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Date July 22, 1982

A STUDY TO DETERMINE THE NEED AND USE OF BUSINESS MATHEMATICS IN VOCATIONAL EDUCATION IN SMALL MONTANA HIGH SCHOOLS

by

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ABSTRACT

The purpose of this study was to determine the use and need of business mathematics in vocational education in small Montana high schools.

The population included all 96 small high schools in Montana. A questionnaire was used as a survey of the principals and vocational education teachers to determine the use and need of business mathematics. The data was analyzed on a percentage basis of those responses returned. The percentage was determined by the number of respondents to each question, since every question was not answered by every school.

The conclusions of the study were: (1) Business mathematics is available in most small Montana high schools with class size being small thus aiding in the learning process. (2) Students in all grade levels are allowed to enroll in business mathematics making it easily accessible for all students to take the course at some time in their high school education. (3) The vocational instructors have a reasonable amount of teaching experience thus aiding in the well-rounded and complete education of the student. (4) The following areas of study in business mathematics all received a total average emphasis ranking above 3.95, thus indicating a strong need and use of these areas in vocational education: basic operations, fractions, decimals, percents, personal money records, borrowing, saving and investing money, taxes, buying problems, and home expenses. (5) The following areas of study in business mathematics all received a total average emphasis ranking below 3.85, thus indicating less time and emphasis should be placed on these areas in preparing students for vocational education: the metric system, wages and commissions, business problems, selling problems and transportation problems.

The recommendations of the researcher were: (1) Business mathematics should be taught by the business education teacher in order to provide a vocational background to the areas of study. (2) Class size should be kept small, preferably under 20, so as to promote more open discussions involving various areas of business mathematics and applications of them to the student's vocational interests. (3) The business mathematics course should be taken by all

juniors and seniors so as to provide a sound foundation for their careers in the business world. (4) The business mathematics instructor should place an extremely strong emphasis on the basic operations, for these are the basis on all other areas of study involving mathematics and business. (5) The business mathematics instructor should place a strong amount of emphasis on the areas of fractions, decimals and percents. These concepts are used in all aspects of the business world and therefore should be thoroughly understood by all students entering into a career. (6) The areas of personal money records, borrowing, saving and investing money, taxes, buying problems and home expenses should receive a reasonable amount of emphasis in the business mathematics course. These areas are used by the consumers, which is everyone, and therefore a knowledge of them is vital for the success of our economy. (7) Receiving emphasis of a lesser degree should be the areas of the metric system, wages and commission, business problems, selling problems, and transportation problems. Even though these areas are of importance, they are not as crucial to one's success and survival as the above-mentioned areas receiving more emphasis. (8) There is definitely a need and use for business mathematics in vocation education and its content should be promoted and used to the utmost.

CHAPTER I

INTRODUCTION

Because mathematics is a basic tool for all vocational education areas and even society in general, this writer wishes to determine how home economics, vocational agriculture, and business and office education programs in small Montana high schools need and use business mathematics. In a report on a course of study for consumer mathematics compiled by the Montgomery, Maryland school district:

> Rationale for high school mathematics curricula in America since 1930 has traced a somewhat circuitous path. During the period 1930 to 1950 there existed a strong emphasis on consumer-oriented education at the secondary school level. After 1950, however, with the realization of the space age technological lags, a heavy emphasis was placed on our schools on the mathematics necessary for research and development, and subject areas on consumerism received little or no attention in many secondary schools. Since the late 1960's the status of consumerism on a national level has focused the attention of educators on the priority which should be given to the subject of consumer mathematics. (Montgomery County Schools:1977:10)

Since mathematics is used in our everyday life and more emphasis is being placed on our mathematical knowledge, this writer will attempt to determine how business mathematics can become more involved with and part of the vocational educational area.

STATEMENT OF THE PROBLEM

The problem of this study is to determine how home economics, vocational agriculture, and business and office education programs in small Montana high schools need and can improve the use of business mathematics in their respective areas.

NEED FOR THE STUDY

This study of the need and use of business mathematics is important because mathematical knowledge is of vital importance to all people in all areas, especially the vocational areas. Contained in a report from the Education Commission of the States is a very important statement regarding business mathematics:

> The importance of consumer mathematics in today's American society is indisputable. The consumer cannot afford to rely upon advertisements or computerized statements. Yet it appears many Americans are doing just that. (Education Commission of the States:1975:6)

No matter what else students become, they are bound to become consumers. "The application of mathematical skills in consumer education can make a significant contribution to the financial well-being of an individual." (Peterson:1977:104)

LIMITATION OF THE STUDY

This study has been limited to small Montana high schools and to the areas of home economics, vocational agriculture and business and office education relative to the need and use of business mathematics.

The materials reviewed and information obtained for this study were limited to the library at Montana State University and the library at Eastern Montana College.

The survey and questionnaire responses were limited to those from the areas of home economics, vocational agriculture and business and office education in 96 small Montana high schools, with 78 schools responding to the survey.

DEFINITION OF TERMS

It is necessary to define certain words and terms used in this study since many meanings may be applied to various terms. Definitions were obtained from various dictionaries and other sources.

Business Mathematics - A course in mathematics pertaining to the everyday use and applications of mathematics.

Consumer Mathematics - A course in mathematics pertaining to the everyday use and applications of mathematics.

Small High School - A high school with enrollment of

120 or less and a Class "C" rating in the State of Montana.

Vocational Education - For this study it will apply to home economics, vocational agriculture, and business and office education.

ORGANIZATION OF THE STUDY

In Chapter I of this study, this writer has introduced the topic of business mathematics, stated the problems of involvement with other vocational education areas, presented a need for such a study, expressed the limits of the study and defined certain terms with various meanings.

Chapter II presents a review of various studies and investigations into the importance and involvement of business mathematics in vocational educational areas.

Chapter III deals with the explanation of procedures used to gather information from educators throughout Montana in determining the needs and uses of business mathematics.

Chapter IV presents the results of the questionnaire used to gather information from high schools throughout Montana. It also describes the findings and descriptions of these procedures.

Chapter V deals with the summarization and conclusions of the findings as well as any recommendations of the study.

CHAPTER II

REVIEW OF LITERATURE

INTRODUCTION

In reviewing the literature for this study of the needs and uses of business mathematics, this writer will take a brief look at the history of business mathematics; then discuss the purposes, objectives, and needs of business mathematics.

HISTORY

> Business mathematics has been part of the commercial curriculum for more than a century. When business arithmetic, as it was then called, made its entry into the secondary school curriculum in the 1860's, it was a practical course. Its content contained both ordinary and complex business transactions which enabled students to enter the countinghouses of the nineteenth century with the necessary skill for job success. (Fiber:1975: 40)

In the early 1900's, the high school population grew to include young people who had little motivation to study abstract fields. Unhappiness and discontent arose among students and educators, many of whom found it impossible to maintain both a high standard of achievement and a psychologically satisfying scale of marks.

> Educators seized upon the thought that the failure of the traditional sequence could be blamed on its lack of relevance. Thus began the utilitarian movement

> which led on the one hand to vocational mathematics (for example, mathematics for sheet-metal workers) and on the other hand to consumer mathematics. (Paige:1964: 195)

In the 1940's large problems were arising in the big cities of the United States in that "pupils are frightened and inhibited by the ordinary aspects of mathematics. The need is present for a course especially designed to aid in these pupil's careers." (Standing committee:1951:537) Courses were then developed to teach mathematics to students for use in their day-to-day living as well as their vocation.

Today, business mathematics continues to be an important subject in the vocational education curriculum because it enables high school graduates to apply their learnings in their vocations and business offices.

PURPOSES

A study done by the Colorado State University, Depart of Vocational Education, "The purpose of business mathematics is to give students a chance to explore various business and office occupations while gaining insight into how and why a knowledge of mathematics is important in everyday work life." (BO-CEC:1975:10) From this purpose of business mathematics, this writer has based the importance of determining how business mathematics is used and needed in voca-

cational education. The National Assessment of Educational Progress (NAEP) concluded in a recent study: "It is clear that in the Nation's schools there is considerable room for improvement in putting across the mathematics for everyday living." (Branscombe:1975:21)

OBJECTIVES

A variety of other studies have concluded that business mathematics has needed to be modified and improved to meet the needs of today's vocational education students. John Williams in a University of Nebraska study states: ". . . It appears that the vocational students had a preference for small group instruction with the teacher, followed by small group peer instruction. The least preferred method was independent study using programmed materials." (Williams:1975:13)

In a study done at Georgia State University, Peggy Barger concludes "The underlying abilities which projected a student's ability to successfully complete business mathematics were reading ability and mathematical ability." (Barger:1975:10) Another objective of this study is indicated in a report by James Carstens, Colorado State University: ". . . The findings supported the need to develop differen-

tiated business mathematics material for specific business careers as well as materials common to all careers." (Carstens:1971:6)

With few exceptions, the issue of valuing is seldom considered in the classroom. It has been mistakenly believed that teachers of business mathematics need not be concerned with values. In the case of vocational education, values are inherent in the subject. Furthermore,

> A direct examination of values can bring the subject of life and can enhance the possibility that the classroom learning will be put to actual use. Helping students become aware of the values they hold so that they will be able to make maximally satisfying decisions is a laudable goal for secondary-school teachers in any discipline. . . . (Burton:1982:164)

As a result of these studies and objectives, this study has determined the use and need of business mathematics in small Montana high schools.

NEED

There is undoubtedly a need for business mathematics today. Business mathematics is not a course in theory. It deals with problems which are of interest to most consumers regardless of their trade, occupation, or profession.

> Unfortunately it seems that students enrolled in the more prestigious programs are often encouraged to take 'something else'. Correcting this situation is where

> your challenge as a business mathematics teacher begins! (Karnes:1975:25)

Phil McGee stated: "Since math is a part of our daily lives, it is important that we have an understanding of the common uses and needs of business mathematics." (McGee:1976:4) Because business mathematics plays such a vital role in the educational system, the need for improvement is always present. This need is emphasized in a study conducted by Paul Mathews, University of Tulsa: "It is possible to analyze occupations so that needed mathematics competencies for successful performance can be determined and improved." (Mathews:1972:16) These needs, if met, can improve business mathematics to the point of producing educated vocational students who can meet the challenges to tomorrow's world.

SUMMARY

This chapter has given the reader an insight into some of the concepts of the history, purpose, objectives, and needs of business mathematics in vocational education in the small Montana high school.

CHAPTER III

PROCEDURES

The purpose of this study was to determine what could be done to improve business mathematics so that it better meets the needs and uses in vocational education in small Montana high schools. In order to aid in determining these needs and uses, this writer has reviewed literature dealing with the following areas:

1. A brief history of business mathematics
2. Purpose of business mathematics
3. Objectives of business mathematics
4. Need for business mathematics in vocational education

After reviewing the literature on business mathematics, this writer sent a questionnaire to the principals of small Montana high schools. To explain the procedures used in this study, the following areas needed to be developed:

1. The sources of data obtained,
2. the construction of the survey instrument used to collect the data,
3. the procedures used in the administration of the survey instrument, and
4. the analyses of the data.

SOURCES OF DATA

The data for this study was obtained by sending the questionnaire to secondary principals in small Montana high schools. The principals completed a portion of the instrument and then referred to the home economics, vocational agriculture, and office education teachers for completion of respective portions of the questionnaire. The names of the principals were obtained from publications from the Office of Public Instruction in Helena, Montana. The survey instrument was sent to 96 small high schools in Montana.

CONSTRUCTION OF THE SURVEY INSTRUMENT

The questionnaire used for this study (Appendix B) was designed by this writer in July, 1979 with the help of several graduate students and Dr. Daniel Hertz at Montana State University. The instrument was tested by master's candidates in BuEd 524, Research in Business Education. After a number of revisions, the questionnaire was regarded to be appropriate for this study.

The survey was confidential in nature with a survey number given to each questionnaire to be used for follow-up purposes only. The questionnaire was divided into four color-coded parts: general information, home economics,

vocational agriculture, and business and office education.

Questions for the survey were derived from the review of many studies and various materials relating to business mathematics.

The general information section consisted of six questions and was completed by the high school principal in regard to the school's general program of business mathematics. The first question asked if the principal's school offered a business mathematics course. If not, questions 2 through 6 were omitted. Questions 2 and 3 pertained to the instructor of the business mathematics class and class size. Questions 4 and 5 asked the principal if business mathematics was a prerequisite or required a prerequisite in their system. Question 6 dealt with the grade levels eligible to enroll in business mathematics.

The home economics, vocational agriculture, and business and office education sections were completed by the respective instructors with the same questions being asked of each instructor. Question 1 dealt with the number of years of teaching experience of the instructor. Question 2 asked the instructor to rank the amount of emphasis which should be placed on various areas of study in business mathematics.

ADMINISTRATION OF THE SURVEY INSTRUMENT

The questionnaire was mailed to 96 secondary principals in small Montana high schools on October 1, 1979. Included with the questionnaire were a cover letter (Appendix A) and a self-addressed envelope.

On November 5, 1979, 56.3 percent of the questionnaires had been returned. A second mailing was then made for return of the remaining questionnaires. A deadline of December 10 was established for the return of the remaining questionnaires. Those not returned by that date would not be considered part of this study. By December 10, 78 questionnaires were received for a total response of 81.3 percent.

ANALYSES OF THE DATA

Once the deadline for the return of the questionnaire was reached, the responses for each question were tallied. The results of the principal's general information section were reported by listing the total number of responses and percentages of the total number of responses to each question. The results for the home economics, vocational agriculture, and business and office education sections were converted to percentages and compared on that

basis only. The results of the vocational sections were established by comparing the rankings from least emphasis, 1, to most emphasis, 5. The actual number of responses to each area of study was not compared; many schools do not offer some or all of these areas and the number of comparisons would be very misleading.

A written explanation of the tables was included with the analysis of each question. By reviewing the data obtained from the tabulations of the questions, the researcher drew conclusions and made recommendations.

CHAPTER IV

RESULTS OF THE STUDY

The purpose of this chapter was to report the findings of the study through the presentation of factual data dealing with business mathematics in small Montana high schools. Of the 96 questionnaires mailed, 78 or 81.3 percent were returned.

SCHOOL OFFERING

Of the 78 respondents of the questionnaire, 51 or 65.4 percent of them offered a business mathematics course in their school system. Twenty-seven or 34.6 percent of the schools did not offer any type of business or consumer mathematics course in their school curriculum.

The above information is presented below in Table I.

TABLE I

SCHOOL OFFERING

Response	Number	Percent
Yes	51	65.4
No	27	34.6
TOTALS	78	100.0

BUSINESS MATHEMATICS INSTRUCTOR

Question 2 of the principal's general information section dealt with the instructor of business mathematics in his particular school system. The business teacher was listed by 29 (56.8 percent) of the 51 respondents offering business mathematics in their schools. The mathematics teacher was listed by 21 (41.2 percent) as the instructor of business mathematics in their school systems. The special education teacher was listed by one (2 percent) as being the business mathematics instructor.

Table 2, shown below, summarizes the above information.

TABLE II

BUSINESS MATHEMATICS INSTRUCTOR

Instructor	Number	Percent
Business	29	56.8
Mathematics	21	41.2
Other (Special Education)	1	2.0
TOTALS	51	100.0

NUMBER ENROLLED

Question 3 asked the principals how many students were enrolled in the business mathematics class in their schools. Twenty-nine (56.8 percent) of the principals responded with a class size of 10 or less students. Ten (19.6 percent) of the responding schools had a class enrollment of 11 to 15 students. Five (9.8 percent) principals indicated a class size of 16 to 20 students. Four (7.9 percent) replied that their schools had a business mathematics enrollment of 21 to 25 students. Only three (5.9 percent) of the 51 schools offering business mathematics had a class enrollment of more than 25.

The above information is represented in Table III.

TABLE III

NUMBER ENROLLED

Response	Number	Percent
Less than 10	29	56.8
11 - 15	10	19.6
16 - 20	5	9.8
21 - 25	4	7.9
More than 25	3	5.9
TOTALS	51	100.0

A PREPREQUISITE FOR ANY CLASSES

Question 4 asked the principals if business mathematics "was a prerequisite for any classes offered in their school systems". Only 3 (5.9 percent) stated that business mathematics was a prerequisite. Two of the respondents indicated it was a prerequisite for accounting and general business. One of the principals replied that it was a prerequisite for pre-algebra. Forty-eight (94.1 percent) of the responding schools stated that business mathematics was not a prerequisite for any classes offered in their school systems.

Table IV, shown below, summarizes the above information.

TABLE IV

A PREREQUISITE FOR ANY CLASSES

Response	Number	Percent
Yes	3	5.9
No	48	94.1
TOTALS	51	100.0

REQUIRING A PREREQUISITE

The writer was interested in obtaining formation concerning business mathematics requiring a prerequisite before enrolling in business mathematics. Ten (19.6 percent) of the respondents stated business mathematics required a prerequisite before enrolling. Forty-one (80.4 percent) of the principals replied that their schools did not require a prerequisite for business mathematics.

Table V is shown below giving the above information.

TABLE V

REQUIRING A PREREQUISITE

Response	Number	Percent
Yes	10	19.6
No	41	80.4
TOTALS	51	100.0

ELIGIBLE GRADE LEVELS

The final question asked of the principals concerned the grade level or levels eligible for enrollment in business mathematics. One-third (33.3 percent) of the responding schools allow all four grade levels to enroll in business mathematics. On an individual grade level basis, freshmen

were allowed to enroll in business mathematics in 44.4 percent of the responding schools, sophomores in 72.2 percent, juniors in 75 percent and seniors in 75 percent.

The above information is summarized below in Table VI.

TABLE VI

ELIGIBLE GRADE LEVELS

Grade Level	Percent
Freshman	44.4
Sophomore	72.2
Junior	75.0
Senior	75.0
All 4 grades	33.3

SCHOOLS OFFERING COURSES

Before examining and analyzing the information on the sections involving home economics, vocational agriculture, and business and office education, the writer tabulated the number and percentages of responding schools not offering or not replying to a particular section of the vocational education section. Sixty (76.9 percent) of the 78 responding schools do offer a home economics class. Eighteen (23.1 percent) either do not offer a home economics class or did not reply to the home economics section.

Thirty-one (39.7 percent) of the responding schools do offer a vocational agriculture class while forty-seven (60.3 percent) either did not reply or do not offer the class. Seventy-one (91 percent) of the respondents do offer a business curriculum while seven (9 percent) either did not reply or do not offer the program.

The above information is illustrated in Table VII.

TABLE VII

SCHOOLS OFFERING COURSES

Subject Area	Number Replying	Percent
Home Economics	60	76.9
Vocational Agriculture	31	39.7
Business Education	71	91.0
TOTALS	78	

TEACHING EXPERIENCE

The first question asked of the instructors of home economics, vocational agriculture, and business and office education was the number of years experience they had in teaching their particular field. Of the 60 schools offering home economics, 7 (11.7 percent) did not reply to this question. The average, or mean years of experience of the fifty-three (88.3 percent) replying to this question, was 4.4 years.

The median years of experience was four years. Six of the respondents had one year of experience while two had more than ten years with a maximum of fifteen years experience in teaching home economics.

Of the 31 schools offering vocational agriculture, all 31 (100 percent) responded to this question. The mean or average years of experience was nine years with the median being six years. Three of the respondents had one year of experience while six had more than ten years experience in teaching vocational agriculture with the maximum being thirty years.

Fifty-seven (80.3 percent) of the schools offering a business curriculum replied to this question with 14 (19.7 percent) giving no reply. The average or mean years of experience was 5.1 years with five years being the median. Nine of the respondents had one year of experience while nine had more than ten years experience in teaching business education with the maximum being twenty years.

A summary of the above information will be found in Table VIII.

TABLE VIII

TEACHING EXPERIENCE

Subject Area	No Reply	Number Replying	Mean Exp.	Avg. Exp.
Home Economics	7 - 11.7%	53 - 88.3%	4 yrs.	4.4 yrs.
Vocational Agriculture	0 - 0 %	31 -100.0%	6 yrs.	9.0 yrs.
Business Education	14 - 19.7%	57 - 80.3%	5 yrs.	5.1 yrs.

BASIC OPERATIONS

Question 2 of the vocational section dealt with the amount of emphasis placed on different areas of study in business mathematics. The first of these was the basic operations: addition, subtraction, multiplication, and division. Sixty-nine percent of the home economics instructors felt this area should receive the most emphasis while 2.4% felt it should receive the least emphasis. 90.9 percent of the vocational agriculture instructors felt it should receive the most emphasis while zero percent felt it should receive the least emphasis. Fifty-four percent of the business education teachers felt this area should receive the most emphasis while six percent felt it should receive the least emphasis. Overall, the home economics average ranking was 4.50, the vocational agriculture average ranking was

4.50, the vocational agriculture average ranking was 4.91 and the business education average ranking was 4.00 for the basic operations area.

The above information along with all the percentage rankings is shown below in Table IX.

TABLE IX

BASIC OPERATIONS

Subject Area	Ranking Percentages 1	2	3	4	5	Average Ranking
Home Economics	2.4	2.4	7.1	19.1	69.0	4.50
Vocational Agriculture	0	0	0	9.1	90.9	4.91
Business Education	6.0	10.0	16.0	14.0	54.0	4.00
				Total Average		4.47

FRACTIONS

The fractions area of study was rated as getting the least emphasis by 66.7 percent of the home economics teachers, 40.9 percent of the vocational agriculture teachers, and 20 percent of the business education instructors. Meanwhile, 2.4 percent of the home economics and zero percent of both vocational agriculture and business education teachers felt it should receive the least emphasis. Overall

average rankings showed home economics with 4.47, vocational agriculture with 4.36, and business education with 3.44.

Table X summarizes the above information along with the complete percentage rankings.

TABLE X

FRACTIONS

Subject Area	Ranking Percentages 1	2	3	4	5	Average Ranking
Home Economics	2.4	2.4	7.1	21.4	66.7	4.47
Vocational Agriculture	0	0	4.5	54.5	40.9	4.36
Business Education	0	16.0	44.0	20.0	20.0	3.44
				Total Average		4.09

DECIMALS

The study of decimals was rated by 33.3 percent of the home economics teachers as receiving the most emphasis. Vocational agriculture teachers gave the decimal area of study a 36.4 percent ranking of most emphasis. Thirty-six percent of the business education teachers felt it should receive the most emphasis; while 7.1 percent of the home economics teachers felt it should have the least emphasis, zero percent of vocational agriculture and business educa-

tion felt it should be an area of least emphasis. The overall ranking for home economics was 3.78, vocational agriculture was 4.22 and business education was 3.92.

Table XI shows the summary of the above information as well as all the rankings.

TABLE XI

DECIMALS

Subject Area	Ranking Percentages 1	2	3	4	5	Average Ranking
Home Economics	7.1	4.8	23.8	31.0	33.3	3.78
Vocational Agriculture	0	0	13.7	50.0	36.4	4.22
Business Education	0	8	28.0	28.0	36.0	3.92
				Total Average		3.97

PERCENTS

The study of percents in business mathematics was rated by 40.5 percent of the home economics teachers as receiving the most emphasis. 31.8 percent of the vocational agriculture and 42 percent of the business education teachers felt percents should receive the most emphasis. 4.8 percent of the home economics, 4.5 percent of the vocational agriculture and zero percent of the business education teachers

felt percents should receive the least emphasis. The overall ranking for the area of percents was 3.92 for the home economics teachers, 4.04 for the vocational agriculture teachers and 4.10 for the business education teachers.

The above information as well as all the ranking percentages is summarized and shown below in Table XII.

TABLE XII

PERCENTS

Subject Area	Ranking Percentages 1	2	3	4	5	Average Ranking
Home Economics	4.8	9.5	14.3	31.7	40.5	3.92
Vocational Agriculture	4.5	4.5	4.5	54.5	31.8	4.04
Business Education	0	6.0	28.0	26.0	42.0	4.10
				Total Average		4.02

METRIC SYSTEM

The next area of study rated for emphasis by the vocational teachers was the metric system. 42.9 percent of the home economics teachers felt this area should receive the most emphasis while 7.1 percent felt it should receive the least emphasis for an overall ranking of 3.78. 13.6 percent of the vocational agriculture teachers felt the

metric system should receive the most emphasis while 4.5 percent felt it should receive the least emphasis for an overall ranking of 3.18. Only 10 percent of the business education teachers felt the metric system should receive the most emphasis and 8 percent felt it should receive the least emphasis for an average ranking of 3.06.

The above information along with all the ranking percentages is shown below in Table XIII.

TABLE XIII

METRIC SYSTEM

Subject Area	Ranking Percentages 1	2	3	4	5	Average Ranking
Home Economics	7.1	14.3	14.3	21.4	42.9	3.78
Vocational Agriculture	4.5	22.7	36.7	22.7	13.6	3.18
Business Education	8.0	24.0	32.0	26.0	10.0	3.06
				Total Average		3.34

PERSONAL MONEY RECORDS

The next area of study rated by the vocational instructors was the area of personal money records. This area received the second highest overall ranking with 57.1 percent of the home economics instructors feeling it should receive the most emphasis. 54.5 percent of the vocational agriculture and 48 percent of the business education instructors also felt personal money matters should receive the most emphasis. Zero percent of both the home economics and business education instructors felt the personal money records area of study should receive the least emphasis. Overall, the home economics average ranking was 4.45, and vocational agriculture average ranking was 4.22, and the business education average ranking was 4.28

Table XIV illustrates the above information combined with all of the ranking percentages.

WAGES AND COMMISSIONS

The wages and commissions area of study of business mathematics was rated by 26.2 percent of the home economics instructors as receiving the most emphasis and 2.4 percent as receiving the least emphasis. 22.7 percent of the vocational agriculture instructors felt wages and commissions

TABLE XIV

PERSONAL MONEY RECORDS

Subject Area	Ranking Percentages 1	2	3	4	5	Average Ranking
Home Economics	0	0	11.9	31.0	57.1	4.45
Vocational Agriculture	4.5	4.5	9.1	27.3	54.5	4.22
Business Education	0	4.0	12.0	36.0	48.0	4.28
				Total Average		4.32

should receive the most emphasis while 4.5 percent felt it should receive the least emphasis. Thirty percent of the business education instructors felt wages and commissions should receive the most emphasis while 2 percent felt it should receive the least. The overall ranking for home economics was 3.59, vocational agriculture was 3.50, and business education was 3.86.

Table XV shows the above information summarized with all of the ranking percentages.

BORROWING, SAVING, AND INVESTING MONEY

The borrowing, saving, and investing money area in business mathematics was rated by 38.1 percent of the home economics teachers, 36.4 percent of the vocational agricul-

TABLE XV

WAGES AND COMMISSIONS

Subject Areas	Ranking Percentages 1	2	3	4	5	Average Ranking
Home Economics	2.4	14.3	31.0	26.2	26.2	3.59
Vocational Agriculture	4.5	9.1	40.9	22.7	22.7	3.50
Business Education	2.0	8.0	22.0	38.0	30.0	3.86
				Total Average		3.65

ture teachers and 46 percent of the business education teachers as receiving the most emphasis. This was the only area zero percent of all three vocational disciplines felt should receive the least emphasis. The overall ranking for the area of borrowing, saving, and investing money was 4.04 for the home economics teachers, 3.81 for the vocational agriculture teachers and 4.32 for the business education teachers.

The above information combined with all the ranking percentages is shown in Table XVI.

TABLE XVI

BORROWING, SAVING, AND INVESTING MONEY

Subject Area	Ranking Percentages 1	2	3	4	5	Average Ranking
Home Economics	0	7.1	19.1	35.7	38.1	4.04
Vocational Agriculture	0	9.1	27.3	27.3	36.4	3.81
Business Education	0	2.0	18.0	36.0	46.0	4.32
				Total Average		4.06

TAXES

The area of taxes, including personal, property, sales and income, was the next area of study rated by the vocational education instructors. 42.9 percent of the home economics instructors felt this area should receive the most emphasis while 7.1 percent felt it should receive the least for an overall ranking of 4.30. The vocational agriculture instructors gave the area of taxes a 27.3 percent rating for most emphasis and zero percent for least emphasis for an overall ranking of 3.77. Thirty-four percent of the business education instructors felt taxes should receive the most emphasis while 2 percent felt it should receive the least for an overall rating of 3.98.

Table XVII listed below summarizes the above information along with all the ranking percentages.

TABLE XVII

TAXES

Subject Area	Ranking Percentages 1	2	3	4	5	Average Ranking
Home Economics	7.1	9.5	19.1	33.3	42.9	4.30
Vocational Agriculture	0	13.7	22.7	36.4	27.3	3.77
Business Education	2.0	6.0	18.0	40.0	34.0	3.98
				Total Average		4.02

BUYING PROBLEMS

Buying problems involving work with prices, sales and figuring prices was rated by 61.9 percent of the home economics instructors, 36.4 percent of the vocational agriculture instructors and 38 percent of the business education instructors as receiving the most emphasis. 2.4 percent of the home economics instructors, zero percent of the vocational agriculture instructors and 2 percent of the business education instructors felt the area of buying problems in business mathematics should receive the least emphasis. Overall, the home economics average ranking was 4.40, voca-

tional agriculture was 3.90 and business education was 4.12.

The above information was combined with all the ranking percentages to form Table XVIII.

TABLE XVIII

BUYING PROBLEMS

Subject Area	Ranking percentages 1	2	3	4	5	Average Ranking
Home Economics	2.4	0	14.3	21.4	61.9	4.40
Vocational Agriculture	0	4.5	36.4	22.7	36.4	3.90
Business Education	2.0	4.0	12.0	44.0	38.0	4.12
				Total Average		4.14

HOME EXPENSES

Home expenses involving operating, owning, and insuring a home was the next area of study rated by the vocational education instructors. 40.5 percent of the home economics instructors felt this area should receive the most emphasis while 2.4 percent felt it should receive the least for an overall ranking of 4.09. 27.3 percent of the vocational agriculture instructors felt home expenses should receive the most emphasis while zero percent felt it should receive the least for an overall ranking of 3.81. Thirty-

six percent of the business education instructors felt home expenses should receive the most emphasis while zero percent felt it should receive the least for an overall ranking of 4.10.

The above information as well as all the ranking percentages is shown below in Table XIX.

TABLE XIX

HOME EXPENSES

Subject Area	Ranking Percentages 1	2	3	4	5	Average Ranking
Home Economics	2.4	4.8	14.3	38.1	40.5	4.09
Vocational Agriculture	0	18.2	27.3	31.8	27.3	3.81
Business Education	0	6.0	14.0	44.0	36.0	4.10
				Total Average		4.00

BUSINESS PROBLEMS

Business problems involving the retailer, wholesaler, and manufacturer was the next area of study considered by the vocational educators. This area received the lowest ratings for emphasis of all the areas with 16.7 percent of the home economics instructors, 18.2 percent of the vocational agriculture instructors and 20 percent of the busi-

ness education instructors feeling business problems should receive the most emphasis. 7.1 percent of the home economics instructors, zero percent of the vocational agriculture instructors and 6 percent of the business education instructors felt this area should receive the least emphasis. The overall ranking for the area of business problems was 3.26 for the home economics instructors, 3.13 for the vocational agriculture instructors and 3.54 for the business education instructors.

The above information was combined with all the ranking percentages to form Table XX.

TABLE XX

BUSINESS PROBLEMS

Subject Area	Ranking Percentages 1	2	3	4	5	Average Ranking
Home Economics	7.1	23.8	21.4	31.0	16.7	3.26
Vocational Agriculture	0	36.4	31.8	13.7	18.2	3.13
Business Education	6.0	6.0	36.0	32.0	20.0	3.54
				Total Average		3.31

SELLING PROBLEMS

Selling problems including mark-up, mark-down, and profit was the next area of business mathematics to be ranked by the vocational educators. 16.7 percent of the home economics teachers felt this area should receive the most emphasis while 7.1 percent felt it should receive the least for an overall ranking of 3.30. 22.7 percent of the vocational agriculture teachers felt selling problems should receive the most emphasis while zero percent felt it should receive the least for an overall ranking of 3.27. Sixteen percent of the business education teachers felt this area should receive the most emphasis while 2 percent felt it should receive the least for an overall ranking of 3.54.

The above information was combined with all the ranking percentages to form Table XXI.

TRANSPORTATION PROBLEMS

Transportation problems involving owning and insuring an auto and travel expenses was the last area of business mathematics considered by the vocational educators. 28.6 percent of the home economics instructors felt this area should receive the most emphasis while 2.4 percent felt it should receive the least for an overall ranking of 3.71.

TABLE XXI

SELLING PROBLEMS

Subject Area	Ranking Percentages 1	2	3	4	5	Average Ranking
Home Economics	7.1	21.4	21.4	33.3	16.7	3.30
Vocational Agriculture	0	27.3	40.9	9.1	22.7	3.27
Business Education	2.0	12.0	32.0	38.0	16.0	3.54
				Total Average		3.37

27.3 percent of the vocational agriculture instructors felt transportation problems should receive the most emphasis while 4.5 percent felt it should receive the least for an overall ranking of 3.68. Forty-four percent of business education instructors felt this area should receive the most emphasis while 4 percent felt it should receive the least for an overall ranking of 4.02.

Table XXII, listed on the following page, summarizes the above information with all the ranking percentages.

TABLE XXII

TRANSPORATION PROBLEMS

Subject Area	Ranking Percentages 1	2	3	4	5	Average Ranking
Home Economics	2.4	11.9	26.2	31.0	28.6	3.71
Vocational Agriculture	4.5	13.7	18.2	36.4	27.3	3.68
Business Education	4.0	6.0	18.0	28.0	44.0	4.02
				Total Average		3.80

ADDITIONAL COMMENTS

The additional comments section of the questionnaire drew only two responses, both from business education instructors. The two areas requested were financial services and insurance with both receiving an emphasis rating of 4.0. Many business mathematics courses include these areas of study within those previously listed, thus not requiring a separate listing.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to determine the use and need of business mathematics in vocational education in small Montana high schools. A questionnaire was sent to all small high schools in Montana to determine the role of business mathematics in the school and to obtain information from the vocational instructors in these schools concerning the importance of various areas of study in business mathematics. From the information received, the author was able to make the conclusions and recommendations that follow.

SUMMARY

Listed on the following pages is the summary of the major findings of the study.

1. Business mathematics is offered in the majority (65.4 percent) of the small Montana high schools.

2. The business education instructor was listed by the majority (56.8 percent) as the teacher of the business mathematics course within the individual schools.

3. Class size was found to be ideal, 76.4 percent of the business mathematics classes contained less than 15 students. Thus aiding in a more complete learning process

by the student.

4. Business mathematics was found in a vast majority of the schools to be neither a prerequisite for any classes or to require a prerequisite before enrolling in the class.

5. All grade levels were eligible to enroll in business mathematics in one-third of the surveyed schools. In 75 percent of the schools juniors and seniors were able to enroll in business mathematics.

6. The average years of teaching experience for the vocational educators was found to be 4.4 years for home economics, 9 years for vocational agriculture and 5.1 years for business education.

7. Vocation education instructors indicated that the study of basic operations in business mathematics should receive the most emphasis of all areas of study surveyed with the total overall average being the highest at 4.47.

8. The ranking of the fractions area of study had the largest variance in the overall ranking from a high of 4.47 to a low of 3.44 yielding a total average of 4.09.

9. The area of study in business mathematics of decimals was found to have a total average of 3.97, showing it to be an area of high importance and emphasis.

10. Emphasis on percents in business mathematics was the most consistent in the rankings by the three disciplines of vocational education surveyed with a total average of 4.02.

11. Study of the metric system was found to be one of three areas that should receive the least emphasis in business mathematics with a total average ranking of 3.34.

12. The study of personal money records received the second highest total average ranking of 4.32 from the vocational educators surveyed.

13. Emphasis on wages and commissions in business mathematics was ranked by the survey as being slightly below average with a total average of 3.65.

14. The study of borrowing, saving and investing money received a strong ranking with a total average of 4.06 from the survey.

15. Emphasis on the study of taxes in business mathematics was found to rank close to the top of the areas of study by receiving a total average ranking of 4.02.

16. Study of buying problems in business mathematics was also found to be of significant importance to the vocational instructors with a total average ranking of 4.14.

17. The area of study of home expenses in business

mathematics was found to have a total average ranking of 4.00.

18. The study of business problems involving the retailer, wholesaler and manufacturer received the lowest total average ranking of 3.31.

19. Selling problems in business mathematics involving work with mark-up, mark-down and profit also received a low total ranking from the vocational educators of 3.37.

20. Studying transportation problems in business mathematics received a slightly below average total ranking of 3.80.

CONCLUSIONS

This study was to determine the use and need of business mathematics in vocational education in small Montana high schools. The conclusions drawn from this study are as follows:

1. Business mathematics is available in most small Montana high schools with class size being small thus aiding in the learning process.

2. Students in all grade levels are allowed to enroll in business mathematics making it easily accessible for

all students to take the course at some time in their high school education.

3. The vocational instructors have a reasonable amount of teaching experience thus aiding in the well-rounded and complete education of the student.

4. The following areas of study in business mathematics all received a total average emphasis ranking above 3.95, thus indicating a strong need and use of these areas in vocational education: basic operations, fractions, decimals, percents, personal money records, borrowing, saving and investing money, taxes, buying problems, and home expenses.

5. The following areas of study in business mathematics all received a total average emphasis ranking below 3.85, thus indicating less time and emphasis should be placed on these areas in preparing students for vocational education: the metric system, wages and commissions, business problems, selling problems and transportation problems.

RECOMMENDATIONS

The researcher's major purpose for conducting this study was to determine if there was a need and use for business mathematics in small Montana high schools. In addition

to the recommendation that business mathematics be offered in all Montana high schools to strengthen and promote vocational education, the researcher has the following recommendations:

1. Business mathematics should be taught by the business education teacher in order to provide a vocational background to the areas of study.

2. Class size should be kept small, preferably under 20, so as to promote more open discussions involving various areas of business mathematics and applications of them to the student's vocational interests.

3. The business mathematics course should be taken by all juniors and seniors so as to provide a sound foundation for their careers in the business world.

4. The business mathematics instructor should place an extremely strong emphasis on the basic operations, for these are the basis on all other areas of study involving mathematics and business.

5. The business mathematics instructor should place a strong amount of emphasis on the areas of fractions, decimals and percents. These concepts are used in all aspects of the business world and therefore should be thoroughly understood by all students entering into a career.

6. The areas of personal money records, borrowing, saving and investing money, taxes, buying problems and home expenses should receive a reasonable amount of emphasis in the business mathematics course. These areas are used by the consumers, which is everyone, and therefore a knowledge of them is vital for the success of our economy.

7. Receiving emphasis of a lesser degree should be the areas of the metric system, wages and commission, business problems, selling problems, and transportation problems. Even though these areas are of importance, they are not as crucial to one's success and survival as the above-mentioned areas receiving more emphasis.

8. There is definitely a need and use for business mathematics in vocation education and its content should be promoted and used to the utmost.

BIBLIOGRAPHY

BO-CEC Math Resource Guide, Colorado State University, 1975.

Barger, Peggy, The Relationship of the General Aptitude Test Battery and Other Factors to the Successful Completion of Business Mathematics in Selected Vocational-Technical Schools in Georgia, Georgia State University, 1975.

Branscombe, Art, "Checkout on Consumer Math," American Education, October, 1975, p. 21.

Burton, Grace M. and Burton, John R., "A Question of Values: Consumer Education in the Mathematics Classroom", School Science and Mathematics, February, 1982, pp. 163-169.

Carstens, James, Relationship Between Business Career Objectives and the Supporting Course Business Mathematics, Colorado State University, 1971.

"Consumer Math: Selected Results from the First National Assessment of Mathematics," Education Commission of the States, 1975.

Fiber, Larry Roy, "Business Math in Transition", American Vocational Journal, March, 1975, pp. 40-42.

Kaliski, Burton S., "Algebra or Arithmetic?", The Journal of Business Education, April, 1975, pp. 289-290.

Karnes, Delbert D., "Challenge for the Business Mathematics Teacher!", The Journal of Business Education, October, 1975, pp. 25-26.

Mathews, Paul Jones, Developing Occupational Demand and Performance Curricula in Mathematics for Vocational-Technical Education at the Tulsa Area Vocational-Technical Educational Center, University of Tulsa, 1972.

McGee, Phil, Business Math in Everyday Life, Iowa State University, 1976.

Merchant, Ronald, "Business Math Without Tears", American Vocational Journal, October, 1980, pp. 52-54.

Paige, Donald, "General Mathematics: The Future as the Past?", School Science and Mathematics, 1964, Issue 64, Vol. 3, p. 195.

Standing Committee on Mathematics of New York City, "Concerning the Teaching of Second-Track Mathematics," Mathematics Teacher, Vol. 44, No. 8, p. 537.

Walendowski, George, "Improving the Standard of Business Mathematics Education," Journal of Business Education, February, 1979, p. 212.

Williams, John, Mastery Learning in Business Mathematics, University of Nebraska, 1975.

APPENDIXES

APPENDIX A

October 1, 1979

Dear Principal,

Enclosed you will find a questionnaire relating to improving business mathematics to meet the needs of vocational education. The questionnaire is divided into four parts:

-- PART ONE -- general information to be completed by you

-- PART TWO -- home economics teacher should complete

-- PART THREE -- vocational agriculture teacher should complete

-- PART FOUR -- business teacher should complete

The purpose of this survey is two-fold. One, it will be included as part of my master's program. Two, the results will be used to improve business mathematics instruction in Montana high schools in order to meet needs and uses in vocational education.

Will you please return the completed questionnaire in the stamped, self-addressed envelope no later than April 1, 1980.

Thank you very much for your help and cooperation in the completion of this survey.

Sincerely,

Jerry Fisher
Rosebud High School

Enclosures

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APPENDIX B

SURVEY INSTRUMENT FOR DETERMINING
NEEDS AND USES OF BUSINESS
MATHEMATICS IN VOCATIONAL EDUCATION

SURVEY #_____

INSTRUCTIONS: Please indicate your answer to the following questions by placing an "X" on the appropriate line.

DEFINITION: For survey purposes, business mathematics is defined to include consumer mathematics, practical mathematics, and general mathematics.

PART I -- to be completed by PRINCIPAL

1. Does your school offer a business mathematics course?

_____ YES _____No

****If no, please proceed directly to PART II

2. Please indicate the instructor of business mathematics in your school system:

_____ business teacher _____ mathematics teacher _____ other (specify _____)

3. How many students are enrolled in the business mathematics class?

_____less than 10 _____11-15 _____16-20 _____21-25 _____more than 25

4. Is business mathematics a prerequisite for any classes?

_____YES _____ NO

****If yes, specify _____

5. Does Business Mathematics require a prerequisite before taking?

_____YES _____ NO

6. What grade level(s) are eligible to enroll in busines mathematics?

_____Freshman _____Junior

_____Sophomore _____Senior

(Please have home economics, vocational agriculture, and business teachers complete their respective sections of the questionnaire.)

PART TWO -- to be completed by HOME ECONOMICS teacher

1. How many years experience of teaching home economics do you have?

2. Please check the appropriate ranking number for each area of business mathematics you feel should receive emphasis in order that students in home economics may be benefitted:

AREA OF STUDY	LEAST EMPHASIS TO MOST EMPHASIS 1	2	3	4	5
basic operations, (add, subtract, multiply, divide)					
fractions					
decimals					
percents					
metric system					
personal money records					
wages and commissions					
borrowing, saving and investing money					
taxes (personal, property, sales and income)					
buying problems (prices, sales, and figuring prices)					
home expenses (operating, owning, and insuring)					
business problems (retailer, wholesaler, and manufacturer					
selling problems (mark-up, mark-down and profit)					
transportation problems (owning an auto, insuring an auto and travel expenses)					

(other suggestions)

PART THREE -- to be completed by VOCATIONAL AGRICULTURE teacher

1. How many years experience of teaching vocational agriculture do you have? _____

2. Please check the appropriate ranking number for each area of business mathematics you feel should receive emphasis in order that students in vocational agriculture may be benefitted.

AREA OF STUDY	LEAST EMPHASIS TO MOST EMPHASIS 1	2	3	4	5
basic operations, (add, subtract, multiply, divide)					
fractions					
decimals					
percents					
metric system					
personal money records					
wages and commissions					
borrowing, saving and investing money					
taxes (personal, property, sales and income)					
buying problems (prices, sales, and figuring prices)					
home expenses (operating, owning, and insuring)					
business problems (retailer, wholesaler, and manufacturer)					
selling problems (mark-up, mark-down and profit)					
transportation problems (owning an auto, insuring an auto and travel expenses)					

(other suggestions)

PART FOUR -- to be completed by BUSINESS teacher

1. How many years experience of teaching business do you have? _____

2. Please check the appropriate ranking number for each area of business mathematics you feel should receive emphasis in order that students in business education may be benefitted:

AREA OF STUDY	LEAST EMPHASIS TO MOST EMPHASIS 1	2	3	4	5
basic operations, (add, subtract, multiply, divide					
fractions					
decimals					
percents					
metric system					
personal money records					
wages and commissions					
borrowing, saving and investing money					
taxes (personal, property, sales and income)					
buying problems (prices, sales, and figuring prices)					
home expenses (operating, owning, and insuring					
business problems (retailer, wholesaler, and manufacturer					
selling problems (mark-up, mark-down and profit)					
transportation problems (owning an auto, insuring an auto and travel expenses)					

(other suggestions)