal academic preparation in data processing is non-existent.

He believes that teachers are going to have to learn data processing on their own, unless industry will help finance college programs.

He believes that both the Data Processing Management Association and the Association for Computing Machinery are helpful to data processing teachers. He is not a member of either, but is trying to establish a campus chapter of the Data Processing Management Association at the present time.

Problems and Anticipated Changes

There is a problem of carry over in this school. All data processing courses are offered on the sophomore level. This educator feels that there should be a computer applications course at the junior or senior level.

Another problem is that the faculty at this school is not computer oriented; however, he believes that time will overcome this problem.

This educator is involved in writing case problems for statistics whereby the student can use the computer to do the arithmetic for him in solving problems. He plans to publish his cases.

Recommendations for Teacher Preparation

This educator believes that data processing education is almost as important as learning to read and write. He said,

It is a tool and no teacher can be proficient in his occupation unless he can use the computer. One of the important tools of discovery is the computer. If you are knowledgeable in this area, as you progress, knowledge of the computer will give you something that you will never see if you depend

on someone else to be your eyes. The computer enforces logic. Attention to detail is a necessity in writing a program. It is like saying a chemist doesn't need to know how to conduct a lab experiment because he can hire a graduate assistant to do this for him. All instructors should be able to instruct with the latest tool possible.

He believes that students in business should be able to use the computer for decision making. He suggested that students should learn some programming language. He prefers FORTRAN because it is the language of decision making and COBOL is the language of record keeping. After you learn FORTRAN, he does not believe that it is difficult to learn another language.

He believes that every teacher must think in terms of application rather than in terms of technique. The teacher should read extensively and be aware of the hardware developments.

CASE 30

General Information About the Respondent

This educator is male, married, and in the 25 to 34 age group. He is a data processing instructor in a four-year college in Oklahoma. He has a bachelor's degree and a master's degree.

Subject Matter and Equipment

This school is offering courses in computer science for both mathematics students and business students. The business courses offered are as follows: Business Computer Programming I, Business Computer Programming II, Advanced Computer Concepts, and Computer Science Seminar. The majority of the students in computer programming courses are business students. Business students account for about 40 per cent of the total enrollment of the college. The computer center is operated solely for instructional and research purposes. They do not do any administrative data processing in the computer center. It was funded by the division of mathematics and physical sciences. There are nine courses offered in computer science at this college. Of these nine courses, some have mathematics emphasis and some have business emphasis.

The equipment in this college consists of two keypunch machines, an IBM 1130 computer with a 2315 disk drive and a 1442 card reader. This school has a laboratory assistant in the laboratory at all times and runs a completely open shop. All students have two hours a week on the machine, and at other times the laboratory is open if students need to do extra work.

The objective of the program at this college is primarily to make students aware of the computer--what they can do and how to do it with the computer. Two languages are taught at this school, FORTRAN and Assembly. The school

plans to offer RPG, and will teach COBOL if it is ever possible on the 1130. Business students are taught FORTRAN. In the Business Computer Programming I course, students develop about eight programs on their own. In the Business Computer Programming II course, the students develop a project such as inventory control, banking, etc., some type of business application.

The business department in this school is doing a lot with the computer in other courses. They are using games such as Finansim for a finance class, and The Executive Game for a management class. This school also has a one-week workshop for elementary teachers designed to provide them with an introduction to computers, their programming and applications. Laboratories are operated for eight or less students at one time.

The greatest difficulty this teacher has with textbooks is in finding an introductory programming book for business students. He is now using Price's book, Fortran IV, published by Holt, Rinehart & Winston. He commented that it was difficult for him to find a textbook that suits his particular equipment--the 1130.

Students

There is no student selection in this college for data processing courses. There are no prerequisites for the first courses. This educator has found that grade point averages seem to be the best indicator of success in data processing.

Teacher Preparation

This educator has a Bachelor's Degree in Mathematics and a Master's Degree in Mathematics. He has approximately 12 hours beyond his master's. He worked for four years as a statistical analyst for industry. This is his third year to teach full time in data processing. He taught courses in data processing at night for two years. He became interested in data processing while working as a statistician. He plans to extend his schooling in computer science and attend institutes.

As for the emphasis on mathematics in data processing programs, he commented as follows:

Undoubtedly the ability for logical thought is a requirement for success in data processing. Some students have this without mathematics and some do not get it with mathematics. As to the difference in computer science for mathematics students and computer science for business students, they are fundamentally the same, but the applications are obviously different.

This educator is a member of the Data Processing Management Association and the Association for Computing Machinery. He recommends both of these organizations for data processing teachers.

Problems and Anticipated Changes

The problem at the college level is that students have such diversified backgrounds. You get freshmen and seniors in the same course--there is a wide range of students. He feels that he loses a few students and bores a few students due to this wide range. Most of the students have the same assignments, and he gets duplication of programs. He has reduces the amount of their grade from the programs and gives more tests. When he has time, he assigns each student a different program; however, this is difficult to do because you sometimes cannot think of 30 different programs that are of equal difficulty.

As for changes, he would like to make the two introductory courses that the college is offering now into one course and then branch off into two different areas. At the present time the college is offering one introductory course for mathematics students and another introductory course for business students. He said that after students learn the fundamentals in the beginning course, there is a distinct difference in the mathematics courses and the business courses.

Recommendations for Teacher Preparation

This educator commented that the students that our current teachers are training are coming up in a generation where computers are more prevalent. He feels that all

teachers need an introduction to data processing, and data processing teachers obviously need some college training.

He plans to keep his knowledge updated by attending institutes and reading journals in the area of data processing.

He believes that it would help any teacher to have a course in data processing. He believes that business teachers should have a programming language. He hopes to introduce a course for teachers at his college. All courses offered in data processing in the business department now are electives.

APPENDIX D
QUESTIONNAIRE

Level	Emphasis	
	Computer Science	Business Data Processing
_____ Certificate Program		
_____ Baccalaureate Degree		
_____ Master's Degree		
_____ Doctoral Degree		
_____ Courses offered under non-degree program (electives, adult educ.)		
_____ Other _____		
(Specify)		

3. In what department are courses offered?

Business _____
 Computer Science _____
 Mathematics _____
 Other (Specify) _____

4. What courses are offered in your school?

Keypunch	_____	Data P. Math	_____
Unit Record Systems	_____	Data P. Systems	_____
Computer Theory	_____	Data P. Applications	_____
Programming	_____	Accounting Systems	_____
Programming Systems	_____	Market Research	_____
Systems Analysis	_____	Information Storage	_____
Computer console	_____	and Retrieval	_____
operation	_____		
Other (Specify)	_____		

III. School Policy

5. When did your school begin offering courses in business data processing? _____

6. How has your data processing program changed since it was first offered?

No change _____
 Added more equipment _____
 Added courses _____
 Changed standards _____
 Other (Specify) _____

7. Do you require any data processing subjects for persons obtaining a degree in business teacher preparation?

Yes _____ No _____
 If yes, how many college hours are required? _____

8. Do you encourage students who plan to receive a degree in business teacher education to take data processing electives? Yes _____ No _____

9. Where is your equipment located?

Own department _____
 Business or Govt. office _____
 School Adm. office _____

10. What are prerequisites for business data processing courses?

College Algebra _____
 Statistics _____
 Calculus _____
 Other (Specify) _____

11. Are data processing courses required in the School of Business for management, marketing, finance, and economics majors?

	Yes	No
Management	_____	_____
Marketing	_____	_____
Finance	_____	_____
Economics	_____	_____