Development of an electronic data processing instructional program for implementation in the business department at the secondary level in the Great Falls public schools, Great Falls, Montana

Richard Duane Enochson

The University of Montana

Let us know how access to this document benefits you.
Follow this and additional works at: https://scholarworks.umt.edu/etd

Recommended Citation
https://scholarworks.umt.edu/etd/2050

This Thesis is brought to you for free and open access by the Graduate School at ScholarWorks at University of Montana. It has been accepted for inclusion in Graduate Student Theses, Dissertations, & Professional Papers by an authorized administrator of ScholarWorks at University of Montana. For more information, please contact scholarworks@mso.umt.edu.
DEVELOPMENT OF AN ELECTRONIC DATA PROCESSING INSTRUCTIONAL PROGRAM FOR IMPLEMENTATION IN THE BUSINESS DEPARTMENT AT THE SECONDARY LEVEL IN THE GREAT FALLS PUBLIC SCHOOLS, GREAT FALLS, MONTANA

by

Richard D. Enochson
B.S., University of Utah, 1966

Presented in partial fulfillment of the requirements for the degree of

Master of Science in Business Administration

UNIVERSITY OF MONTANA

1970

Approved by:

[Signatures]

Chairman, Board of Examiners

Dean, Graduate School

Date

Aug 6, 1970
ACKNOWLEDGEMENTS

The writer wishes to express gratitude to those who helped make this study possible.

Sincere appreciation is extended to Dr. George J. Brabb, advisor and chairman of the thesis committee, for his interest, encouragement, assistance and guidance in tabulating, interpreting and presenting the material in this study.

Appreciation is also extended to Dr. Donald B. Koeppen, Professor of Business Administration and Chairman of the Business Education Department, Miss Alvhild J. Martinson, Associate Professor of Business Education and Office Administration, for their encouragement and assistance as members of the thesis committee.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>ii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>v</td>
</tr>
<tr>
<td>Chapter</td>
<td></td>
</tr>
<tr>
<td>I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>4</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>5</td>
</tr>
<tr>
<td>Limitations</td>
<td>5</td>
</tr>
<tr>
<td>Definition of Terms</td>
<td>10</td>
</tr>
<tr>
<td>II. REVIEW OF RELATED LITERATURE</td>
<td>11</td>
</tr>
<tr>
<td>The Needs for a Data Processing Program</td>
<td>11</td>
</tr>
<tr>
<td>Selected Studies</td>
<td>17</td>
</tr>
<tr>
<td>Summary</td>
<td>22</td>
</tr>
<tr>
<td>III. STUDENT ANALYSIS OF CURRENT COURSE</td>
<td>23</td>
</tr>
<tr>
<td>IV. RECOMMENDED PROGRAM</td>
<td>39</td>
</tr>
<tr>
<td>V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS</td>
<td>48</td>
</tr>
<tr>
<td>Summary</td>
<td>48</td>
</tr>
<tr>
<td>Conclusions</td>
<td>49</td>
</tr>
<tr>
<td>Recommendations</td>
<td>50</td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td>52</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>----</td>
</tr>
<tr>
<td>APPENDIX</td>
<td>57</td>
</tr>
<tr>
<td>A. Questionnaire</td>
<td>58</td>
</tr>
<tr>
<td>B. Responses to Question 3 of Questionnaire</td>
<td>62</td>
</tr>
<tr>
<td>C. Textbooks</td>
<td>64</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Approximate Grade-Point Average of Students by Grade (By Number)</td>
<td>25</td>
</tr>
<tr>
<td>2. Approximate Grade-Point Average of Students by Grade (By Percent)</td>
<td>26</td>
</tr>
<tr>
<td>3. Does Current Data Processing Course Meet Student Expectations (By Number &amp; Percent)</td>
<td>28</td>
</tr>
<tr>
<td>4. Areas of Current Data Processing Course that Students Indicated They Liked</td>
<td>29</td>
</tr>
<tr>
<td>5. Areas of Current Data Processing Course that Students Indicated They Disliked</td>
<td>31</td>
</tr>
<tr>
<td>6. The Level Which The Students Feel The Course Would Be Most Beneficial To The Student</td>
<td>32</td>
</tr>
<tr>
<td>7. Influences For Enrollment Into Data Processing Course</td>
<td>33</td>
</tr>
<tr>
<td>8. Why Students Enrolled In The Data Processing Course</td>
<td>34</td>
</tr>
<tr>
<td>9. Number of Students Planning On Continuing In Data Processing Field Through Advanced Education (By Method)</td>
<td>36</td>
</tr>
<tr>
<td>10. Number of Students Who Would Be Interested In Additional Data Processing Courses (By Subject)</td>
<td>37</td>
</tr>
</tbody>
</table>
Chapter 1

INTRODUCTION

Education is receiving more attention today than ever before. Schools are being called upon to present more facts and concepts and develop more sophisticated skills in high school students than were developed in college graduates a few years ago. At the same time, more children are in school and the numbers are expected to increase. For example, school enrollment for the fall of 1968 was nearly 57.9 million, more than the population of the entire United States was only eighty-five years ago.

John K. Norton in a report prepared for the National Committee for Support of the Public Schools stated:

Research, the application of new knowledge to industrial processes, and automation are remaking the economy of the United States. The scope and rapidity of this change are bringing about what some have called the Second Industrial Revolution. The impacts of this revolution are profound for education. It is imperative that schools and colleges respond to the new and changing demands being made upon them.

---


So pervasive is computer technology expected to become that in England experiments already are under way aimed at giving computer training to all school students to prepare them for future jobs. 3

There were only about 250 computer systems in operation in the United States in 1955; by 1969 there were 53,000; and, there are expected to be 128,000 computer systems, worth $54 billion, at work by 1975—the number more than doubled in a short five years. 4

The manpower requirements for highly trained data processing professionals already exceed by a vast margin current availability. 5 A study by Philip H. Weber indicates that the data processing industry will double in size by the early 1970’s. Based on an estimated total of 550,000 for 1967, the number of personnel working in the data processing field will reach one million within a few years. The study was conducted nationally and covered 2500 companies in sixty industries in 465 cities. 6


4 Ibid.

5 "Should U. S. Schools Teach dp?" Education Age, September–October, 1967, p. 44.

6 Ibid., p. 45.
Who is going to accept the challenges imposed by this rapid increase in automation in our society? Norton states, "It is imperative that schools and colleges respond to the new and changing demands being made upon them." 7

Stuart L. Bundy, a management consultant in Dallas, believes the demand for personnel has already stimulated certain colleges and universities to offer courses in the computer sciences. Mrs. Fran Kreilling, Savings and Loan Association Vice President and Personnel Director, states that junior colleges and universities are beginning to do a good job of exposing students to the computer, but thinks this is already too late for some students. She feels the time to expose a student to the reality of what the computer can and cannot do is during the junior and senior years in high school. 8

Employers generally agree that a valuable service could be rendered by the high schools by teaching the basic terms and concepts fostered by this electronic age. It is important that the student not fear the computer and automation but realize it is a tool for all mankind. 9

7Norton, loc. cit.

8"Should U. S. Schools Teach dp?" op. cit., p. 44.

Dr. E. Dana Gibson, co-founder of the Society of Data Educators, stressed in May 1969 that computerized data processing will affect not only every business subject but every other subject in the curriculum. Other disciplines, however, would lag behind the impact now being felt by business education. 10 Although the use of the computer in industry is not yet twenty years old, its impact is making business educators face the same challenges that scientists faced with the coming of the space age and mathematics teachers with the coming of modern math.

STATEMENT OF THE PROBLEM

There have been numerous research projects outlining course content and objectives for high school data processing courses. These projects deviate as to content, implementation, equipment required, and cost. These varied views indicate that data processing is not a fixed course that can be incorporated into all curricula. Each school will have to attempt to develop its own course within the societal and economic limitations imposed by the community it serves.

PURPOSE OF THE STUDY

The purpose of this study was to gather, compile and compare data on the present curriculum offered at the Great Falls Public High School, Great Falls, Montana. Great Falls, a city of approximately 70,000 inhabitants, has a public school system consisting of two senior high schools, three junior high schools and numerous elementary schools.

A questionnaire was used to obtain data from students presently enrolled in the course as to their desires, likes and dislikes of the present course. This information along with a review of related literature written by colleagues in the education and business fields and an inventory of existing hardware and software owned, leased or rented by the school district enabled the author to develop a data processing program for implementation into the business department at the secondary level of the Great Falls Public Schools, Great Falls, Montana.

LIMITATIONS

Hardware and software, if available, should be considered for any data processing program established. This equipment must be selected with great care to insure that future growth can be easily integrated with the established facility. The expense of procuring and maintaining the equipment requires that utilization be accomplished.
The Great Falls School District entered the field of computer training in 1967 with the acquisition of an IBM 1620, Model 1 Computer. The peripheral equipment consisted of an IBM 1622 Card Reader and two IBM 029 Key Punches. The initial entry was primarily for instructional purposes in the computer science classes established under the control of the mathematics department. The current courses offered under the mathematics department are:

COMPUTER PROGRAMMING I: 1 Semester (either), 1/2 unit

PREREQUISITE: Algebra 3, Trigonometry
Seniors only

Computer Programming I is an additional senior elective taken concurrently with, but not instead of, one of the usual mathematics courses.

This course develops a sound understanding of the mathematics related to both programming and analysis. The student will program and run over 100 small computer problems and numerous non-computer problems. As a result, the student will develop an awareness of the "why," as well as the "how" of the coding procedures he is using. The basic language used is FORTRAN (Formula Translation).

COMPUTER PROGRAMMING II: 1 Semester (either), 1/2 unit

PREREQUISITE: Computer Programming I

Computer Programming II is an additional senior elective taken concurrently with, but not instead of, one of the usual mathematics courses.
This course is an extension of Computer Programming I with emphasis on machine and symbolic languages. More involved problems worthy of term project consideration will be encountered. This course will enable the student to deal with these problems which require a more powerful language.

Departments with classes that could have utilized the equipment were physics, business, and vocational-technical education.

Due to the limited console typewriter output, any major business application which required printed output was almost impossible. This situation prompted the school administration to rent time on an IBM 360, Model 20 Computer from a local accounting firm when class schedules and report cards had to be printed.

An IBM 083 Sorter was added a short time later to the equipment configuration, and additional hardware features were incorporated into the central processing unit of the IBM 1620. These features are: additional instruction, automatic divide, and indirect addressing. These features made available extra programs supplied by the manufacturer plus final examination scheduling, test score frequency, plot sub-routine for FORTRAN, and other comparable programs in the mathematics and science fields. At present, the IBM 1620 leased by the Great Falls Public Schools has all available special features except the floating point capability.
In 1969 an IBM 1311 Disk Drive was added to the equipment already in use by the school district. This alone increased the efficiency of student instruction by decreasing program compilation time by 80 per cent.

The influx of students into data processing at the Area Vocational-Technical School prompted the school district to lease the previously rented IBM 360, Model 20 Computer. The computer was moved to the school's data processing facility in Great Falls Public High School. Peripheral equipment with the IBM 360, Model 20 includes an IBM 2560 Card Reader and an IBM 2203 Printer. The IBM 1620 can now be used for scheduling and scientific research and the IBM 360 for all listing, business instructional use, and administrative business applications.

GOTRAN (Load and Go Language), FORTRAN II D (Formula Translation), AFIT (Armed Forces Institute of Technology), and SPS (Symbolic Programming System) compilers are available for the IBM 1620, Model 1 Computer. RPG (Report Program Generator) and BASIC (Beginner's All Purpose Symbolic Instruction Code), Assembler are used for processing on the IBM 360, Model 20 Computer.

Processing of programs written in COBOL (Common Business Oriented Language) has been accomplished through local rented facilities.

Additional programs have been supplied by the equipment manufacturer. Besides the Utility Programs, there are the Executive Management Game for
economics classes, Elementary German-to-English Translation for the German classes, and a program to power-match teams in a debate tournament for the speech classes.

A listing of current equipment configuration is as follows:

1 - IBM 1620, Model 1 Computer, 20K
1 - IBM 1622 Card Reader
1 - IBM 1311 Disk Drive
9 - IBM 029 Key Punch
1 - IBM 029 Ken Punch, Model C22
1 - IBM 083 Sorter
2 - IBM 059 Verifier
1 - IBM 360, Model 20 Computer, 8K
1 - IBM 2560 Card Reader
1 - IBM 2203 Printer
1 - UARCO 1731 Deleaver
1 - Moore Burster

The above equipment, although available, should not be the sole criteria for establishing a data processing program. The equipment should be utilized if it is deemed advisable under the objectives of the program.
Throughout this report the following terms are used as defined here:

**Electronic Data Processing (EDP).** Pertaining to data processing equipment that is predominantly electronic such as an electronic digital computer.

**Hardware.** Physical equipment, e.g., mechanical, magnetic, electrical, or electronic devices.

**Program.** (1) A plan for solving a problem. (2) To devise a plan for solving a problem. (3) A computer routine, i.e., a set of instructions arranged in proper sequence to cause a computer to perform a particular process. (4) To write a computer routine.

**Software.** A collection of programs and routines associated with a computer (including assemblers, compilers, utility routines, and operating systems) which facilitate the programming and operation of the computer.

**Tabulating Equipment.** Data processing machines which use punched cards and are predominantly electro-mechanical, such as tabulators, collators, gang punches, interpreters, reproducers, and sorters.
Chapter II

REVIEW OF RELATED LITERATURE

After defining the problem, a review of related literature written by colleagues in the education and business fields was made to gain more objectivity and a broader background for determining the needs for a data processing program. Also, studies by leading educators in the field were reviewed to give additional insight into the current status of data processing as a course of instruction in the high school curriculum.

THE NEEDS FOR A DATA PROCESSING PROGRAM

"Let us prepare our young people with skills and nurture their abilities. Let us accomplish this by teaching them to use the extension of their brain that is the computer." ¹

F. Kendrick Bangs reports three changes that will affect the future life-work of the youth of today: "Mobility of people," "urbanization of our population," and "technology." In the realm of "technology," he further states that in a ten-year period we have moved ahead over one hundred years in computer development. The introduction of the computer has changed the

¹Francis Brown, "To Be Or Not To Be Automated," Business Education Forum, XIX, 5 (1965), 11.
complexion of office work. Yet, many parts of the business education curriculum in which we teach the tens of thousands of new workers going into the offices is still based on a 1925 study by Charters and Whitley entitled, "Analysis of Secretarial Duties and Traits."2

The computer is definitely making an impact on education. Only a few years ago a computer was a complex and expensive giant far beyond the reach of all but the biggest and richest schools. Computer courses are offered now at approximately 1200 U. S. colleges and universities, and thousands of secondary schools; moreover, the number is continually growing. Technological advances and manufacturing competition have combined to shrink computer sizes and in many cases reduce prices.3

Kargilis states the selection of the data processing instructional program, with primary orientation to business education, depends upon the needs of the student, the school, and the community.4 Haga reemphasizes this thought in explaining that the lesson to be learned from the present state of

---

2F. Kendrick Bangs, "Our Commitment to Research," The Balance Sheet, XLIX, 9 (1968), 399-400.


data processing instruction on the high school level is simply that no one, at this stage at least, can assert with any degree of confidence or validity that high schools should universally offer a particular set of well defined courses in their respective curricula.

Quite apart from specific computer skills, there is a growing awareness of the need to teach basic computer concepts and to remove the mystery of the computer. The mystery of the big complicated thinking machine can be dispelled. The fear of dealing with it can be overcome. There is no mystery to electronic data processing; computers are not awesome monsters to overpower the little man. A general education course would help the students to deal with something that will be more and more a part of each one's daily existence in the future. Children who are in school today will spend half their lives in the twenty-first century, when the computer will be as much a fact of daily existence as electricity and the automobile are today.

---

5 Enoch Haga, "... Introductory Automation and Data Processing for All High School Students," *Business Education Forum*, XXII, 8 (1968), 17.


John H. Chafee, Governor of Rhode Island, reiterated this fact also in an introduction written for the book, *The Computer in American Education*, by Don B. Bushnell and Dwight W. Allen. He wrote:

> In time, every educated individual in American society will come into contact with computers. He should become acquainted with them early and understand their potentialities and limitations, what they can do and how they accomplish it. For this reason we must give special attention to developing course materials that will bring students not majoring in the sciences into contact with a computer and teach them about its principles and operation.\(^8\)

Haga points out that data processing is not the exclusive preserve of business educators; other departments may develop their own programs, too. There is no reason why a data processing course could not be business-oriented and yet serve the science and mathematics students who want to obtain a background in data processing. At the introductory level, much of the logic, systems and vocabulary are the same for both scientific and business data processing.\(^9\)

Kidd suggests that teachers should avoid being carried away with just teaching the mechanics of data processing; more important, possibly, is

---


\(^9\)Haga, loc. cit.
the "why" of data processing. Speed, accuracy, and decision making in the
modern business world are the reasons data processing has developed so tremen-
dously.

As far as the implications of computers for employment are concerned,
there is hardly any type of employment a young person can enter today that does
not require at least a minimum knowledge of data processing principles as a con­
dition for advancement. In addition to this employment outlook, Davidson
believes that for the student going on to college, previous data processing
instruction is no less important. Practically every university discipline, he
states, now uses computers in one way or another. Applications range from
education departments with their computerized teaching machines to engineer­
ing departments which now often expect their students to do much of their
"homework" on a computer. 11

Basic instruction in data processing in high school classes would help
identify native abilities of students for this type of work. In the eleventh grade,
for example, classes might be offered in basic machine principles and unit

10 Richard D. Kidd, "A Sane Approach to Teaching Data Process­

11 "Should U. S. Schools Teach dp?," Education Age, September­
October, 1967, p. 43.
record operations. Then in the twelfth grade those students who showed an aptitude for data processing could advance to courses in basic computer programming.

"It is said that programming, currently the most exotic branch of data processing, is going to reach the point, like typing, where everyone will know how to do it."13

Based on the results of an experiment he conducted in data processing education, B. J. Hoffman reports that mastery of a programming language may measurably improve self-image of the student and decrease the school dropout rate. This experiment, conducted in the Compton Union High School District in California, involved 300 sophomore, junior and senior students. A sampling of the students who had taken the computer science language indicated that they not only improved in mathematics and in spelling, but in English composition as well.14

---

12 Ibid., p. 45.
SELECTED STUDIES

In a recent study John M. Bunch requested executives from 800 business firms to indicate their thoughts and beliefs about their local education system; he received 320 responses, or 40 per cent of the total. Of the 320 companies, 101 had data processing equipment and 219 firms did not. The results indicated:

A shortage in the availability of data processing workers was noted by 76 per cent of the firms. The greatest shortage appears to be for programmers, keypunch operators, and machine operators—in that order. Of the 65 firms which already have a programming staff, 55 per cent indicated that they do plan to increase this staff soon. The program languages most recommended for teaching in the public schools were COBOL and FORTRAN.15

S. J. Wanous, in 1968, conducted a survey of thirty-one nationally recognized leaders in secondary business education. Based on twenty-four responses, he concluded that:

1. Eighty-four per cent of the leaders believed that instruction in automated data processing should be offered in secondary schools.

2. Forty-six per cent believed that the instruction should be offered as a unit in some business course that is open, on an elective basis,

---

to all students.

3. Thirty-eight per cent believed that the instruction should be offered in a data processing course offered on an elective basis to all students.

4. Seventy-nine per cent believed that the course in automated data processing should be primarily concerned with principles, processes, and terminology—not with the machinery of automation.

5. Thirteen per cent believed that the course should be primarily concerned with the development of vocational skills on the card punch and other unit-record machines.\(^{16}\)

In 1969 an effort was made to determine what the educational institutions throughout the fifty states were doing in the area of data processing. A questionnaire was mailed to each state supervisor or the director of business and office occupations inquiring about the number and length of data processing courses at the high school, vocational-technical school, and junior college level. Specifically, information was requested on the following program alternatives:

1. Business data processing courses consisting of introductory courses without the use of equipment.

---

2. Business data processing courses providing training through the use of unit-record (card punch) equipment only.

3. Business data processing courses providing training through the use of computers only.

4. Business data processing courses providing training through the use of both unit-record equipment and computers.\textsuperscript{17}

As of July 1969, thirty-four of the states had responded. General findings are as follows:

1. Eighteen states offered courses in data processing at all three education levels.

2. Nine states offered courses in data processing at only two levels—high school and either the vocationa-technical school or the junior college.

3. Two states offered courses in data processing at the vocational-technical school level only.

4. One state offered courses in data processing at the junior college level only.\textsuperscript{18}

Since some states operate their junior college programs separately from the state department of education, most of the information submitted concerned the high school program rather than the higher levels of education. Information about the high school programs are as follows:

1. Twenty-five states offered data processing courses without the use of equipment. Some schools integrated these materials with other business courses.


\textsuperscript{18}Ibid.
2. Twenty-seven states offered data processing courses involving the use of unit-record equipment only. Some courses were restricted to offerings utilizing card punch equipment.

3. Four states offered data processing courses with the use of computers only.

4. Fifteen states offered data processing courses involving the use of both unit-record equipment and computers. These course lengths ranged from one semester to three-year programs. ¹⁹

State directors offered the following typical comments about the future trends in data processing which were being considered in the development of new or expanding programs:

1. The need for teachers of data processing is so great that summer workshops and other college offerings are being initiated.

2. Consideration is being given to a total system approach to data processing involving not only business education but also mathematics, science, and school administration.

3. Time-sharing methods using remote terminals to large computers are being used.

4. Plans are being made to expand computer training in schools previously equipped with unit-record equipment.

5. Introduction to programming is offered to high school students using software rather than hardware.

6. There is a phasing out of unit-record equipment and instruction and addition of programs in computer programming.

¹⁹Ibid.
7. Computer "hands-on" experience is to be offered at high school level.

8. As the use of computer services comes within the reach of more businesses, the demand for data processing programs in the high school will become greater.

9. Key punch training will remain, with less emphasis on unit-record board wiring and more introduction to sophisticated computer languages such as COBOL and RPG.

10. Mobile units to house unit-record laboratories are being used in some states.

11. There is a gradual conversion from card punch to key tape machine training.

12. Basic data processing is offered as a semester course in the eleventh grade with a full-year course at the senior level to teach programming.

13. There is a need for continued funding through the various vocational acts.

14. There is a need to encourage cooperative work-experience programs.

15. Advisory committees should be used to determine the type of offerings in data processing and to determine the availability of jobs.20

20Ibid.
SUMMARY

It seems apparent that there is a general need for a data processing program at the high school level. Although the need for data processing is nationwide, each school district will have to determine the direction of its program by the needs of the student, the school, and the community. Thousands of secondary schools have answered this requirement for data processing and the number is continually growing. The need for data processing is recognized for all students, regardless of the direction of their studies, to effectively operate in an automated society. Although a general course in concepts and principles is deemed advisable at the junior level, additional courses such as computer programming would complement any basic data processing course offered and could be available to the students at the senior level.
Chapter III

STUDENT ANALYSIS OF CURRENT COURSE

The research on the current data processing course offered by the Great Falls Public Schools was conducted primarily by a questionnaire (Appendix A). Students enrolled in the course during February, 1970, were selected to complete the questionnaire as their opinions would be vital to any curriculum change. Of the fifty-seven students enrolled in the two sections of the course at that time, forty-four (77 per cent) responded to the questionnaire. Their answers to the questions are the basis for this analysis of the current course.

The current course, Secondary Basic Data Processing, is offered in the Business Department. The objectives and general outline of the course are as follows:

1. Objectives
   A. Introduce the subject of business data processing so that its elements are understood in their simplest form.
   B. To make the student familiar with the various tools, and by no means computers only, that can be used to perform the data processing operations.
C. Emphasize that an understanding of the data required to operate and control a business is an essential prerequisite for determining the tools needed to accomplish this task.

II. General Outline

A. Concepts and Equipment
   1. Concepts of Business Data Processing
   2. Manual Data Processing
   3. Mechanical Data Processing
   4. Punched-card Data Processing
   5. Paper-tape Data Processing
   6. Computer Data Processing I
   7. Computer Data Processing II

B. Systems and Procedures
   1. Business Data Processing Systems
   2. An Order and Billing Systems
   4. An Inventory Control System
   5. Manual, Mechanical, Punch-card, and Computer System for Inventory Control
6. A Payroll System

7. Manual, Mechanical, Punched-Card and Computer System for Payroll

C. Business Organization and Data Processing

1. Business Enterprises and Their Organization

2. Jobs in Modern Business Data Processing

Table 1, below, shows that of the forty-four students responding, seventeen were juniors and twenty-seven were seniors. Great Falls High School, where the course is offered, is a three-year high school featuring grades 10, 11, and 12. Since the course in data processing is an elective course, sophomores are rarely admitted due to the number of required courses at that level.

Table 1

Approximate Grade-Point Average of Students by Grade (By Number)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Not Indicated</th>
<th>1.1 D</th>
<th>1.5</th>
<th>2.0 C</th>
<th>2.5</th>
<th>3.0 B</th>
<th>3.5</th>
<th>4.0 A</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>1a</td>
<td>0</td>
<td>1</td>
<td>7</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>12</td>
<td>-</td>
<td>0</td>
<td>1</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>2</td>
<td>1</td>
<td>27</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>15</td>
<td>12</td>
<td>10</td>
<td>3</td>
<td>1</td>
<td>44</td>
</tr>
</tbody>
</table>

*aStudent did not indicate approximate grade-point
Table 1, above, and Table 2, below, indicate that the majority of students have an approximate grade-point average of 2.5 or above. To arrive at a grade-point average, the student adds four points for each A, three for each B, two for each C, and one for each D, and divides them by the number of full-year credits he has received. If the course is a half-unit course, he divides the points for that grade by two to arrive at the grade-point average. An approximate grade-point average is reached by rounding the grade point to the nearest point or half-point level.

Table 2

Approximate Grade-Point Average of Students
by Grade (By Per Cent)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Not Indicated</th>
<th>1.0</th>
<th>1.5</th>
<th>2.0</th>
<th>2.5</th>
<th>3.0</th>
<th>3.5</th>
<th>4.0</th>
<th>Total*</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>5.9a</td>
<td>0</td>
<td>5.9</td>
<td>41.1</td>
<td>29.4</td>
<td>11.7</td>
<td>5.9</td>
<td>0</td>
<td>99.9</td>
</tr>
<tr>
<td>12</td>
<td>-</td>
<td>0</td>
<td>3.7</td>
<td>29.6</td>
<td>29.9</td>
<td>29.6</td>
<td>7.4</td>
<td>3.7</td>
<td>99.9</td>
</tr>
<tr>
<td>Total</td>
<td>2.3</td>
<td>0</td>
<td>4.5</td>
<td>34.0</td>
<td>27.2</td>
<td>22.7</td>
<td>6.8</td>
<td>2.3</td>
<td>99.8</td>
</tr>
</tbody>
</table>

*aStudent did not indicate approximate grade point.

*Rows do not add to 100.0 because of rounding.
About one-third of the students have a grade point of 2.0 or a C average. One respondent failed to indicate approximate grade point; therefore, 2.3 per cent of the total is registered as grade not indicated. There were 41.1 per cent of the students in the eleventh grade who indicated a C average and 29.6 per cent of the students in the twelfth grade who were in the same category. With this deviation, however, both grades are fairly uniform in the range of 2.0 through 3.0, with the eleventh grade having a total of 82.2 per cent within this range and the twelfth grade, 85.1 per cent within this range. This deviation was offset by the larger percentage of seniors in the 3.0 (29.6 per cent) compared to the juniors (11.7 per cent).

When the students were asked what they perceived the objectives of the current course to be, the students who responded almost unanimously agreed that it was to provide a brief introduction into data processing, illustrate the effects of data processing on today's businesses, and give an insight into data processing as a career objective. These objectives are very closely aligned with the objectives as stated in the course outline. The main discrepancy between stated objectives and the student responses was in the failure to utilize the equipment which the students knew was available.

Table 3, below, indicates that seven students, or 41 per cent of the students in the eleventh grade, and eighteen students, or 67 per cent of the
students in the twelfth grade, felt that the current course in data processing is what they expected the data processing course to be. These twenty-five students represent 57 per cent of the students responding. The other nineteen students, ten in the eleventh grade (59 per cent), and nine in the twelfth grade (33 per cent), comprised 43 per cent who felt the current course did not meet their expectations. Twelve of these students indicated that they expected more equipment usage or computer programming than the current course offers.

Table 3

<table>
<thead>
<tr>
<th>Grade</th>
<th>Yes</th>
<th>Per Cent</th>
<th>No</th>
<th>Per Cent</th>
<th>Total</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>7</td>
<td>41</td>
<td>10</td>
<td>59</td>
<td>17</td>
<td>100</td>
</tr>
<tr>
<td>12</td>
<td>18</td>
<td>67</td>
<td>9</td>
<td>33</td>
<td>27</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>57</td>
<td>19</td>
<td>43</td>
<td>44</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 4, below, reveals that twenty-five of the forty-four students indicated they liked the subject of data processing; several other students indicated various areas that they liked in the course though they did not like the course as a whole. Only six students indicated they liked the textbook, seven listed projects, five listed visual aids, and six listed items not printed on the questionnaire. These latter items were more of an indication of negative response to the course than of appreciation and resulted from the failure of the course to provide any opportunity to see or to operate any data processing equipment. Students could indicate more than one area so responses are larger in total than the number of students responding.

### Table 4

Areas of Current Data Processing Course That Students Indicated They Liked

<table>
<thead>
<tr>
<th>Grade</th>
<th>Subject</th>
<th>Textbook</th>
<th>Projects</th>
<th>Visual-Aids</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>9</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>12</td>
<td>16</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>6</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>49</td>
</tr>
</tbody>
</table>

*Student could indicate more than one area, resulting in double counting.*
Table 5, below, stresses areas of the course that negative responses were indicated by the students. Again, some students indicated more than one area, so the total is larger than the number of students responding. The largest negative response is indicated in the category "Other" with a total of seventeen. Ideas under "Other" range from inordinate time spent on workbooks to inadequate time for discussion-centered activity and a lack of work on actual equipment. The second major negative response with fifteen replies concerned the textbook. With less negative responses are: difficulty of the course, three; lack of adequate skills necessary for the course, seven; lack of proper academic background, eight; visual-aids, one; projects, three; and dislike of the subject, one.

The student responses were inconsistent within the areas of likes and dislikes. Twenty-five students indicated they liked the subject of data processing and only one of the remaining nineteen indicated he disliked the subject. The other eighteen students didn't indicate whether they like the course or not, yet they did indicate other areas of the course that they disliked. The current course indicates no prerequisite, but the students indicated that the lack of skills and a proper academic background did influence their dislike of the course. This was more prevalent among the seniors than the juniors, and indicates that seniors are more critical of the course offering.
Table 5

Areas of Current Data Processing Course That
Students Indicated They Disliked

<table>
<thead>
<tr>
<th>Grade</th>
<th>Difficulty of the Course</th>
<th>Lack of Adequate Skills Necessary for the Course</th>
<th>Lack of Proper Academic Background for the Course</th>
<th>Visual-Aids</th>
<th>Textbook</th>
<th>Projects</th>
<th>Other</th>
<th>Subject</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>9</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>5</td>
<td>8</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>8</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>7</td>
<td>8</td>
<td>1</td>
<td>15</td>
<td>3</td>
<td>17</td>
<td>1</td>
<td>55</td>
</tr>
</tbody>
</table>

* Students responded to more than one area, resulting in double-counting.

Another conclusion that could be drawn from the areas of dislike is that the material in the course was not adequately presented to the students although they felt that this lack of comprehension was due to their own inadequacies and lack of preparation for the subject.
Fifteen students responded that they did not like the textbook. The textbook used in the course, *Understanding Modern Business Data Processing* by Beryl Robichaud, is considered to be a high school level textbook. It is understandable that all persons do not like the same text; however, the presentation of the material may have influenced the students' response to this question.

Table 6, below, reflects the grade level at which the students thought a course in data processing would be most beneficial to the high school student. Eleven of the seventeen juniors felt that the course should be offered at the junior level. Four of the remaining six thought it should be offered at the sophomore level and two students at the senior level. Of the seniors responding, seven indicated it should be at the sophomore level, thirteen at the junior level, and

Table 6

<table>
<thead>
<tr>
<th>Grade</th>
<th>Sophomore</th>
<th>Junior</th>
<th>Senior</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>4</td>
<td>11</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>12</td>
<td>7</td>
<td>13</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>24</td>
<td>12</td>
<td>47</td>
</tr>
</tbody>
</table>
ten at the senior level. Three students of the twelfth grade indicated that either junior or senior levels would be appropriate; their response is tabulated under both recommended grades, resulting in an overcounting of three. The junior level was the one most selected with twenty-four responses; senior level, twelve; and sophomore level, eleven. This would indicate that the students did not feel the course too difficult for the junior level.

It is apparent from Table 7, below, that twenty-nine students enrolled in the data processing course from their own desire to become

Table 7

Influences For Enrollment Into Data Processing Course

<table>
<thead>
<tr>
<th>Grade</th>
<th>Recommendation of School Counselor</th>
<th>Recommendation of Parents</th>
<th>Recommendation of Students Previously in Course</th>
<th>Recommendation of Instructor</th>
<th>Own Desires</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>10</td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>19</td>
<td>1</td>
<td>27</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>29</td>
<td>3</td>
<td>46a</td>
</tr>
</tbody>
</table>

*aThe 46 total is due to one student indicating three answers to a question requiring one choice.
acquainted with the subject. Twenty-eight responded that they elected to take the course without any outside recommendations by their school counselors, parents, students previously enrolled in the course, or instructors. One responded that he enrolled to take the course out of his own desire but had also been recommended to take the course by the school counselor and a student previously in the course. A total of nine responded they enrolled upon recommendation of school counselors, five on recommendation of students previously in the course, and three for other reasons. No students reported that they enrolled because of recommendation of their parents or instructors.

Table 8, below, reflects that over half of the students responding enrolled in the data processing course for reasons other than obtaining employment or preparing for college. Reasons under the "Other" category reflect

Table 8

<table>
<thead>
<tr>
<th>Grade</th>
<th>Obtaining Employment</th>
<th>College Preparation</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>6</td>
<td>0</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>12</td>
<td>9</td>
<td>3</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>3</td>
<td>23</td>
<td>41</td>
</tr>
</tbody>
</table>

1The 46 total is due to one student indicating three answers to a question requiring one choice.
either an interest in finding out what data processing is or a need for graduation credit. Fifteen (36.6 per cent) responded that the main reason for selecting the course was for employment. Only three of the forty-one (7.3 per cent) wanted the course for college preparation. Three students did not respond to this question.

A total of twenty-five students, ten in the eleventh grade and fifteen in the twelfth grade, indicated that they would not pursue further study in the data processing field. One student in the eleventh grade had not decided whether to continue the study of data processing. The eighteen remaining students planned some method of advanced education in the data processing field. Table 9, below, indicates the various methods considered for continued training in the field: attending a private business college, six; Area Vocational-Technical School, five; Liberal Arts College or University in Montana, two; Liberal Arts College or University outside Montana, two; and others, one. The one listed under "Others" indicated no choice of means for further studies.

Although only eighteen students planned on some method of advanced education in the data processing field, thirty-one (70.4 per cent) of the forty-four students responding indicated they would attend additional data processing courses at the high school level if offered. These thirty-one students were composed of twelve from the eleventh grade and nineteen from the twelfth grade.
Table 9

Number of Students Planning on Continuing in Data Processing Field Through Advanced Education (By Method)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Private Business School</th>
<th>Area Vocational - Technical School</th>
<th>Liberal Arts College or University in Montana</th>
<th>Liberal Arts College or University Outside Montana</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>12</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>18</td>
</tr>
</tbody>
</table>

Students answering this question indicated many areas that they would be interested in studying; they will be listed in order of preference, as itemized in Table 10, below.

19 - Advanced Computer Course

17 - Computer and other Electronic Data Processing Equipment Operations

14 - Key Punch Operations

10 - COBOL (Common Business Oriented Language)
<table>
<thead>
<tr>
<th>Grade</th>
<th>Advanced Computer Course</th>
<th>COBOL</th>
<th>FORTRAN</th>
<th>Key Punch Operations</th>
<th>Unit Record Equipment</th>
<th>Computer and Other EDP Equipment Operations</th>
<th>Other Computer Languages</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>7</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td>0</td>
<td>2</td>
<td>26</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>8</td>
<td>5</td>
<td>9</td>
<td>1</td>
<td>11</td>
<td>1</td>
<td>0</td>
<td>47</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>10</td>
<td>8</td>
<td>14</td>
<td>2</td>
<td>17</td>
<td>1</td>
<td>2</td>
<td>73</td>
</tr>
</tbody>
</table>

8 - FORTRAN (Formula Translation, Business Oriented)

2 - Unit Record Equipment

2 - Other than listed

1 - Other Languages (RPG)

It is apparent from these preferences that the students wish to have courses which offer either machine operation or some type of computer programming.
In summary, the student analysis of the current course offered under the business department of the Great Falls Public High School provided the following information:

1. That the students enrolled in the current course were of average to above average in cumulative grade-point standings and the course is not a "dumping-ground" for non-productive students.

2. That the present course objectives are similar to what the students perceived them to be except the students thought there would be more utilization of the data processing equipment which was available.

3. That students would prefer machine operation and discussion-centered activity in the present course and desire additional courses with machine operation and computer programming.

4. That a majority of the students thought that the course should continue to be offered at the junior level to be most beneficial to the high school student.

5. That school counselors, instructors, and parents should assume a more active role in encouraging students to enroll in data processing courses.

6. That a data processing course should be geared neither to college preparation nor vocational competency but to a general understanding of the field.
Chapter IV

RECOMMENDED PROGRAM

The specific purpose of this chapter is to recommend a comprehensive program of data processing to be incorporated into the business education departments at the secondary level of the Great Falls Public Schools. It has been shown previously in this study through a review of related literature that a program of this nature is not only feasible at the high school level but also desirable due to the tremendous impact the computer will have on all activities of daily life in the years to come. Student responses to the questionnaire, although not the sole criteria for establishing the program content, did provide information to make the course as relevant as possible to the students.

It is intended that this program be divided into two one-semester courses, both offered on an elective basis to students of the eleventh and twelfth grade level. Each semester course would be comprised of ninety class periods, each fifty-five minutes in length. The amount of time spent on any one portion of each course proposed will be determined by the ability of the students enrolled, the instructor's knowledge and capabilities in the field, and the general academic environment of the schools concerned.
This program was designed to use existing hardware and software which are currently owned, leased or rented by the Great Falls Public Schools. Utilization of this equipment is considered essential for both courses.

Languages taught during the programming portion of each course should be those for which the instructor has some knowledge or experience. The recommended language for the first semester course is FORTRAN (Formula Translation), due to the convertibility of the language to either scientific or business application. Recommended languages for the second semester course are COBOL (Common Business Oriented Language) and FORTRAN.

Since much of the logic, systems and vocabulary are the same at the introductory level, a team teaching situation could be used with a combination of a business education instructor and a mathematics of science instructor for the first semester course. Upon completion of the course, students would then have three options available to them: (1) enroll in the computer science courses presently offered to seniors under the mathematics department; (2) enroll in the course "Computer Programming" taught by the business education department personnel; or (3) terminate their studies in this field.

The first-semester course entitled, "Introduction to Computers" will illustrate the development of computer systems from manual methods of data processing to a brief introduction to computer programming. All data
processing systems, regardless of size, type or basic use, have certain fundamental concepts and operation principles. The course is not an introduction to any specific machine but rather is intended to provide the foundation of data processing for personal use or for further detailed study. To see and utilize unit-record equipment that is available is an essential part of this course. Because data processing is a very dynamic field, current periodicals should supplement the textbook used.

**Course:** Introductions to Computers

**Objectives:**

1. To provide a brief history of data processing.
2. To provide a basic understanding of the three methods of data processing—manual, mechanical, and electronic.
3. To provide actual operation of unit-record equipment.
4. To provide a basic understanding of computer programming and the processing of such programs on an electronic computer.
5. To provide information concerning opportunities for employment in the many areas of data processing.
6. To review current periodicals to familiarize students with the latest developments in the field.
Course Outline:  

I. History of Data Processing

A. What is Data Processing?  1 - 2
B. The Need for Data Processing  2 - 3
C. The Data Processing Operation  3 - 5

1. Input
2. Manipulation
3. Output

D. Methods of Data Processing  13 - 15

1. Manual
2. Mechanical
   a. First Stage
   b. Second Stage
   c. Third Stage

3. Punched Card Machine
   a. History
   b. Card
   c. Field
   d. Equipment
      (1) Key Punch
      (2) Sorter
      (3) Collator
      (4) Interpreter
      (5) Accounting Machine

4. Electronic
   a. Digital
   b. Analog
II. Computer Configurations

A. Input/Output Media and Devices 10 - 15

1. Punched Cards
   a. Punched Card Equipment
   b. Advantages and Limitations of Punched Cards

2. Paper Tape
   a. Coding
   b. Paper Tape Equipment
   c. Advantages and Limitations of Paper Tape

3. Magnetic Tape
   a. Coding
   b. Magnetic Tape Equipment
   c. Advantages and Limitations of Magnetic Tape

4. Other
   a. Console
   b. MICR (Magnetic Ink Character Recognition)
   c. OCR (Optical Character Recognition)
   d. Printers
   e. Online Terminals
   f. Visual Communications
   g. Voice Communications

B. Central Processing Unit 8 - 10

1. Control Unit
2. Storage Unit
   a. Internal
   b. External
3. Arithmetic/Logic Unit
III. Brief Introduction to Programming

A. Flow Charting 5 - 7
   1. System
   2. Program

B. Computer Languages 5 - 8

IV. Current Trends in Data Processing

A. Hardware 2 - 3
B. Software 2 - 3
C. Applications 10 - 15

V. Opportunities in Data Processing Field

A. Job Classification 2 - 4
B. Training Required 2 - 3
C. Methods of Advanced Training 1 - 2

The second-semester course entitled "Computer Programming" will illustrate the use of various computer languages and their applications to business problems. Actual programming will be involved with successful processing on the computer. Since this course would deal in greater depth the operations and applications of the computer plus a more comprehensive review of related literature, successful completion of "Introduction to Computers" would be considered a prerequisite. Further, it is recommended that some type of pre-testing be administered to the students to determine capabilities of logical expression and aptitude. This test should not be used as a screening method,
but should be used as a tool by the instructor to determine the abilities of each student. Computer programmer and computer operator aptitude tests are available through area or local IBM sales representatives.

Course: Computer Programming

Objectives:

1. To help bridge the gap from theoretical to practical use of computers.

2. To provide the student with a basic understanding of various computer languages.

3. To provide the student the opportunity to prepare and process successfully various types of programs with business applications.

4. To review and to comprehensibly analyze current periodicals in the field.

5. To provide information concerning personal and professional characteristics, and training and availability necessary to enter the field of data processing.
### Course Outline:

**I. Review of Computer Concepts**

<table>
<thead>
<tr>
<th>A. Input/Output Media and Devices</th>
<th>2 - 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Punched Card</td>
<td></td>
</tr>
<tr>
<td>2. Paper Tape</td>
<td></td>
</tr>
<tr>
<td>3. Magnetic Tape</td>
<td></td>
</tr>
<tr>
<td>4. Other</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Central Processing Unit</th>
<th>2 - 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Control Unit</td>
<td></td>
</tr>
<tr>
<td>2. Storage Unit</td>
<td></td>
</tr>
<tr>
<td>3. Arithmetic/Logic Unit</td>
<td></td>
</tr>
</tbody>
</table>

**II. Computer Logic**

| 3 - 5 |

**III. Computer Flow Charting**

| A. Systems                          | 2 - 3 |
| B. Program                          | 3 - 7 |

**IV. Computer Languages**

| 10 - 15 |

**V. Programming and Processing**

| A. Flow Charting                    | 3 - 5 |
| B. Writing Programs                 | 8 - 10 |
| C. Debugging                        | 8 - 10 |
| D. Successful Processing of Program | 3 - 5 |

**VI. Familiarity with Modern Developments**

| A. Hardware/Software Compatibility | 5 - 7 |
| B. Languages                        | 10 - 13 |

**VII. Employment Opportunities**

| 10 |
It is practically impossible to recommend any one textbook which could serve in either segment of this program. Each instructor would undoubtedly prefer to select his own based on his own experience and educational preparation. The author's preference for student textbooks and supplementary reference materials are included in the appendix. Additionally, there are other paperbacks, bound texts, pamphlet series, programmed materials, and practice sets on the market which could be adopted for use in this program.

Visual aids and films should be selected at the discretion of the instructor. Current film catalogues and educational catalogues should be consulted for these selections. Two film catalogues which are considered excellent resources are:


Chapter V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY

This study was made to develop an electronic data processing (EDP) instructional program to be implemented in the business department at the secondary level in the Great Falls Public Schools, Great Falls, Montana. Great Falls is a city of approximately 70,000 inhabitants. The school district has two senior high schools, three junior high schools and numerous elementary schools. The senior high schools contain grades ten, eleven and twelve. The students who were enrolled in the data processing course under the business department in February, 1970, were selected to participate in this study.

A questionnaire method was used in obtaining student desires, likes and dislikes about the current course. Fifty-seven students were enrolled in the two sections of the course and forty-four students, or 77 per cent of the total, responded.

These student responses, in addition to a review of related literature written by colleagues in the education and business fields and an
inventory of existing hardware and software within the school district, pro-
vided the basis for the recommendations for this study.

A program consisting of two one-semester courses is recommended
for implementation in the business department at the two senior high schools
of the Great Falls Public Schools. The first-semester course would deal with
fundamentals of data processing and the second, computer programming.

CONCLUSIONS

1. The addition of computer courses to the curricula indicates
that educators are accepting the challenge imposed by computer technology.
Over 1200 U. S. colleges and universities and thousands of high schools have
adopted such courses. However, educators must be prepared to accept fur-
ther demands made by automation and either change or add new courses as
required.

2. There is definite need for a data processing program at the
secondary level if the high schools are to continue to provide the youth with
the academic and vocational background to become productive members of
society. High school students today will spend half their life in the twenty-
first century where the computer will be very much a part of their daily
existence.
3. Computer programming should be considered an integral part of any data processing program. Programming gives the student the insight into the necessity for clarity of instruction, requires a logical choice of available approaches, and emphasizes the importance of a correct computational interpretation of the problem. Programming will help the student understand not only data processing but also other areas of the curriculum.

4. The initial entry of students into the field of data processing should continue to be at the junior level. The availability of such courses at this level should be emphasized to the students. With the completion of the introduction at the junior level, students who desire additional courses could obtain them during the senior year.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

1. That the recommended program be implemented, replacing the current data processing course in the business department of the senior high schools in the Great Falls Public Schools, Great Falls, Montana; and that a "hands-on" approach be used with the equipment available for data processing instruction.
2. That an advisory committee comprising local business and community leaders be established to advise the school system on appropriate aspects of the program.

3. That a follow-up study be made within a reasonable time after implementation of the program to determine its effectiveness in meeting the needs of the student.

4. That, above all, business educators accept the challenge of incorporating data processing into their curriculum and prepare themselves academically for this challenge.
BIBLIOGRAPHY

BOOKS


PERIODICALS


Johnson, Margaret H. "Is Business Keeping Abreast of the Big Business Education Development?" The Balance Sheet, XLIX, 9 (1968), 393-396.


"Should U. S. Schools Teach dp?" Education Age, September-October, 1967, pp. 43-45.

REPORTS AND MONOGRAPHS


APPENDIX

APPENDIX A - QUESTIONNAIRE

APPENDIX B - RESPONSES TO QUESTION 3, QUESTIONNAIRE

APPENDIX C - TEXTBOOKS
APPENDIX A

Questionnaire

NAME ___________________________ Grade (Circle One) 10 11 12

This questionnaire was prepared for the purpose of acquiring from students taking a data processing course at the Great Falls Public High School information which may be helpful in the development of an Electronic Data Processing instructional program for School District #1, Great Falls, Montana.

1. My approximate grade-point average is (Circle One)

   1.0  1.5  2.0  2.5  3.0  3.5  4.0
   D    C    B    A

2. What do you perceive the objective is of the present course?

   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________

3. Is the course you are taking in Data Processing what you expected it to be? (Circle One)

   YES       NO

   If "NO" what did you expect the course to be?

   __________________________________________
   __________________________________________
   __________________________________________
   __________________________________________
4. What do you like about the course? (Circle appropriate letter or letters)
   a. Subject
   b. Textbook
   c. Projects
   d. Visual-aids
   e. Others (please specify) ________________________________

5. What do you dislike about the course? (Circle appropriate letter or letters)
   a. Subject
   b. Difficulty of the course
   c. Lack of adequate skills necessary for the course
   d. Lack of proper academic background for the course
   e. Visual-aids
   f. Textbook
   g. Projects
   h. Others (please specify) ________________________________

6. At which level (grade) do you think this course would be most beneficial to the student? (Circle one)

   SOPHOMORE 10  JUNIOR 11  SENIOR 12
7. Did you enroll in the Data Processing Class by (Circle letter)
   a. recommendation of school counselor
   b. recommendation of parents
   c. recommendation of student(s) previously in course
   d. recommendation of instructor
   e. own desires
   f. other (please specify) _________________________________

8. Did you enroll in the Data Processing Class for (Circle letter)
   a. purpose of obtaining employment in the field
   b. preparation for college entrance
   c. other (please specify) _________________________________

9. Do you plan on continuing in the Data Processing field through advanced education? (Circle one)
   YES    NO

   If "YES", indicate through which method (Circle letter)
   a. Private Business School
   b. Area Vocational-Technical School
   c. Liberal Arts College or University in Montana
   d. Liberal Arts College or University outside Montana
   e. Other (please specify) _________________________________
10. Would you be interested in additional courses in Data Processing if there were more offered as electives? (Circle one)

YES       NO

If "YES" indicate preference: (Circle letter or letters)

a. Advanced Computer Course (functions of the computer)

b. COBOL Programming (Common Business Oriented Language)

c. FORTRAN Programming (Formula Translation, Business Oriented)

d. Key Punch Operations

e. Unit Record Equipment Operations

f. Computer and other EDP Equipment Operations

g. Other Languages (please specify) _______________________________

h. Others (please specify) _______________________________
APPENDIX B
RESPONSES TO QUESTION 3, QUESTIONNAIRE

Is the Course you are taking in Data Processing what you expected it to be?  (Circle One)

YES (25)  NO (19)

If "NO" what did you expect the course to be?

Comments to this question were:

"I expected this course to lean a little more towards computer programming (which I am interested in)."

"I don't feel that it is as interesting as I was expecting, Data Processing is too complicated with the different machines and such."

"Something along the lines of computer operation."

"I thought that you would be able to see most of the machines and how they are run."

"I felt that there would be more than just workbooks and books, I felt we would be able to work with the computer at least a couple of times."

"Easier, more interesting--this course just runs over very quickly some of the outside facts."

"I expected to work more with the machines that involve computer programming, like tabulator billing machines and computers, etc."

"I expected that we would learn how to work some of the machines. I thought it would be more first hand instead of just working in a workbook."
"I expected we would get more of a chance to really see and understand computers, punch card machines and other data processing equipment. I thought there would be more discussion and activity."

"Everything was as I suspected except the part of leaving our workbooks in class."

"I thought we would be able to use the computer or at least some other equipment related to data processing."

"Less to do with business."

"I didn't think there would be so many things involved with the computer."

"I expected it to be more specific. We learn the names of machines and what they do but we never learn how to use them. In fact, most of the equipment we learn about, I've never seen."

"I thought we would be doing work with computers or some such thing."

"I expected to have an opportunity to work with the different machines used in data processing and work with the computer in this school."

"I expected more machine work."

"I did not know what it was going to be, but I needed another elective so I picked this one."
APPENDIX C

Textbooks

Course: Introduction to Computers

Textbook: Computers In Business, An Introduction
Donald H. Sanders

Computers in Business is designed for use in an introductory one-semester or one-quarter course in computer data processing. No mathematical or data processing background is required or assumed; no specific computer make or model is featured. The book can be used without access to a machine. The primary purpose of the book is to lay the foundation for the continuing study which will allow potential managers to prepare for a successful working relationship with computerized information processing.

Supplementary: Modern Data Processing
Robert R. Arnold, Harold C. Hill, and Aylmer V. Nichols
John Wiley and Sons, Inc., 1969

FORTRAN, Logic and Programming
Fritz A. McCameron
Richard D. Irwin, Inc., 1968

Course: Computer Programming

Textbook: FORTRAN, Logic and Programming
Fritz A. McCameron
Richard D. Irwin, Inc., 1968

The purpose of this book is twofold. First, it provides a basic introduction to FORTRAN in business administration, and through the terminology and examples used, makes the nature of the language comprehensible to the business student. Second, it suggests the business uses to which a computer may be put.
This is a COBOL manual for beginning programmers. It is assumed that the reader knows nothing about computers or their control. The objective of this manual is to present the basic nature of COBOL, after introducing the electronic computer, in such a way that the reader may gain an understanding of the language’s use as well as its composition.

Supplementary: COBOL Programming
Nancy B. Stern and Robert A. Stern
John Wiley & Sons, Inc., 1970

IBM Systems Reference Library
Branch Offices
International Business Machines Corporation