Automated data processing education in the public high schools of Wisconsin

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AUTOMATED DATA PROCESSING EDUCATION

IN THE PUBLIC HIGH SCHOOLS

OF WISCONSIN

1968-1969

By

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degree of

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CHAPTER I
INTRODUCTION

Technology and automation, which have exerted tremendous social and economic impact on society, produced data processing and computers. Although accepted enthusiastically by business and industry as an innovation for facilitating and perfecting many procedures, data processing has been slow in making any appreciable inroads in the field of education.

STATEMENT OF THE PROBLEM

What types of automated data processing equipment are in use or available for use, and what types of automated data processing courses are being taught in the public high schools in the State of Wisconsin?

1. High school administrators and faculty need information concerning equipment and courses in order that they may have some basis for intelligent decision making in the area of school offerings in automated data processing equipment and courses.

2. The higher education institutions across the state involved in teacher education and preparation need this information in order to update and develop new courses and methods that will properly prepare the prospective teacher entering the teaching profession and to upgrade the experienced teacher's knowledge.
3. The Wisconsin Department of Public Instruction could utilize this information in order to advise school officials in the areas of automated data processing equipment and course content, as well as a basis for further study in curriculum, methods, and equipment best suited to automated data processing instruction.

OBJECTIVES

The primary purposes of this thesis were to determine what types of automated data processing equipment are in use, and what types of automated data processing courses are being taught in the public high schools of Wisconsin. Also, the future plans of school administrators in this area and teacher preparation and work experience was analyzed. Specific questions which were answered in attaining the stated purposes were:

1. What data processing content is taught in the publicly supported high schools in Wisconsin and to what major purpose?

2. What unit record equipment and electronic computers are available for use, and what use is now made of such equipment?

3. What are the future plans of schools in the area of data processing?

4. What is the preparation, work experience, and number of teachers presently engaged in data processing?

5. What are the projected needs in the area of teacher training in data processing?

A secondary purpose of the study was to seek ideas which could be used to make improvements in future programs; such as, the Experienced-Teacher Fellowship Program being offered at the University of Montana, Missoula, Montana.
SIGNIFICANCE

There is a lack of knowledge and agreement among school administrators and business educators as to the offerings in automated data processing on the secondary school level. These school officials can only speak on an assumption basis when discussing data processing.

The study will show what is being offered in the data processing area of the curriculums in public secondary schools in Wisconsin and will attempt to make suggestions that will be helpful to school administrators, educators, and to others in decision making and those conducting research in this area.

Examples of disagreement are shown when Tonne states:

Awareness of the impact of data processing upon the functioning of business is vital. Programs of instruction in advanced business and in bookkeeping must include these learnings if they are to be meaningful. Apart from these understandings, however, added training in data processing at the high school level should be questioned rather than encouraged....

Adamson agrees with Tonne when he advocated the integration of data processing within existing courses.

Haga disagrees when he advised,

First-year bookkeeping should be followed by an intensive course in the principles of punched card data processing, which is the method often applied to routine bookkeeping tasks....If after one and one-half years of bookkeeping


and data processing, a student has open time for additional electives, I would recommend a semester course in computer fundamentals.³

LaSalle also disagrees when he stated,

Business Education Departments in the secondary schools should offer a separate, one-year course on automation. This course, to be given on the twelfth grade level, should include a study of the following units: types of automated equipment available, employment opportunities in the field of automation, an orientation to data processing, and automated equipment operation.⁴

Although differences of opinion such as those shown above may not be resolved through this study, a study of this nature is needed to show what path educators in the state are currently taking in this type of education. It is hoped that it will also lead to the upgrading of such education and bring a closer union of thought to all involved in this area.

It is assumed that automated data processing is, and should be, taught on the secondary school level within all high schools in the State of Wisconsin.

DELIMITATIONS

The population for this study was delimited to publicly supported high schools in the State of Wisconsin. Also, only those schools that responded to the initial questionnaire or follow-up letter were referred to in the study.


The primary objective of this study was to determine the status of data processing instruction in Wisconsin as it exists at the present time. There was no attempt made to measure the adequacy of available data processing equipment used for instructional purposes or to evaluate the adequacy of that instruction.

LIMITATIONS

The data accumulated in this study can apply only to the population identified. Schools having nothing whatsoever in data processing and those not wishing to participate in this study or to respond to the questionnaire may, therefore, make the results less valid.

Also, the fact that the study relied on the questionnaire as the main instrument in attaining replies and on the researcher's ability to correctly interpret the data may lessen the validity of the results.

DEFINITION OF TERMS

DATA PROCESSING The handling by manual or electronic means (or both) of all paper work from the production and distribution of goods and services, including all steps in the processing cycle (classifying, sorting, calculating, comparing, summarizing, and recording.)

UNIT RECORD OR PUNCHED CARD EQUIPMENT Electromechanical machines such as: (1) key punch, (2) sorter, (3) collator, (4) reproducer, (5) interpreter, (6) accounting machine (also referred to as tabulator), (7) other card-handling equipment. Each machine has a particular function or series of functions to contribute to the whole.
COMPUTER  An 'Electronic Machine' capable of manipulating 'Data' expressed in 'Symbolic Form' according to 'Logical Rules' in a 'Self-directed' but 'Predetermined' way.

AUTOMATED DATA PROCESSING COURSES Those courses which have as their major objective the understanding of automated or electronic data processing equipment, its operation and uses.
CHAPTER II

REVIEW OF THE LITERATURE

There has been an increasing number of efforts made to identify problems created by the introduction of integrated data processing into business offices and to determine the educational implications of electronic data processing on the curricula in both high schools and institutions of higher education. These investigations have analyzed and explored such areas as the existing automated data processing education taught, the electronic data processing equipment available for student use, the duties of persons employed in the various electronic data processing occupations, the training and personal qualifications necessary to perform these duties successfully, the salaries paid in jobs on different levels, applications for which computers have been used in processing business data, the specialized training programs provided by businesses, and the types of equipment used. These factors have been examined in the hope that the knowledge thus obtained would prove beneficial in curriculum development and equipment acquisition at both the high school and higher educational levels.

The growth of automated data processing in secondary schools can be seen when a comparison is made between studies conducted by LaSalle and Davis. When LaSalle\textsuperscript{5} did his study concerning the role of data

\textsuperscript{5}LaSalle, loc. cit.
processing in secondary schools, 1961, he could locate only ninety-five schools in the entire United States that offered data processing instruction. Seven years later the study conducted by Davis showed one hundred and two separate high school districts reporting electronic data processing equipment in Pennsylvania. To combine the implications of data processing into our rapidly moving educational concept a new term was coined. Edumation is automation in education or automated education, and represents this new educational concept.

Cook conducted a postal card survey in late 1965 and early 1966. He wanted to determine how much data processing equipment was in use in school districts, how this equipment was being used, what type of equipment was used for instruction, and find if community surveys had been part of the original equipment planning. Although his sample represented a small percentage of return and could be viewed only as preliminary research, he found that 23.2 percent of the respondents had some data processing equipment in their school districts; but that only 7.2 percent allowed any student access to the equipment for instructional purposes. The schools having the greater percentage of the equipment were generally quite large, and these large schools were about the only ones to have a computer. The survey indicated that the number of schools having access to data processing equipment was expected to almost double within the next two years.

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Carlberg\(^9\) conducted a survey of business education practices in the teaching of automated data processing at the high school level. The purpose of the study was to determine how high schools were handling data processing programs.

The population was restricted to an in depth study of ten high schools in the United States that offer data processing instruction as a special training course. Of the ten high schools, two were actually post-high schools on the junior college level, and two other schools offered data processing instruction only on the IBM key punch machine. Thus to present a realistic picture of data processing training at the secondary level, only the other six schools were included in the study.

Her study indicated that (1) the field of data processing is one of the fastest growing and dynamic occupational areas in our nation today, (2) some data processing instruction should be included in the high school curriculum, (3) administrators, in setting up a business curriculum, must keep in mind the two types of students who will be graduating—those going on to college or training school and those seeking employment after high school, (4) teacher education is of major concern in adequate data processing instruction, and, (5) cost plays a major role in the limiting of decisions to undertake data processing programs.

Kallaus\(^10\) listed twenty statements through which he described the present status of automated data processing. The statements showed how

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automated data processing has moved from a purely clerical activity to the point where mathematical and statistical methods allow such things as sales prediction and management simulation. His article, written for business educators, stresses the necessity for each business teacher to avail himself of all opportunities to learn about data processing; as shown when he states, "the critical area in data processing education is in teacher supply...."\[11^1\]

The purpose of the study completed by Giles\[12^2\] was to determine the status of data processing instruction in the business curriculum of the Illinois public secondary schools.

Questionnaires were sent to 200 public secondary schools, and 160 (80 per cent) replied. The results revealed that 94.4 per cent of the schools do not offer a separate course in data processing. Of those offering a course, a one-semester course is most prevalent, and this is offered to students who are in either the eleventh or twelfth grade. It was also found that most of the schools that offer only a unit on data processing teach the unit in office practice.

The predominant data processing equipment that is made available to the business students are the IBM simulators, calculators, and key punch machines. Field trips seem to be a popular way of acquainting students with data processing because 60 (37.5 per cent) of the schools use them.

\[11^1\]Kallaus, Ibid, page 22.

Also of interest was the fact that almost as many business teachers are self-educated (44.6 per cent) in data processing as are college-prepared (50 per cent). Also, of the teachers who are college-prepared, most of them (85.1 per cent) have had only three to six semester hours in data processing courses.

Haga\textsuperscript{13} sent 208 business educators a questionnaire to determine professional opinions on electronic data processing. Responses were received from 146 (70 per cent) of the educators.

The second question was stated to determine whether electronic data processing will make necessary none, some, or an entire revision of high school vocational business education. The majority of the respondents, 86 per cent, marked "some effect."

The third question asked whether personnel who operate and use electronic data processing equipment could best be trained by the manufacturers, on the job, in high school, in junior college, or by the manufacturer.

Backles\textsuperscript{14} conducted a study on the impact of automation on the high school business education curriculum. The purpose of his study was to determine what strides had been taken in the field of automation in recent years and the impact that this advancement had on the high school business education curriculum.


Backles obtained his information through personal interviews with the top management of twenty-three different manufacturers and users of automated equipment, by letters requesting information on this subject from manufacturers and users of automated equipment, and from information obtained from current books, magazines, newspapers, circulars, addresses, etc.

Backles conclusions were:

1. Automation will make it more difficult for the secondary student to penetrate the business field because of his lack of training, and for the better opportunities, a college education is almost necessary.

2. Future high school graduates contemplating a career in the business office will need more accounting or bookkeeping to better understand business operations, more mathematics for rapid mental computation and analysis of business-machine calculations, and more typing in preparation for accurate key-punch and other machine operations.

3. The same personal traits desirable in any competent employee will still be sought in the automated age, although some will be stressed more than others.

4. Business educators have not done their task of informing students of the changes taking place in the business office.

5. Business educators must encourage students to do creative thinking.

6. Better students must be attracted into the areas of business education.

7. Automation has made change one of the characteristics of this era.

Sister Mary Judith and Williams\textsuperscript{15} made a survey of thirty-five parochial and public high schools in the Rochester, New York, area to

determine the extent of data processing in business courses and the future trends in data processing.

Thirty-three (94.3 per cent) of the schools responded. Of the thirty-three schools, ten of them had data processing equipment available and twenty-three did not. Of the twenty-three which did not have equipment, seven of them had a unit on data processing in their business curriculum, and eleven others had given consideration to a unit on data processing in the future. Therefore, only seven schools out of the thirty-three had given no consideration to data processing instruction.

Additional findings of this study were:

1. Data processing does have a place in the high school curriculum.

2. Most high schools use the Selectric Typewriter and the 1428 Key Punch Simulator as a first step in introducing students to data processing equipment.

3. Office practice classes usually offer a unit on data processing.

Wenner\textsuperscript{16} conducted a study with the purpose of determining the minimum employment requirements for the positions in the field of electronic and mechanical data processing in selected businesses in the state of Iowa, and also to design an introductory course in data processing to be taught at the high school level if, through the minimum requirements, it was shown that this was feasible.

The information for Wenner's study was obtained by the use of two questionnaires. One was sent to Iowa business firms which had mechanical

or electronic data processing equipment in their offices. The second questionnaire was sent to twenty high schools in Iowa which had some form of mechanical or electronic data processing equipment on their premises.

Wenner's conclusions were:

1. Generally, the minimum age to secure a job in data processing in Iowa is eighteen. There is one major exception—for the tab equipment supervisor position—the minimum age is twenty-five.

2. A high school diploma is necessary to successfully perform the varied tasks related to the particular job classification in the field of data processing.

3. There are two particular job classifications for which some college education is necessary—electronic data processing analyst and systems analyst.

4. There is evidence to show that electronic data processing experience is an important asset for a number of positions in data processing, particularly in positions of responsibility, three of which are electronic data processing analyst, systems analyst, and programmer.

5. Company schools and equipment manufacturers' schools are an important adjunct to the education and training of data processing employees.

6. There seems to be a good deal of difference in the philosophies of the two high schools interviewed (Cedar Rapids and Des Moines) in the state of Iowa.

7. The results of the survey of Iowa business firms lead the author to conclude that there are positions in the field of data processing that are open to persons who have recently graduated from high school.

Godby17 conducted a survey of clerical employees in data processing occupations in the business firms of the Pekin-Peoria, Illinois area.

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The purposes of the study were to identify the opportunities and requirements of the clerical workers in the business data processing occupations in the Pekin-Peoria area and to determine what changes might advisedly be made in the business education curriculum at Pekin Community High School to help students prepare for these opportunities and requirements.

Twenty-one business firms in the Pekin-Peoria area participated in the study. These businesses constituted a representative sample of large, medium, and small businesses in the areas of manufacturing, wholesaling, retailing, service, and finance.

Procedures used were: (1) an interview study of occupational opportunities and requirements of the clerical operators of business data processing machines in the Pekin-Peoria area; (2) a curriculum study of Pekin Community High School in regard to the curriculum offerings, especially those of the business education department and the occupational guidance programs.

Godby's indications are:

1. Automation in the office is proceeding at an ever-increasing rate. Little emphasis has been given by business education departments to instruction on automation, especially in regard to automated equipment operation.

2. The employees covered in this investigation are expected to have the kind of personality traits which will enable them to work well with the others and to demonstrate resourceful methods of approach to new problems.

3. The preparation of students, like the ones who are clerical majors at Pekin Community High School, is adequate to meet the pre-employment educational requirements of the persons entering the clerical occupation in the data processing field in the Pekin-Peoria area.

4. A unit of work giving background information about data processing should be included in the clerical office practice course.
5. Courses which apparently have a high job utility for persons in clerical positions in business data processing are:
(a) courses in English pertaining to grammar, composition, and related expressions; (b) courses in mathematics, particularly algebra; (c) courses in bookkeeping and accounting; (d) courses in beginning and advanced typewriting; and (e) courses in office machine operation.

The Catholic Schools of the Diocese of Brooklyn, in cooperation with IBM, combined three tools of modern communications—educational television, telephones, and computers—to teach 70 teachers an eight-unit course, THE WORLD OF COMPUTERS.

Eight 30-minute telecasts were videotaped and each telecast was backed up by two hours of questions and informational material for the "voice—response" unit, and also by 100 projection slides to be on call at the broadcast center. Thus, THE WORLD OF COMPUTERS consisted of 8 tele-lectures, 16 hours of associated instructional material and 800 slides—all available to each user through his television set and telephone.

Four different experimental groups were set up and each group was capable of carrying on conversations with the computer voice response unit.

The results of this article show that the future of computer-assisted instruction is a wide open field for future education. It also implies that a new area of training is open to the teachers of data processing whereby they can continually be able to update and upgrade their own educational needs. As new ideas and methods are learned, they can be used to expand data processing into existing courses at all levels of education.

Chotiner's study was undertaken to determine the current and potential utilization of data processing by selected school systems in the suburban Washington metropolitan area.

The study indicated that four school systems have both a centralized center and school centers of data processing. The teaching of data processing courses and equipment usage has been included in the school curriculum of all four school systems; and one, Montgomery County, has submitted a proposal for computer-assisted instruction in accordance with Title III of the Elementary and Secondary Act of 1965.

Four recommendations offered by the author for improving educational data processing in the Washington area are:

1. Colleges and universities institute and expand courses in data processing for those in education.

2. School systems establish procedures whereby administrators and key personnel may share procedures and experimentations in data processing.

3. That teaching of data processing in the classroom be expanded.

4. School systems, either individually or jointly, develop, experiment with, and evaluate computer-assisted instruction.

Some conclusions made as a result of the author's study are:

1. Data processing affords school districts a more efficient system for performing its many business and clerical functions and is worth the financial investment.

2. Both a centralized center and school centers are necessary for an effective and complete data system.

3. Washington suburban areas seem to be far more advanced than any others that I have reviewed in relation to data processing activities.

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The purpose of the research study completed by Bangs and Hillestad was to provide guidance for schools in evaluating existing programs and for establishing new programs in integrated data processing. The study compiled information to form the basis for modification of existing data processing programs and for establishment of new and flexible data processing curriculums in office occupation oriented educational programs. Occupational information about the data processing field for use of counselors was also obtained.

Through the use of a one-page questionnaire a preliminary census of data processing offerings in all secondary and two-year post high schools in the United States was obtained. Over a 94 per cent return (10,278 questionnaires) was received.

Since data processing equipment represents large capital investment, larger companies were the source of information for the problem. The population from which the sample of data processing equipment users was drawn was Dun and Bradstreet's 1963 Million Dollar Directory, which listed some 28,000 businesses with net worth of one million dollars or more. Use of the N.E.A. small-sample formula indicated that 285 businesses would constitute a reliable sample for a study of this kind. The study included 353 businesses.

The schools and teachers for the study were determined by the location of the businesses selected for the sample. Teachers from a total of 176 school systems included in the study were interviewed.

Analysis of the data resulted in two recommended curriculums for data processing; one for the high school, and one for the two-year post high school institutions.

Among the specific topics and concepts to be included in the high school data processing courses, the following are recommended in the suggested courses:

**Introduction to data processing** (10th Grade-1/2 Unit)

1. History of records systems and manual data processing
2. Tabulating cards and equipment
   a. Card layout and design
   b. Equipment (purposes and operation, excluding panel wiring)
3. Electronic computer logic
   a. Memory
   b. Input of data
   c. Calculation (arithmetic)
   d. Output
4. Flow charting
5. Computer operation (using a type and model of computer and a symbolic language for which the teacher and student have access)

**Computer concepts and systems development** (11th Grade-1 Unit)

1. Review of electronic digital computers and principles of data processing
2. Computer logic
3. Logic development through problem solving in general
4. Procedures development
5. Forms design
6. Computer languages (two languages: COBOL and one other, possibly Autocoder)
7. Computer business applications

**Data processing applications** (12th Grade-1/2 Unit)

1. Systems analysis and design
2. Programming essentials
3. Report writing and analysis from computer printout
4. Gaming (simulation)
5. Laboratory (or on a co-op basis)
Among the topics and concepts to be included in the post high school data processing courses, the following are recommended in the suggested courses:

**Introduction to data processing (1st Year, 1st Semester-4 Units)**

1. History of data processing
2. Principles of data processing
3. Overview of unit records
4. Card layout and design
5. Electronic computer equipment
   - a. Types
   - b. Logic
6. Flow charting
7. Elements of programming
8. Laboratory in data processing equipment
9. Number systems

**Logic and introduction to systems analysis (1st Year, 2nd Semester 5 Units)**

1. Procedures development
2. Forms design (source document)
3. General flow charting
4. Program flow charting and block diagramming
5. Computer logic
6. Analysis of information network systems
7. Coding and condensing data

**Introduction to computer programming (2nd Year, 1st Semester-3 Units)**

1. Review of computer equipment
2. Principles and theory of digital computers
3. Programming essentials
4. Computer logic
5. Block diagramming
6. Coding and condensing data
7. Purposes and functions of different languages
8. Uses of symbolic languages
9. Central processing unit
10. Computer applications
11. Registers
12. Assembly programs and compilers
13. Programming systems
14. Fixed and floating points
15. Macro-generators
**Business systems design and development** (2nd Year, 1st Semester 3 Units)

1. Identification of system objectives
2. Identification of system requirements
3. Methods for achieving system objectives
4. Development of operating procedures
5. Installation of system for each of the following
   a. Customer order and billing
   b. Customer accounts receivable
   c. Inventory control
   d. Sales information
   e. Payroll
   f. Purchasing and accounts payable
   g. General-ledger accounting

**Data processing applications and practicum in programming** (2nd Year, 2nd Semester-5 Units)

1. Data processing applications
   a. Payroll
   b. Inventory
   c. Accounts receivable and payable
   d. Sales analysis
   e. Policyholders records
   f. Cost accounting
   g. General accounting
   h. Billing

2. Practicum in programming
   a. Systems
   b. Programming essentials
   c. Report writing and analysis
   d. Gaming
   e. Simulation
   f. Field project

**Advanced programming** (2nd Year, 2nd Semester-3 Units)

1. Report generators
2. Macro-generators
3. Assembly programs and compilers
4. Emulators
5. Data scheduling systems
6. Monitors and high level languages
7. Fixed and floating points
The findings and their implications from their study seem to fall into three categories as follows:

Findings Concerning Jobs and Job Opportunities in Data Processing

1. High school graduates from data processing programs may enter the following data processing jobs: key punch operator, unit record operator, tape librarian, and computer operator.

2. Graduates of two-year post high school institutions may enter the same jobs as those who graduate from high school data processing programs, but in addition, the following jobs are available to them: programmer, systems analyst (with some further experience and training), and supervisor of data processing (with experience and possibly further training).

3. Generally, the jobs in data processing will become more complex rather than proliferate.

4. Computer manufacturers indicated that little change would take place in computers in the next three to ten years except for miniaturization and greater memory unit capacity; thus, many of the jobs now available will continue to be prevalent for several years to come.

5. With the relative decrease in use of punched cards as input, the proportion of key punch and verifier operators will decrease.

6. Advances in the software will be extensive in the next three to ten years; consequently, opportunities will expand for persons trained in the use of the new software as it is developed and accepted.

7. Programmers will not need to be as technically trained as is presently true. Graduates of two-year post high school programs will be adequately trained for programming positions. However, the programmer as he is known today will become important to the business organization if he is prepared to move into the position of systems analyst. Business will want their programmers to have the necessary background training to move into the position of systems analyst, or expect the programmer to continue his training on the job so that he may move into the higher level position.

8. Unit record equipment is being phased out with the installation of smaller computers. The position of unit record equipment operator will not be as prevalent in the near future as it has been in the past.
9. Opportunities for persons to program software equipment as it is developed will increase greatly.

10. Persons who will be classified as Applications Specialists will be increasingly in demand. These people will advise businesses on how to use automated systems.

11. An administrative level position possibly will emerge, a person known as an Automated Data Management Specialist, who will be responsible for deciding what to do with the data from the computer. His job will be to teach management through application.

12. As the use of time sharing increases, more and more business employees will need to understand automatic data processing. In a time-sharing installation many of the regular clerks will be responsible for originating and putting data into the automated data processing system. They will be required to be a part of the total system but will not necessarily hold a job classified as a data processing position.

Findings Concerning Teachers of Data Processing

13. 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.

14. 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.

15. 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.

16. 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 Curricula

17. 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.
18. 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.

19. Data processing personnel need to be oriented to the total systems approach in business. The educational institutions have not been satisfying this need for the persons in data processing positions.

20. 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.

21. 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.

22. 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.

23. Three-fourths of those high schools with a cooperative program in data processing require up to six weeks of on-the-job training.

24. 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.

25. 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.

26. 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.
27. 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.

The recommendations for further action made by the researchers are:

1. The schools are not meeting the needs in training personnel for the many job opportunities in data processing in business. Much more effort needs to be exerted by school boards, school administrators, teachers, and state supervisors to inaugurate curriculums in data processing and to update the programs currently in existence.

2. Teacher training institutions must train more teachers for the field of business data processing. Since frequently the cost of such a teacher training program is too costly for an individual institution, they should be helped financially by state, federal and/or private business funds. Two approaches to increasing the number of teachers are: (a) summer programs for beginning teachers and for updating current data processing teachers, and (b) in-service training programs during the academic year offered at strategic locations to train data processing employees as potential teachers and to prepare other teachers for teaching in the data processing area.

3. Businesses should make data processing jobs available for teachers during the summer months.

4. Workshops in data processing occupation information should be developed for counselors and school administrators and in data processing curriculums and equipment for school administrators.

5. Further research is needed in making in-depth analyses of course offerings in the field of data processing.

6. Further research is needed in the development of adequate teacher training programs for teachers of data processing.
CHAPTER III

RESEARCH PROCEDURE

A questionnaire was designed that would elicit from the respondents answers that pertain to and would permit complete investigation of the following objectives:

1. To learn what data processing content is taught in publicly supported high schools in Wisconsin and to what major purpose.

2. What unit record equipment and electronic computers are available for use, and what use is now made of such equipment?

3. What are the future plans of schools in the area of data processing?

4. What is the preparation, work experience, and number of teachers presently engaged in data processing?

5. What are the projected needs in the area of teacher training in data processing?

The proposed questionnaire was given to three people who have knowledge and experience in the area of questionnaire development and utilization. These people represented the following fields: two from education, and one from the Wisconsin Department of Public Instruction. They were asked for their critical evaluation of the questionnaire, including any ideas or comments they wished to express. From the information thus obtained, the questionnaire which was utilized in this study was developed.
The survey was taken by mailing to the Principal of each high school in the State of Wisconsin: the questionnaire, with instructions, a self-addressed, stamped envelope, and a cover letter explaining briefly the objectives of the study. The Principal was instructed to either fill out the questionnaire, if he were in command of the necessary information, or to pass it on to the person in charge of data processing within that high school. A follow-up letter was sent to all of those districts not responding to the original request.

The information thus collected was compiled and analyzed with emphasis primarily restricted to the aforementioned objectives.
CHAPTER IV

ANALYSIS AND FINDINGS OF STUDY

The findings of the questionnaires were hand tabulated as they were returned. The tabulated data was then totalled and the following analysis made.

The data presented in this section represents the composite results from the 371 questionnaires which were returned. Since 426 questionnaires were originally mailed, this represents a return of 87.1 per cent. This percentage of returns appears to reflect the enthusiasm and interest of administrators and educators in data processing throughout the public schools of the state.

The reader should note that of the 55 schools not responding to the survey, it appeared that there were no unusual biases relating to either the size of the school or area of the state that caused the particular nonresponse.
TABLE I
OVERVIEW OF SCHOOLS
(Questions 1, 2, 3)

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Per cent Answering Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does your high school have any data processing equipment?</td>
<td>66</td>
<td>305</td>
<td>17.8</td>
</tr>
<tr>
<td>Are any separate courses being taught in data processing in your high school?</td>
<td>23</td>
<td>343</td>
<td>7.5*</td>
</tr>
<tr>
<td>Is a unit of data processing included in any existing courses?</td>
<td>144</td>
<td>227</td>
<td>38.8*</td>
</tr>
</tbody>
</table>

*Totalling these two categories shows that somewhat less than 46.3 per cent (because of double counting) of the schools reporting are giving their students some type of instruction in data processing.

Table I, above, shows the answers for the first three questions. There are aspects of questions one and two, however, that are not readily apparent. Although there are schools that have equipment and offer separate courses, there are schools that don't have equipment that offer theory courses. There are also some schools that have equipment, but do not have any data processing courses or make the equipment they have available for student use. This analysis suggests that closer cooperation and coordination between the administration and teaching staff in the schools having equipment used solely for production could result in appropriate courses being developed.

The response to question three reflects a high percentage of schools (38.8 per cent) trying to introduce their students to data processing through existing courses.

An analysis of Table II, below, reveals the kind of courses in which the schools have developed a unit of data processing. It is quite
apparent that the majority of these units are incorporated into business education subject areas. This suggests that educators in other fields involved with data processing could possibly examine their curriculums to find places where a unit or at least an exposure to data processing could be placed into their program.

Also, it is evident from the table that there are a number of schools which have integrated data processing as a unit into more than one course.

<table>
<thead>
<tr>
<th>Course</th>
<th>Number of Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office Practice</td>
<td>101</td>
</tr>
<tr>
<td>Bookkeeping I</td>
<td>69</td>
</tr>
<tr>
<td>Secretarial Practice</td>
<td>53</td>
</tr>
<tr>
<td>Advanced Bookkeeping</td>
<td>18</td>
</tr>
<tr>
<td>Advanced Math</td>
<td>11</td>
</tr>
<tr>
<td>Business Machines</td>
<td>6</td>
</tr>
<tr>
<td>Science</td>
<td>5</td>
</tr>
<tr>
<td>Algebra</td>
<td>3</td>
</tr>
<tr>
<td>Recordkeeping</td>
<td>3</td>
</tr>
<tr>
<td>Typing</td>
<td>3</td>
</tr>
<tr>
<td>Distributive Education</td>
<td>3</td>
</tr>
<tr>
<td>American Careers</td>
<td>2</td>
</tr>
<tr>
<td>Physics</td>
<td>2</td>
</tr>
<tr>
<td>General Math</td>
<td>1</td>
</tr>
<tr>
<td>Electronics</td>
<td>1</td>
</tr>
<tr>
<td>No course listed</td>
<td>4</td>
</tr>
</tbody>
</table>

As shown in Table III, below, question five queried those schools not currently involved in data processing as to their plans for the future. Of the group responding to this question, 108 or 38.4 per cent of the schools indicated they had future plans in the area of automated data processing.
TABLE III
DATA PROCESSING IN THE FUTURE
(Questions 5, 21)

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Per cent Answering Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you are not currently involved in data processing, do you have any plans in this field for the near future?</td>
<td>108</td>
<td>173</td>
<td>38.4</td>
</tr>
<tr>
<td>Do you have any plans for expansion in the area of data processing in the near future?</td>
<td>48</td>
<td>23</td>
<td>67.6</td>
</tr>
</tbody>
</table>

It should be noted that although in Table I, 227 schools indicated that they were not involved with any data processing, 281 responded to question five referring to data processing plans for the future if not presently involved in this field.

The apparent justification for this response is that many of the schools which indicated data processing as a unit in an existing course seem to feel that they are not actually involved in the field to any great degree.

Questions six and seven further analyzed the situation to discover what the actual plans of the schools indicating expansion are. The results are shown below in Table IV.

An analysis of Table IV will show that of the 108 schools that indicated plans for development in data processing, a number of them have incorporated plans for combination of equipment acquisitions and course offerings.
TABLE IV
AREAS OF PLANNED DEVELOPMENT AND YEAR*
(Questions 6, 7)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment acquisition</td>
<td>15</td>
<td>13</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Separate course</td>
<td>7</td>
<td>18</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Unit in existing course</td>
<td>35</td>
<td>32</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

*Two schools indicated equipment acquisitions, three separate courses, and five unit courses but gave no specific year for implementing their plans.

Question twenty-one, shown previously in Table III, queried those schools which are currently offering courses or have equipment available for student use if they had any plans for expansion in the area of data processing in the near future. As indicated in Table III, 48 schools have plans for expansion. Of those 48 indicating expansion, 13 indicated additional equipment acquisitions, 14 additional course offerings and 19 indicated both additional equipment and course offerings. Two replying didn't answer in what area their plans were to be expanded.

Questions eight and twenty-three were concerned with the number of additional teachers that would be needed by the schools either entering data processing as one of their educational offerings, or those expanding their efforts in this field.

Of the 156 schools that plan to begin offering data processing or to expand in this area, 44 or 25 per cent indicated that they would need additional teachers to implement their plans. Thirty-seven of the 44 indicated they would require one additional teacher and three reported a need for two more teachers. Four, although reporting they would require additional teachers, did not specify how many would be needed.
The number of schools (156) that contemplate the addition or expansion of data processing equipment and/or courses to their instructional program lays a heavy burden upon all concerned. This is especially true when considering that some may also have plans involving production programs requiring data processing. Appropriate planning and organization to secure efficient and sufficient results and yet attain an economical program will require close coordination among the administrators, the teachers, and the Department of Public Instruction. Also, the colleges and universities of the state must be involved and take an ever-increasing role in seeing that a sufficient number of teachers are adequately trained and/or retrained to handle the duties, responsibilities, and problems that will undoubtedly arise in the implementing of a program of this nature.

Questions nine through thirty-one related only to those schools that have either data processing equipment or training at the present time.

Question nine asked if the schools had access to unit record equipment. In response to that question, 71 of the schools now involved in data processing indicated access to this type of equipment. The next question asked where the equipment was housed. Table V, below, reveals where the unit record equipment available to schools for use is housed.

An analysis of Table V reveals that although the majority have the unit record equipment at their own schools, some are also using central data centers, vocational-technical schools, colleges, and industrial plants. Also, it should be noted that the mobile trailer unit seems to be an increasingly important means of attaining and sharing the use of unit record equipment.
TABLE V
WHERE UNIT RECORD EQUIPMENT AVAILABLE FOR USE IS HOUSED
(Question 10)

<table>
<thead>
<tr>
<th>Location</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Premises</td>
<td>53</td>
</tr>
<tr>
<td>Central Data Center</td>
<td>15</td>
</tr>
<tr>
<td>Trailer Unit</td>
<td>8</td>
</tr>
<tr>
<td>Voc-tech School</td>
<td>3</td>
</tr>
<tr>
<td>Industrial Plant</td>
<td>2</td>
</tr>
<tr>
<td>Neighboring School</td>
<td>1</td>
</tr>
<tr>
<td>College</td>
<td>1</td>
</tr>
</tbody>
</table>

Further analysis of Table V will show that although 71 schools reported access to unit record equipment, 83 different sources are listed. This infers that some are making use of equipment from sources outside of the school as well as what is available to them on premises. This seems to be especially true in school districts where individual schools have some equipment and there is also a central administrative area for the entire district which has a more complete line of equipment and facilities.

Questions eleven and twelve inquired if the students were allowed to use the equipment and for what other purpose the equipment was used. Sixty-two or 87.3 per cent of the schools reported that the unit record equipment was made available for instructional purposes. Sixty-one or 98.4 per cent of those using this equipment for instructional purposes reported students were allowed to use the equipment. Forty-two of the 71 respondents indicated that the equipment was used strictly for instructional purposes, nine that the equipment was used entirely for production purposes, and twenty indicated the unit record equipment
was used for both instructional and production purposes. Of those reporting a combination, the larger schools inferred the equipment was used mainly for production—in the smaller schools the opposite seemed to be true.

The possibility of those schools having equipment but not using it for instructional purposes suggests the feasibility of incorporating student use of the equipment into their instructional programs. Likewise, the possibility of those schools (42) reporting the availability of unit record equipment but not reporting the use of such equipment for school production purposes suggests that the feasibility of this joint use be closely examined—if merely for economic reasons.

Questions thirteen and fourteen queried those schools which are involved in data processing but not currently making unit record equipment available for student use as to their plans for making this type of equipment available in the near future. Two replied that unit record equipment would be made available to students during the 1969-70 school year, four indicated the 1970-71 school year, and four said the school year 1971-72 would be the year this equipment would be made available to students.

The next question inquired about computers and the results show that 38 of the schools had access to an electronic computer. Question sixteen asked, if a computer were available for use, where it is housed—Table VI, below, shows these results.

Analysis of Table VI shows that only 9 of the schools responding have an electronic computer located on premises. Cost, of course, is probably the cause of this situation. The development of lower cost computer systems such as mini-computers, however, may make it economically
feasible for schools to acquire a computer. This should be looked at as a possibility for schools thinking of acquiring such equipment. Also, the possibility of having terminals connected to some centrally located computer and shared by a number of schools, as well as businesses, should be looked into by those planning computer usage.

**TABLE VI**

WHERE COMPUTERS AVAILABLE FOR USE ARE HOUSED
(Question 16)

<table>
<thead>
<tr>
<th>Location</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Data Center</td>
<td>16</td>
</tr>
<tr>
<td>On Premises</td>
<td>9</td>
</tr>
<tr>
<td>Trailer Unit</td>
<td>5</td>
</tr>
<tr>
<td>Industrial Plant</td>
<td>4</td>
</tr>
<tr>
<td>Voc-tech School</td>
<td>2</td>
</tr>
<tr>
<td>Neighboring School</td>
<td>2</td>
</tr>
</tbody>
</table>

Question seventeen asked those respondents who had a computer available for use whether the students had an opportunity for hands-on experience. Question eighteen inquired as to what other purpose the computer was used.

Combining the answers to these two questions shows that of the 38 schools which have a computer available for use, 6 indicated the computers were used solely for instructional purposes, 18 indicated they were used for production only, and 14 replied that the computers were used for both instructional and production purposes. Of the 20 replying that computers were available for instructional purposes, 17 or 85 percent reported that the students were allowed to do work on the computer.
Questions nineteen and twenty queried schools involved in data processing but not yet offering computer usage to the students as to their plans. Of the 13 replying, 3 indicated computers would be made available to students during the 1969-70 school year, 11 during the 1970-71 school year, 2 during 1971-72, and 2 during the 1972-73 school year.

Table VII, below, shows the number of schools having the types of unit record equipment indicated, as asked in question 24-B. The reader should note that this shows the number of schools having this type of equipment and not the number of machines, as some schools reported more than one machine. This is especially true of equipment such as the keypunch, verifier, sorter, and keypunch simulators. Availability of keypunches for usage ranged from 36 schools reporting 1 or 2 machines available to 2 schools reporting 11 or more available. The machine model numbers are not given because of lack of the respondents to supply that information.

The advisability of using and teaching unit record equipment has been debated for some time. This equipment, other than keypunches, verifiers, and sorters has been out of production for a period of time now. Its use, however, can be justified for a number of reasons. First, keypunching, verifying, and sorting are, and can be expected to remain for the foreseeable future, some of the most important activities associated with data processing. Second, many small companies which previously were considered too small to fully utilize data processing equipment are finding the lower costs of electro-mechanical equipment attractive and economically feasible. Third, many of the small computer
systems, especially card systems, rely on such machines as the collator and interpreter for support.

**TABLE VII**

UNIT RECORD EQUIPMENT AVAILABLE  
(Question 24-B)

<table>
<thead>
<tr>
<th>Type of Equipment</th>
<th>Number of Schools Reporting Equipment Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key Punch</td>
<td>57</td>
</tr>
<tr>
<td>Key Punch Simulators</td>
<td>15</td>
</tr>
<tr>
<td>Verifier</td>
<td>21</td>
</tr>
<tr>
<td>Accounting Machine</td>
<td>18</td>
</tr>
<tr>
<td>Interpreter</td>
<td>11</td>
</tr>
<tr>
<td>Reproducer</td>
<td>9</td>
</tr>
<tr>
<td>Collator</td>
<td>14</td>
</tr>
<tr>
<td>Sorter</td>
<td>40</td>
</tr>
</tbody>
</table>

Table VIII, below, shows the computerized systems available as reported through question 24-A.
Of the 60 schools responding as to how their equipment was acquired, 55 indicated that they rented their equipment, 4 reportedly purchased it, and 1 indicated it was loaned to them. The high rate of schools renting equipment, 87.5 per cent, probably reflects the caution on the part of administrators to delve too deeply into this type of program. It should be stressed, however, with the amount of monies being made available for vocational education and the federal and state policies of reimbursement, a school system may well be better off purchasing the equipment. It is generally agreed, too, that money is saved over rentals if purchased equipment is to be used in excess of five years. Unit record equipment, which is especially static in design, would seem to lend itself more to purchase than rental.
Table IX, below, deals with the departments in control of the data processing equipment, and Table X deals with the departments in which the equipment is being utilized, number of teachers, and their degrees.

**TABLE IX**  
CONTROL OF DATA PROCESSING EQUIPMENT  
(Question 27)

<table>
<thead>
<tr>
<th>Department</th>
<th>Number of Schools Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Education</td>
<td>42</td>
</tr>
<tr>
<td>Administrative Area</td>
<td>14</td>
</tr>
<tr>
<td>Mathematics</td>
<td>11</td>
</tr>
<tr>
<td>Data Processing</td>
<td>6</td>
</tr>
<tr>
<td>Vocational</td>
<td>5</td>
</tr>
<tr>
<td>Science</td>
<td>1</td>
</tr>
<tr>
<td>Guidance</td>
<td>1</td>
</tr>
</tbody>
</table>

The impetus given by the business education departments of the state is in evidence through analysis of Tables IX and X. The fact that equipment is under the control of a separate data processing department in 6 schools, however, is an indicator of thoughtful planning. The establishment of such a department can more easily allow shared utilization of the equipment by all departments.

As indicated, Table X follows and is used jointly with the preceding table.
TABLE X
EQUIPMENT USED FOR INSTRUCTIONAL PURPOSES BY
(Question 28)

<table>
<thead>
<tr>
<th>Department</th>
<th>Number of Teachers</th>
<th>Degree Held</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>BA</td>
</tr>
<tr>
<td>Business Education</td>
<td>72</td>
<td>32</td>
</tr>
<tr>
<td>Mathematics</td>
<td>28</td>
<td>17</td>
</tr>
<tr>
<td>Administrative*</td>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>Data Processing</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Science</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Vocational</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

*The reader should note that although 16 people are reportedly using the equipment in the administrative area, these are not necessarily teachers involved in data processing.

Question twenty-nine inquired as to the separate data processing courses taught in the high schools and for what major objective.

Table XI, below, shows the results.
### TABLE XI
**DATA PROCESSING COURSES**
(Question 29)

<table>
<thead>
<tr>
<th>Course</th>
<th>Number of Schools</th>
<th>Background Information</th>
<th>Vocational Competency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Data Processing</td>
<td>21</td>
<td>21</td>
<td>2</td>
</tr>
<tr>
<td>Unit Record Equipment*</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Introduction to Functional Wiring</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Intermediate Wiring</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Introduction to Computer Programming</td>
<td>8</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Intermediate Computer Programming</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Advanced Computer Programming</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Computer Operation</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

*The reader should note that unit record equipment as indicated in this table refers to a variety of equipment and not one piece of equipment, such as the keypunch.

Table XII, below, indicates the programming languages taught at the various stages of instruction.

### TABLE XII
**PROGRAMMING LANGUAGES BEING TAUGHT**
(Question 29)

<table>
<thead>
<tr>
<th>Language</th>
<th>Number of Schools</th>
<th>Introduction</th>
<th>Intermediate</th>
<th>Advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fortran</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Easy Coder</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>--</td>
</tr>
<tr>
<td>Cobol</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Nobis</td>
<td>1</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Basic</td>
<td>1</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Machine</td>
<td>1</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
It becomes apparent from the above data that although about 46.3 per cent of the schools are involved with some phase of data processing, very few of them are teaching programming languages. Also, it should be noted that Fortran, which is considered to be primarily a scientific or mathematically oriented language, is the most commonly taught language. This indicates that although the business education departments seem to be teaching basic data processing concepts much more than other departments, the mathematics departments seem to be utilizing the computer for the teaching of programming to a larger extent.

Questions thirty and thirty-one inquired how many teachers are devoting 50 per cent or more of their time to data processing instruction, and how many are devoting some but less than 50 per cent to this type of instruction.

Question thirty-three asked how many teachers are certified in data processing by the Department of Public Instruction, and question thirty-four inquired as to data processing work experience of the teachers.

Combining the replies to the first two categories of Table XIII, below, will show that 216 persons are engaged in teaching some data processing. The replies to question thirty-two, which asked for special data processing courses, revealed that 72 teachers had taken Introduction to Data Processing, 36 some Programming Language, 26 a course in Unit Record Equipment, 8 Advanced Computer Applications, 8 Computer Application to Educational Administration, and 6 Systems Analysis and Design. The duration of these courses ranged from one-day workshops to those lasting a semester in length. The majority of them were, however, courses lasting for 8 weeks at colleges and universities during the summer session.
TABLE XIII
TEACHERS: INSTRUCTIONAL TIME, CERTIFICATION, WORK EXPERIENCE
(Questions 30, 31, 33, 34)

<table>
<thead>
<tr>
<th>Question</th>
<th>Schools Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many teachers are now devoting 50% or more of their time to data processing instruction?</td>
<td>10 1 -- -- 1 -- -- 17</td>
</tr>
<tr>
<td>How many teachers are now devoting some but less than 50%?</td>
<td>59 32 9 -- 1 -- -- 1** 199</td>
</tr>
<tr>
<td>How many teachers are certified in data processing by the Department of Public Instruction?</td>
<td>13 1 -- -- 1 -- -- 20</td>
</tr>
<tr>
<td>How many teachers have data processing work experience?</td>
<td>22 6 -- 1 1 -- -- 43</td>
</tr>
</tbody>
</table>

*Total indicates number of teachers.

**In this one instance the school reported a total of 44 teachers devoting some time to data processing instruction. It should be noted, however, that the reporting school does have a very extensive data processing program and intracurricula data processing instruction seems to be extensive.

Analyzing the results of question thirty-two in relation to the two preceding it as shown in Table XIII, it would seem evident that a number of teachers are teaching data processing concepts without any formal training. This data also makes it apparent that much more education in the field of data processing is necessary before the quality of instruction reaches the level of other academic subjects. This fact is again recognized for, of the 216 teachers involved in
teaching in this area, only 20 are certified by the Department of Public Instruction.

Question thirty-five, which queried respondents as to the data processing work experience of teachers, shows that 11 have had work experience with unit record equipment, 5 with the writing of computer programs, and 4 with computer operations. Twenty-three or 53.5 per cent of the respondents did not list the work experience that was performed.

The fact that school administrators and teachers recognize the need for further training and preparation to be adequately prepared to teach data processing is evidenced by the fact that of the 287 replies to question thirty-six, 241 or 84 per cent stated that they felt there is a need for more formal training in data processing.

Below are some of the responses given by the teachers and administrators regarding their recommendations for the initial preparation of teachers or the upgrading of knowledge in this area:

Data Processing courses show the student the world of business today. These courses should be required training for all present day business teachers and business students.

A workshop or course which would help teachers and prospective teachers develop materials to be used in a data processing course. This course should also include the principles of instruction.

I believe a course (summer or semester) should be developed in the actual training on and use of the equipment. It should be similar to an on-the-job training situation.

I would like to be able to find more information useable in a high school classroom. There seems to be a lack of good materials for use on this level. A workshop dealing with this would be a great help.

More courses and programs should be made available at the graduate school level.
At least two computer science courses should be a requirement for all mathematics, science and business college graduates. There should be more inservice courses. There should be speeches at conventions, institutes, and workshops giving a summary of how data processing is affecting these areas.

Any course that would enable a teacher to talk about data processing in other than general vague terms. To teach how to operate machines and the need for such learning through practical examples and/or demonstrations.

Provide summer seminars for older teachers to upgrade their understanding of data processing. Funding should be by Foundation or by Federal or State government.

Should provide work experience in data processing while in college. Instead of requiring summer school for degree teachers give them credit for working in industry.

Cooperative Education Service Agencies should be providing us with more information in this area.

Colleges should provide more hands-on experience and field trips to actual data processing centers.

Industry could possibly sponsor summer work programs.

Courses dealing with actual work on the equipment should be offered rather than the intricate theory.

Seminars and institutes conducted by business—not educators—should be provided.

Workshops or courses that would teach instructors methodology are needed.

Summer seminars in basic data processing explaining what it is and how we in educational administration can apply it in local situations are needed.

Workshops or programs where a person can learn to sell this type of program to the school board would be very helpful.
CHAPTER V

CONCLUSIONS

1. The 87.1 per cent return on the questionnaire appears to reflect the interest which the teachers and administrators of Wisconsin have in knowing what is happening in electronic data processing.

2. Less than half of the high schools in the state are currently offering any form of data processing training to their students.

3. The business education departments play a most prominent part in offering a unit of electronic data processing as a portion of an existing course.

4. Unit record equipment is the predominant type of equipment available for student use.

5. There are a number of schools that have equipment available for use, but use it solely for production purposes. Conversely, there are also many that have equipment that is used only for instructional purposes.

6. Over half of the data processing equipment in the public schools is under the control of the business education departments.

7. The mathematic departments lead all other departments in the utilization of the computer for instructional purposes.

8. Schools, at the present time, are nearly all renting their equipment.

9. The majority of schools offering separate courses in data processing are primarily aiming at supplying the students with background information.
10. The schools presently offering courses and having equipment available feel their programs are worthwhile, and over two-thirds are planning expansion in this area.

11. Many teachers engaged in the teaching of data processing have had no formal training in the area of data processing at institutions of higher education.

12. There will be a greatly increasing number of teachers needed in the area of data processing by schools which are entering and expanding offerings in the field of data processing.

13. Administrators and teachers alike feel there is a definite need for more formal data processing training.

14. Teachers feel they should have more hands-on experience with data processing equipment and, if possible, work experience along this line.

15. Close cooperation is needed and necessary between the educational institutions and the Department of Public Instruction in planning for the future educational needs that will undoubtedly be encountered in this area of instruction.

RECOMMENDATIONS

1. All departments in the public high schools in the state not currently offering any data processing instruction should take a careful look at their programs to see where some unit or at least different concepts relating to data processing can be introduced. With the increased technological developments that have come into being, the students in our high schools should, at the very minimum,
be introduced to this area. Also, if a need exists, a separate
data processing course should be developed.

2. Closer cooperation between instructional and production personnel
in those high schools which have electronic data processing equip-
ment, but which do not have electronic data processing courses,
could and probably should result in courses being developed. This
type of cooperation should be undertaken for the benefit of the
student.

3. For economic reasons those schools having equipment available for
instructional purposes but not using such equipment for production
purposes should see if such use would be feasible.

4. Since data processing is transcending all departmental boundaries,
the feasibility of setting up a separate electronic data processing
department should be analyzed. This could lessen the chance of
electronic data processing becoming subservient to one department,
such as the business education department.

5. The possibility of purchasing rather than renting equipment, if it
is known the equipment will be used for a number of years, should
be seriously considered. This is especially true if reimbursement
through government funds is possible.

6. With the present and prospective growth in electronic data proc-
essing, it seems that teachers in all fields should not be allowed
to graduate from an institution of higher learning without at
least one course in electronic data processing.

7. The Department of Public Instruction might well set up seminars
and summer programs leading to certification in electronic data
processing.
8. In order to meet the basic needs of the teachers and administrators responding to this study, thought should be given to two types of inservice programs that could be established by the colleges and universities. One could provide for basic unit record concepts and hands-on experience with related equipment, as well as some general familiarity with concepts of electronic computers and programming. The second type could be offered to those who have the aptitude for and the equipment available to use. This could deal with computer operation and programming of applications—both business and scientific. These would surely prepare the teacher to answer student questions as to equipment usage.

9. Schools should consider not only the needs of their immediate community, but the spectrum of possibilities for the students outside this area when developing the data processing offerings for their school system.

10. Further study needs to be undertaken in the following areas:
   a. What should be the distinct responsibility of each of the various institutions of education in the areas of electronic data processing instruction?
   b. Are the data processing programs now in operation doing an effective job—both in terms of general and vocational education?
   c. How can electronic data processing equipment be best used to gain full benefits—both for instruction and production?
   d. Development of adequate teacher training programs for teachers of data processing.
   e. In-depth analysis of course offerings in the field of data processing.
   f. The feasibility of using computer-assisted instruction in the various curriculums at all levels of education.
BIBLIOGRAPHY

1. Books


2. Periodicals


Carlberg, Mona, "How Are High Schools Handling Data Processing Programs?", *Business Education World*, XLVI:3 (November, 1965), 16-18, 34.


Tonne, Herbert A., "Data Processing Instruction in High School", 

Wood, Merle W., "A Look at Data Processing Instructional Progress", 

3. Theses and Dissertations


APPENDIXES
Dear Administrator:

As part of the continuing effort to update and upgrade education in the schools in Wisconsin, a study is being conducted in cooperation with the State Department of Public Instruction to determine the extent to which automated data processing equipment is available for use and what automated data processing courses are being taught at the high school level. Also to be analyzed will be teacher preparation in this area.

An analysis of the results of this study will make available to you information which should assist you in making future plans in this field, inform you as to what other schools are doing in this area, and what their extended plans are. Also, it will supply the Department of Public Instruction with information so that it may be of greater service to you.

It may be of interest to you that I am a teacher on leave from Pualski High School, Pulaski, Wisconsin, and am participating in a Fellowship Program at the University of Montana. Our program is involved to a large extent with the various aspects and facets of electronic data processing.

Because of your overall knowledge of your school district, you were selected to complete this questionnaire, or to pass it along to the person in charge of data processing.

Your help in this project is vital and is therefore most earnestly solicited. The information given will be treated as confidential for individuals and schools alike.

If he desires, the person completing this questionnaire will receive an abstract of the results of this study at the close of the project.

Sincerely,

James M. Farrell
Graduate Student

Ruel F. Falk
State Supervisor of Vocational Office Education
Department of Public Instruction
I. Name and position of the person completing the questionnaire.

Name (Please print) ______________________________ Position or Title ______________________________

Signature of person completing questionnaire ______________________________ Date ____________________

II. Name of High School __________________________________________

III. Mailing address ________________________________________________

Street or Box No. ________________________________________________

City __________________________ State ______ Zip Code __________

1. Does your high school have any data processing equipment?

   Yes _____ No _____

2. Are any separate courses being taught in data processing in your high school?

   Yes _____ No _____

3. Is a unit of data processing included in any of your existing courses?

   Yes _____ No _____

4. If the answer to number 3 is yes, within what course or courses are they taught?

   ______________________________________________________________
   ______________________________________________________________
   ______________________________________________________________
   ______________________________________________________________

Questions 5, 6, 7, and 8 to be answered only by respondents from schools that are not currently involved with any data processing.
5. If you are not currently involved in data processing, do you have any plans in this field for the near future?

   Yes ________ No ________

6. Are these plans in the form of:
   a. Equipment acquisitions ________
   b. Separate data processing course ________
   c. As a unit in an existing course ________

7. When do you expect your plans to be realized?
   a. Equipment acquisition (Year) __________
   b. Separate data processing course (Year) __________
   c. As a unit in an existing course (Year) __________

8. Will you need to add new teachers for this (these) addition(s) to the program?

   Yes ________ No ________

   If yes, approximately how many? __________

   NOTICE: IF YOUR HIGH SCHOOL HAS NEITHER DATA PROCESSING EQUIPMENT NOR
   TRAINING AT THE PRESENT TIME, PLEASE GO TO QUESTION 32.

9. Do you have access to unit record or punched card equipment such as the keypunch, accounting machine, sorter or reproducer?

   Yes ________ No ________

10. If unit record equipment is available, where is it housed?
    a. On premises ________
    b. At local vocational-technical school ________
    c. At local college ________
    d. Other, please specify ________

11. Is the unit record equipment available to students for hands-on experience?

    Yes ________ No ________

12. For what purposes do you use the unit record equipment?
    a. Instructional ________
    b. Production, such as school district accounting, scheduling, etc. ________
    c. Combination of the above ________ About ________ percent instruction and ________ percent production.

   Questions 13 and 14 to be answered only by respondents who do not now make unit record equipment available to students.
13. Do you plan to make unit record equipment available to students in the near future?
   Yes _____  No _____

14. When do you plan on having students use the unit record components?
   1969-70 _____  1971-72 _____
   1970-71 _____  1972-73 _____

15. Do you have access to an electronic computer?
   Yes _____  No _____

16. If a computer is available, where is it housed?
   a. On premises _____
   b. At local vocational-technical school _____
   c. At local college _____
   d. Other, please specify __________________________

17. Is the computer available to students for hands-on experience?
   Yes _____  No _____

18. For what purposes do you use the computer?
   Instructional _____
   Production, such as school district accounting, scheduling, etc. _____
   Combination of the above _____  About _____ percent instruction and _____ percent production.

Questions 19 and 20 to be answered only by respondents who do not now make computers available to students.

19. Do you plan to make an electronic computer available to students in the near future?
   Yes _____  No _____

20. What is your target time for student use of the computer?
   1969-70 _____  1971-72 _____
   1970-71 _____  1972-73 _____

Questions 21, 22, 23 to be answered only by respondents who presently have equipment or courses available for student participation.

21. Do you have any plans for expansion in the area of data processing in the near future?
   Yes _____  No _____
22. Are these plans in the form of:
   a. Additional equipment acquisition
   b. Additional course offerings
   c. Both of the above

23. Will you need to add new teachers for this (these) addition(s) to the program?
   Yes ______  No ______
   If yes, approximately how many? __________

24. Please list available equipment where appropriate, ignoring anything that does not apply to your particular situation.

### A. COMPUTERIZED SYSTEM

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Machine Model Number</th>
<th>In School</th>
<th>Elsewhere</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

### B. UNIT RECORD EQUIPMENT

<table>
<thead>
<tr>
<th>Machine Name</th>
<th>Machine Model No.(s)</th>
<th>In School</th>
<th>Elsewhere</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key punch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verifier</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounting Machine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpreter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reproducer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sorter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTHERS, PLEASE SPECIFY</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
25. Please list any equipment that you may have "on line" with the computer, ie., printer, card reader, etc.

<table>
<thead>
<tr>
<th>Name of Equipment</th>
<th>Manufacturer</th>
<th>Model Number</th>
<th>How Many</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

26. The major portion of equipment is:

   a. Rented _____%
   b. Purchased _____%

27. The equipment is in what department(s) in the high school?

   a. Separate Data Processing Department _____
   b. Business Education Department ______
   c. Vocational Department ______
   d. Mathematics Department ______
   e. Science Department ______
   f. Administration Area ______
   g. Other, please specify _____________________________

28. Please indicate in which departments the equipment is being utilized for instructional purposes, by how many teachers, who have what degree(s)?

<table>
<thead>
<tr>
<th>Department Utilized</th>
<th>Yes</th>
<th>No</th>
<th>Number of DP Teachers</th>
<th>Degree(s) held by Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Processing Dept.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business Education Dept.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Vocational Dept.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Mathematics Dept.</td>
<td></td>
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<tr>
<td>Science Department</td>
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</tr>
<tr>
<td>Administration Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTHER, PLEASE SPECIFY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
29. Please check the courses taught and for what major objective in your high school. Check only those taught as separate course.

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Major Objective IS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Background</td>
</tr>
<tr>
<td></td>
<td>Information</td>
</tr>
<tr>
<td></td>
<td>Vocational</td>
</tr>
<tr>
<td></td>
<td>Competency</td>
</tr>
<tr>
<td>Introduction to Data Processing</td>
<td></td>
</tr>
<tr>
<td>Unit Record Equipment</td>
<td></td>
</tr>
<tr>
<td>Introduction to Functional Wiring</td>
<td></td>
</tr>
<tr>
<td>Intermediate Functional Wiring</td>
<td></td>
</tr>
<tr>
<td>Advanced Functional Wiring</td>
<td></td>
</tr>
<tr>
<td>Introduction to Computer Programming</td>
<td></td>
</tr>
<tr>
<td>Intermediate Computer Programming</td>
<td></td>
</tr>
<tr>
<td>Advanced Computer Programming</td>
<td></td>
</tr>
<tr>
<td>Computer Operation</td>
<td></td>
</tr>
<tr>
<td>Systems Design and Analysis</td>
<td></td>
</tr>
</tbody>
</table>

OTHERS, PLEASE SPECIFY

30. How many teachers are now devoting 50% or more of their time to data processing instruction? _________

31. How many teachers are now devoting some but less than 50%? _________

32. Special Data Processing courses taken or Institutes attended by teachers. Indicate on next page please.
<table>
<thead>
<tr>
<th>Course Title</th>
<th>Where Taken</th>
<th>When</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
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<td>7</td>
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<tr>
<td>8</td>
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</tbody>
</table>

**Basic Content of Course Taken**

1
2
3
4
5
6
7
8

33. How many teachers are certified in data processing by the Department of Public Instruction?  

34. How many teachers have data processing work experience?  

35. Please list data processing work experience of teachers.

<table>
<thead>
<tr>
<th>Dates</th>
<th>Company</th>
<th>Duties</th>
<th>Major Equipment Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>to</td>
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<td>to</td>
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</tbody>
</table>
36. Do you feel that there is a need for more formal training in data processing?

Yes _____ No _____

37. If "yes" above, describe the kind of course, workshop, seminar or institute you believe would be helpful to you in improving and upgrading your knowledge in the field.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

38. What other recommendations would you make regarding the initial preparation of teachers of data processing and/or the upgrading of present teachers?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

39. Would you like an abstract of the results of this study?

Yes _____ No _____

PLEASE RETURN QUESTIONNAIRE IN ENCLOSED STAMPED ENVELOPE TO:

James M. Farrell
525 Cleveland Street
Missoula, Mont. 59801
May 13, 1969

Dear Administrator:

On April 28 a duplicate of the enclosed questionnaire was mailed to you in cooperation with the State Department of Public Instruction inquiring about the status of data processing programs within your high school. Because of the nature of this study, it is imperative that all high schools reply in order to make the report complete.

If your reply and this letter have crossed in the mail, please accept my sincere thanks and disregard the enclosed material. If not, will you please take the necessary time to complete it so the information you supply can be used to update what Wisconsin high school administrators are doing and contemplating in this area.

Also, the results of this study will aid the Department of Public Instruction to be of greater service to you.

Sincerely,

James M. Farrell
Graduate Student

Enclosures