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Survey of practices in general mathematics in the secondary schools of Wyoming

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·A SURVEY OF PRACTICES IN GENERAL MATHEMATICS

·IN THE SECONDARY SCHOOLS OF WYOMING

by

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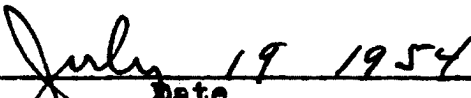
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CHAPTER I

INTRODUCTION

General mathematics in Wyoming assumes many forms
from simple arithmetic to relatively complicated consumer
mathematics. However, adequate information about these
courses has not been generally available to the teachers.
The information which has been available was rather limited
in scope and dealt only with certain specific problems in
a few schools. This study was conducted for the purpose of
obtaining information about the common practices in general
mathematics in the secondary schools of Wyoming.

This survey included only the common practices that
existed in the general mathematics courses of the high
schools and three-year junior high schools of Wyoming. No
attempt was made to include courses offered below the ninth
grade. The survey was not exhaustive in any one area, and
the information obtained must be limited to the point in
question. The information presented was designed to give
an overview of general mathematics in the secondary schools
of Wyoming. The results which were obtained will provide
general information about topics such as: the place of
general mathematics in the curricula of Wyoming schools,
the selection and enrollment of students in the general

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mathematics classes, the textbooks and classroom materials being used in the general mathematics classes, and the teachers of general mathematics.

The information for this study was obtained by means of a carefully planned questionnaire. Numerous resources were read in order to determine more accurately which questions might be most important. The findings of the survey are reported as briefly and clearly as possible with the aid of numerous tables. A general overview of the research in the field of general mathematics is presented in Chapter II in order to provide some means of comparison between the findings of this study and the findings of other studies which were conducted in other parts of the United States.

CHAPTER II

REVIEW OF LITERATURE

Before the beginning of the twentieth century the
high schools of America were coming into their own, and the
general pattern of education was changing. In an effort
to meet these changes as well as the changing social order
there were numerous changes in the school curricula. Most
of these were relatively haphazard and served only to stimu-
late efforts to study the curricula and the needs of the
child in greater detail.

In the area of mathematics, efforts were being made
to improve the offerings. A large number of individuals
and many organized groups have been given credit for aiding
and speeding the development of secondary mathematics. Wren
summarized this growth briefly:

> In the 1894 report of the Committee of Ten, definite
> recommendations were made for the reorganization of sec-
> ondary mathematics. Subsequent groups which made sig-
> nificant recommendations were the Committee on College
> Requirements, the International Commission of the Teach-
> ing of Mathematics (1911-18), the National Committee
> on Mathematical Requirements (1923), and the College
> Entrance Board (1923, 1925). In its report (1940) the
> Joint Commission of the Mathematical Association of Amer-
> ica, Inc. and the National Council of Teachers of Mathe-
> matics undertook to construct a mathematical curriculum
> for the junior high school, senior high school, and the
> junior college which would provide the necessary con-
> tinuity of instruction and yet permit a desirable flexi-
> bility of administration. The National Council of Teach-
> ers of Mathematics, the Central Association of Science

and Mathematics Teachers, and the Mathematical Association of America have been especially influential in shaping the direction and progress of secondary mathematics.[1]

Beckmann lists three reports which had special importance in the movement for mathematical reform:

1. The Mathematical Association of America, The Reorganization of Mathematics in Secondary Education, 1923.

2. Joint Commission of the Mathematical Association of America, Inc., and the National Council of Teachers of Mathematics, The Place of Mathematics in Secondary Education, 1940.

3. Commission on Secondary School Curriculum of the Progressive Education Association, Mathematics in General Education, 1940.[2]

All of these groups and their reports undoubtedly had an influence on the mathematical curriculum of the secondary schools. The growth and development of the mathematics programs in use today have been a long and continuous process accomplished only with the aid of many individuals and many organized mathematical groups. Changes are still being made and new trends are developing.

One of the most significant trends has been the gradual decrease in the emphasis on traditional[3] mathematics courses and an increase in emphasis on new courses.

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[1]Lynwood F. Wren, Monroe Encyclopedia of Educational Research, (New York, MacMillan Company, 1950), p. 717.

[2]Milton W. Beckmann, "How Mathematically Literate is the Typical Ninth-Grader after Having Completed Either General Mathematics or Algebra?", School Science and Mathematics, Vol. LII, June 1952, p. 449.

[3]The traditional mathematics courses include Algebra I, Algebra II, Plane Geometry, Solid Geometry and Trigonometry.

Many courses of a specialized nature have been offered to the student, but the greatest single offering has been in a type of course of a more general nature. The name given to these generalized courses is usually general mathematics. These courses took on various forms and had different purposes in the different schools. Gradually there became increasing alarm that general mathematics was fast becoming a "dumping ground" for the student less proficient in mathematics. Despite its many uses, and abuses, courses in general mathematics are being offered as part of the regular curriculum of most of the larger schools and many of the smaller ones.

A large number of reports and studies have been made on the problems of general mathematics. Many of these seem to be all inclusive, and a smaller number are reports on specific areas of general mathematics. Only a few of the available reports can be mentioned here, and the reader is referred to the bibliography for others.

A study by Schaaf[1] made an effort to determine the trends in junior high school mathematics. The results, based on 152 replies from twelve states, seemed to indicate that the trend in these schools was away from algebra in the ninth grade toward some type of unified, general, or cumulative mathematics.

Two reports on mathematics which give an excellent

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[1]William L. Schaaf, "Current Trends in Junior High School Mathematics," School Science and Mathematics, Vol. XXXV, Dec. 1935, pp. 959-69.

general summary along with many specific suggestions were published in 1944 and 1945. These reports by the Commission on Post War Plans, edited by William Reeve[1], cover mathematics in general from grades one through fourteen. One section of these reports gives a check list which can be used as the main goal of mathematics teachers. Several sections of these two reports seem to emphasize functional competence of mathematics, which is often mentioned and discussed in papers on general mathematics.

The Florida State Department of Education and the College of Arts and Sciences of the University of Florida sponsored a study under the direction of William A. Gager[2] for the purpose of improving certain parts of the present mathematics curriculum. Out of this study of general mathematics came the conclusion that all high school pupils not enrolled in the traditional mathematics courses should be required to take both ninth-grade and tenth-grade functional mathematics courses. Functional mathematics courses for the eleventh and twelfth grades should be made available to all pupils who choose to elect them. The foregoing is but one study that recommended several years of functional mathematics rather than just the usual one year.

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[1] William David Reeve, Editor, "Report of the Commission on Post War Plans," First Report, The Mathematics Teacher, Vol. XXXVII, May 1944, pp. 230 ff., Second Report, The Mathematics Teacher, Vol. XXXVIII, May 1945, pp. 195-221.

[2] William A. Gager, "Functional Mathematics--Grades Seven through Twelve," The Mathematics Teacher, Vol. XLIV, May 1951, pp. 297-311.

Considerable effort has been directed along the lines of a "double track" program of mathematics in the secondary schools. The "double track" system offers the traditional courses along with another sequence of courses such as general mathematics I, general mathematics II, and sometimes general mathematics III and IV. A recent study on the "double track" program was conducted in Kansas by Anderson and Dixon.[1] A number of other studies seem to support the "double track" program of secondary mathematics.

Two years of general mathematics in sequence has been shown superior to a course in algebra followed by a course in geometry. McCormick[2] showed this was true in his report twenty-five years ago. Reeve[3] and many others have supported McCormick's study with further investigation.

A recent study by Irvin Lee gives a summary of the status of mathematical offerings in ninety-two selected secondary schools. Lee summarized one part of his findings when he wrote:

> Seventy-four of the ninety-two cooperating schools offered either a three track or a multiple track mathematics program; sixteen offered a double program at

[1]K. E. Anderson and L. J. Dixon, "Study of the Double Track Program of Mathematics in the Secondary Schools of Kansas," School Science and Mathematics, Vol. LII, Nov. 1952, pp. 637-40.

[2]Clarence McCormick, The Teaching of General Mathematics in the Secondary Schools of the United States, (New York, Bureau of Publications, Columbia University, 1929), pp. 32-52.

[3]W. D. Reeve, "General Mathematics for Grades 9 to 12," School Science and Mathematics, Vol XLIX, Feb. 1949, pp. 99-110.

the ninth or twelfth grade level or at the ninth and twelfth grade level; twenty-nine offered related mathematics in connection with industrial arts and agricultural curricula; and nine offered special-interest mathematics courses for girls in home-making, household arts, or pre-nursing curricula. Forty-three of the schools offered their non-traditional mathematics in two-to-four year sequence, and thirty-three offered two or three differentiated non-traditional courses.[1]

The 1948-49 report by the U. S. Office of Education[2] shows general mathematics as one of three subjects outstanding in its percentage increase. In 1934, 7.4 per cent of all students in high schools were enrolled in general mathematics courses. In 1949, the enrollment had grown to 13.1 per cent. The report shows a corresponding decrease in enrollments in algebra and geometry.

The state departments of education supplied information for a study by W. I. Layton[3] on the statewide mathematical requirements for graduation from high school. Twenty of the forty-eight states required no mathematics, twenty-four required one unit, one required one and one-half units, and one required two units. This study showed that 57 per cent of the states require some mathematical training in all of their four-year high schools. This percentage is

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[1] Irvin Lee, "The Organization of Instruction in Arithmetic and Basic Mathematics in Selected Secondary Schools," The Mathematics Teacher, Vol. XLVI, April 1953, pp. 235-40.

[2] U. S. Office of Education, "Offerings and Enrollments in High School Subjects--1948-49," (Washington D. C., Government Printing Office, 1951).

[3] W. I. Layton, "The Mathematics Required for Graduation from High School," The Mathematics Teacher, Vol. XLVII, May 1954, pp. 315-19.

exceeded by social studies, English, and science.

The content of a course in general mathematics seems to vary considerably from school to school. There seems to be a wide range of opinion among the teachers as to what should be included in a course in general mathematics. Kenneth E. Brown reported on two studies which deal with the course content of general mathematics:

> In 1942, after analyzing more than fifty text-books in general mathematics, 458 questionnaire answers from colleges, and the opinions of 1500 students I reached the following conclusions: (1) According to the authors of the texts and the teachers of the subject, general mathematics could be classified into three divisions based on the objectives of the course as follows; (A) preparatory--to equip the students for a profession, semi-profession, or a vocation in which mathematics is a useful tool (B) cultural--to prepare students to be intelligent citizens mathematically . . . . (C) combined preparatory and cultural--to attain both the above objectives . . . . From a 1949 survey, based on opinions of 900 teachers, regarding the importance of certain topics in a cultural general mathematics course it was found that great emphasis was placed on these topics: arithmetic, consumer problems, algebra, mental arithmetic, statistics, trigonometry, geometry, ...[1]

Textbooks for general mathematics have been topics for considerable study. There seems to be only a limited amount of agreement among authorities as to what should be included. A review of twenty-three texts published from 1934-40 was made by Faith Novinger and points out the differences in content of the general mathematics texts:

> Arithmetic is the sole category on which all of them agree as essential to ninth-grade mathematics. Commercial arithmetic ranks second; geometry is third

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[1]Kenneth E. Brown, "The Content of a Course in General Mathematics--Teacher's Opinions," The Mathematics Teacher, Vol. XLIII, Jan. 1950, pp. 25-30.

in rank; and algebra fourth, in their opinion. These
are followed in order by social uses, consumer train-
ing, graphs, industrial arithmetic, trigonometry, tables,
history of mathematics, and miscellaneous.[1]

The use of projected aids and other multi-sensory

aids in the mathematics classroom was the subject of a sur-

vey of 150 public schools in Massachusetts made by Sayer

and Ingeneri.[2] The survey attempted to determine which aids

were available and to what degree they were used by the

teachers. The four aids reported most often used were solid

geometry models, mathematics books other than the regular

mathematics text, book shelves and cases, and slide rules.

The four projected aids which were found to be most often

available to the teachers were lantern slides, sound films,

strip films, and silent films.

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[1]Faith F. Novinger, "Distribution of Contents in
Twenty-Three Ninth-Grade Mathematics Textbooks for Non-
Academic Pupils," The Mathematics Teacher, Vol. XXXV, April
1942, pp. 165-8.

[2]Henry W. Sayer and Peter J. Ingeneri, "Multi-
Sensory Aids in Mathematics," School Science and Mathe-
matics, Vol. XLIX, Feb. 1949, pp. 134-40.

CHAPTER III

MAKING THE SURVEY

Careful consideration of the major topics of study in the area of general mathematics and discussion with a number of mathematics teachers resulted in the development of a questionnaire which would be suitable for finding out more about general mathematics as it is taught in the secondary schools of Wyoming. An effort was made to cover as many of the major topics about which there seemed to be inadequate information as was practical to include in a two page questionnaire.

Questionnaires were sent to the 101 accredited junior and senior high schools of Wyoming. Seventy-three replied for a percentage return of 72.3. All but two of the junior high schools were organized on a two-year basis and these offered only the conventional seventh and eighth grade arithmetic. For this reason only the replies from the three-year junior high schools were included in the results of the survey. This meant that sixty-eight usable replies out of a possible ninety were received for a 75.6 per cent return. Since the high schools of Wyoming are classified as first class, second class, third class, and junior high, the tables throughout this study will separate the responses whenever this helps to clarify the information given. A

summary of the standards used for classifying the schools

follows:

> The standards used in Wyoming for determining the
> class of a high school are the same as the standards
> of the North Central Association of High Schools.
> Specific standards are determined for the following:
> school plant, sanitation, and janitorial service;
> science laboratories and school library; records;
> requirements for graduation; the teaching load; the
> pupil load; and athletics. Standards for the three
> classes of high schools are based on these major items
> and vary mainly in the degree of rigidity of each
> standard. The capability of offering a student a
> complete and well balanced education in a Class II
> school would be better than in a Class III school.
> Likewise, the Class I schools would be superior to the
> Class II schools.[1]

TABLE I

NUMBER AND PERCENTAGE OF QUESTIONNAIRES RETURNED FROM NINETY SECONDARY SCHOOLS IN WYOMING

Type of High School	Number of Schools	Number of Replies	Per Cent of Replies
Class I	41	35	85.5
Class II	21	15	71.5
Class III	26	16	61.6
Junior High	2	2	100.0
Totals	90	68	75.6

Of the twenty-two schools that did not reply to

the questionnaire, seventeen had enrollments less than eighty-

five; and of these, nine had enrollments less than fifty.

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[1]Based on information received from the State
Department of Education, Cheyenne, Wyoming.

CHAPTER IV

REPORT OF THE FINDINGS

In order to determine what mathematics courses were taught by the schools of Wyoming, a simple check list was provided for indicating the course offered and the year offered in the usual sequence. Table II shows the pattern of courses offered in Wyoming to be much like the traditional set-up which existed for many years prior to the introduction of general mathematics in the curricula of American schools. The only real difference is the addition of a general mathematics course.

TABLE II

MATHEMATICS COURSES OFFERED BY SIXTY-EIGHT SECONDARY SCHOOLS
IN WYOMING AND THE YEAR OFFERED IN THE USUAL SEQUENCE

Name of Course	The Year Usually Offered			
	Ninth	Tenth	Eleventh	Twelfth
Algebra I	53	7	1	
Algebra II		6	34	2
Plane Geometry	2	48	9	
Solid Geometry		1	16	11
Trigonometry			17	12
General Math I	46	2	1	
General Math II		4		
Other Courses	6	5	7	4

The names of the courses which were listed under "other courses" included business mathematics, technical

mathematics, shop mathematics, senior mathematics, and economic mathematics. Four schools indicated that senior mathematics was offered to twelfth-year students for the purpose of insuring that graduates would have a good, well-rounded, working knowledge of the basic mathematical fundamentals immediately before leaving high school. One of the schools had a somewhat unusual system. At the end of the junior year all students are required to take an examination in mathematics which is used to measure the student's proficiency in the mathematical fundamentals. All students who do not obtain a satisfactory score are required to take the course in senior mathematics. Other seniors may enroll if they wish.

The reader may wonder why ninth-year students are permitted to take plane geometry. On both questionnaires the explanation was given that algebra and geometry were necessarily alternated due to the small school enrollment. According to some of the comments on the questionnaires, a number of smaller schools had to adjust their curriculum from year to year in order to meet the needs of the students.

A second year of general mathematics was offered in only four of the schools despite the work in recent years on the benefits of a second year of general mathematics. The second year of general mathematics has been encouraged as part of the "double track" system used by many schools in the United States today.

General mathematics and algebra were the two courses offered most often to ninth-graders. The number and per

cent of schools offering these courses is summarized in Table III. Slightly less than one half of the schools replying offered both general mathematics and algebra to their ninth-grade students last year.

TABLE III

THE NUMBER AND PER CENT OF SCHOOLS OFFERING ALGEBRA, GENERAL MATHEMATICS, OR BOTH TO THEIR FRESHMAN DURING 1953-54, FOR SIXTY-SIX SECONDARY SCHOOLS IN WYOMING

Type of High School	Both General Math and Algebra I	General Math Only	Algebra I Only
Class I	25	4	5
Class II	3	6	5
Class III	1	4	11
Junior High	2		
Totals	31	14	21
Per Cent	47.0	21.2	31.8

Fifty-three per cent of the schools replying offered only general mathematics or algebra to their ninth-graders last year. One school indicated that general mathematics and algebra were given on alternate years, and one stated that general mathematics was given except when an "exceptional class" came along. Enrollment of the school had much to do with determining whether or not both courses could be offered. A comparison of the number of schools which offer only general mathematics or algebra seems to indicate that when only one course is offered algebra is given preference.

As shown before, graduation requirements seem to vary considerably between states. Table IV summarizes the mathematical requirements for graduation in sixty-three

Wyoming schools. The information given in Table IV applies
only to the minimum requirements. Seven schools have double
requirements. These seven schools require two years of mathe-
matics for all students who want to be recommended for col-
lege entrance. One school has a triple requirement: one
mathematics course for the general student, two for the col-
lege preparatory course, and three for the scientific course.

TABLE IV

THE MINIMUM NUMBER OF MATHEMATICS COURSES REQUIRED FOR
GRADUATION, FOR SIXTY-THREE WYOMING SECONDARY SCHOOLS

| | Type of High School | | | | |
	Class I	Class II	Class III	Junior High	Totals
Number of Schools That Require One Mathematics Course	25	10	5	2	42
Number of Schools That Require Two Mathematics Courses	7	4	10		21

A comparatively large number of Class I schools
require only one year of mathematics for graduation; whereas,
a comparatively large number of Class III schools require
two years of mathematics for graduation. The limited curric-
ulum of most Class III schools leaves the student little
choice for other courses than those deemed necessary for
college entrance requirements.

General mathematics and algebra have usually been
courses for the ninth-year student, and the students were
usually directed into one course or the other during the

freshman year. Table V shows the enrollment figures for
algebra and general mathematics courses in thirty-one
schools.

TABLE V

ENROLLMENT IN THE GENERAL MATHEMATICS AND ALGEBRA CLASSES FOR
THE THIRTY-ONE WYOMING SECONDARY SCHOOLS WHICH OFFERED
BOTH COURSES TO THEIR FRESHMAN IN 1953-54

Name of Course	Enrollment	Per Cent of Total
General Mathematics	1556	47.7
Algebra I	1702	52.3
Totals	3258	100.0

A comparison between the number enrolled in general
mathematics courses and the total school enrollment in these
same schools shows that 14.9 per cent of the total student
body is taking general mathematics and 16.3 per cent is
taking algebra.

A further look at the enrollment figures shows that
251, or 16.2 per cent, of the general mathematics students
are not ninth-graders. An effort was made to determine the
reason, or reasons, why students other than ninth-graders
are taking general mathematics. Thirty-three of the fifty-
five responses received indicated the non-ninth-grade stu-
dent in general mathematics usually has either failed gen-
eral mathematics or algebra before. This seems to indicate
that the non-ninth-grade pupil in the general mathematics
course is apt to be there because of having previously fail-
ed some high school mathematics course.

In an effort to find out more about the enrollment procedures and practices used in the Wyoming schools several different questions were asked. In answer to the question, "In your opinion has the method of enrolling and selecting general mathematics students been entirely satisfactory?" twelve replied "yes" and thirty-three replied "no".

An important problem in the enrolling of students in ninth-year mathematics has centered around the better student and what course he should take. Some teachers seem to feel that the better student should have algebra whether or not he ever intends to go to college. Others feel that only those who are certain they will need algebra in their chosen careers should take algebra. Table VI shows the responses to one question associated with this problem.

TABLE VI

RESPONSES RECEIVED FROM SIXTY-EIGHT WYOMING SECONDARY
SCHOOLS IN ANSWER TO THE QUESTION, "ARE THE BETTER
STUDENTS USUALLY ENCOURAGED TO TAKE ALGEBRA
INSTEAD OF GENERAL MATHEMATICS?"

Type of High School	Kind of Reply Received		
	"Yes"	"No"	No Reply
Class I	23	7	4
Class II	6	3	5
Class III	5	3	8
Junior High	2		
Totals	36	13	19

The problem of enrolling students in the proper course is definitely an important one as the student's entire career may be effected by wrong decision. A number of

devices are sometimes used to aid the student in making this
important decision. Three of the schools indicated that the
Iowa Algebra Aptitude Test was used as an aid in determining
which students enroll in algebra. One of these schools
stated that students whose scores were below the twentieth
or thirtieth percentile were excluded from algebra. Another
school indicated that the twenty-fifth percentile was used as
the criterion for 1953-54 but added, "This was too low and
will be raised to at least the thirtieth percentile next
year." A number of other factors are sometimes used as
shown by Table VII.

TABLE VII

A FREQUENCY TABULATION OF THE FACTORS USED BY SIXTY-EIGHT
WYOMING SECONDARY SCHOOLS FOR DETERMINING WHICH STUDENTS
TAKE GENERAL MATHEMATICS AND WHICH STUDENTS TAKE ALGEBRA

| Factor Used | Type of High School | | | | Total |
	Class I	Class II	Class III	Junior High	
Student's Desire . .	22	7	5	1	35
Student's Academic Record	17	3		2	22
Arithmetic Grade Placement	11	4	1		16
I. Q.	10	2	1	1	14
Statement From Previous Teacher . .	12	1		1	14
Algebra Aptitude Test	6	1		1	8
Reading Grade Placement	3				3
Mental Age	1	1			2
Others	4	1			5

In nearly every instance, schools checked more than

one factor; and almost all schools checked either student's
desire or student's academic record. The response "others"
included two each of parents request and student's intent to
attend or not attend college. The remaining response stated
the size of the class was a factor in determining whether
the student took algebra or general mathematics.

In order for a student to make a wise choice of
courses he should receive aid from some individual or group
of individuals. There may be some duplication since one
person may come under more than one heading but Table VIII
attempts to show which persons aid the student most in plan-
ning his course of study.

TABLE VIII

THE PERSON(S) THAT GENERALLY AIDS THE STUDENT MOST IN
DETERMINING IN WHICH COURSES THE STUDENT ENROLLS, ACCORDING
TO RESPONSES FROM SIXTY-EIGHT WYOMING SECONDARY SCHOOLS

Person or Persons Aiding the Student	Type of High School				Total
	Class I	Class II	Class III	Junior High	
Principal	17	7	6		30
Eighth-Grade Teacher	13	3		2	18
Student's Parents	12	1	2		15
General Math Teacher	4	2	2		8
Counselor	7	1			8
A Combination of Some of These in Conference	3	2	1		6
Homeroom Teacher	2	1			3
Ninth-Grade Teacher	3				3
All Others	8				8

From Table VIII the general mathematics teacher seems
to have comparatively little to do in guiding the student

into or out of general mathematics. On the other hand, the principal is mentioned most and is apparently quite influential in determining which courses the students select. A particularly encouraging response is indicated by six schools that checked the response "a combination of some of these in conference." The combinations indicated were:

1. principal, eighth-grade teacher, and parents
2. general mathematics teacher, eighth-grade teacher, and parents
3. counselor, principal, and student's advisor
4. superintendent, teacher, and student
5. student's advisor and principal
6. parent and teachers

The purpose of general mathematics in the curriculum has caused considerable discussion in recent years. Table IX seems to indicate that in about two thirds of the schools general mathematics was offered primarily for the student weak in mathematics.

TABLE IX

OPINIONS FROM FIFTY SECONDARY SCHOOLS IN WYOMING ON WHETHER OR NOT THE GENERAL MATHEMATICS COURSE IS PRIMARILY A TERMINAL COURSE FOR THE STUDENT WEAK IN MATHEMATICS

Type of High School	Reply Received	
	"Yes"	"No"
Class I	20	9
Class II	7	4
Class III	4	4
Junior High	2	
Totals	33	17

A few typical comments supplied by those who indicated that general mathematics was primarily a terminal

course for the student weak in mathematics would include:

1. Some cannot get algebra because they absolutely do not know their arithmetic.
2. I believe this should be the one last chance to teach them whatever fundamentals they lack.
3. It is used here for teaching the fundamentals only, but there is a desperate need for a general mathematics course for the average and above average student.
4. If they don't have the ability to do algebra they cannot go beyond general mathematics.
5. It is used for that purpose in this school but it shouldn't be. (five similar replies)

A few typical comments supplied by those who indicated that general mathematics was not primarily a terminal course for the student weak in mathematics would include:

1. The students will have to take senior math if they do not make a passing score on a test given at the end of their junior year.
2. We use it to combine all mathematics courses into one course for college preparatory or life adjustment for students.
3. It is too difficult for any but the most advanced seniors.
4. It is an introduction to algebra and lays a foundation for algebra.
5. It should be a review course--an introductory course perhaps. I am toying with the idea of requiring general math in grade nine with algebra for the tenth grade.
6. Many students use it as a foundation for algebra. Also, it gives many of them the courage to take algebra after having achieved success in general mathematics.[1]

All of these comments, as well as the responses recorded in Table IX, seem to show that considerable difference of opinion exists among the teachers of Wyoming, as to what purpose general mathematics should serve. In order to better meet the purposes for which the general mathematics

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[1]Numerous other comments were received, but the ones listed were selected as representative.

course is used a variety of textbooks and materials are available.

A total of twenty-nine different textbooks were being used in the general mathematics classes of forty-nine Wyoming schools. About 20 per cent of the schools reporting listed more than one text. Eleven of the texts were used by more than one school; however, no more than six schools used any one text. The six textbooks most often used were:[1]

1. Nelson and Grime, Making Mathematics Work
2. Stein, Fundamentals of Mathematics
3. Patton, Mathematics We Use
4. Lasley and Mudd, New Applied Mathematics
5. Patton and Young, New Standard General Mathematics
6. Hawkins and Tate, Your Mathematics

In response to the question, "In your opinion has any one text been entirely satisfactory in meeting the needs of the general mathematics students?" twelve replied "yes", and named the following ten books:

1. Brueckner, Arithmetic We Use
2. Edgerton and Carpenter, General Mathematics
3. Lasley and Mudd, New Applied Mathematics
4. Nelson and Grime, Making Mathematics Work
5. Patton and Young, Using Mathematics
6. Patton and Young, New Standard General Mathematics
7. Patton, Mathematics We Use (named by two schools)
8. Schorling and Clark, Mathematics in Life
9. Stein, Fundamentals of Mathematics
10. Stein, Refresher Arithmetic (named by two schools)

The major shortcomings of the general mathematics texts were grouped into nine general areas and tabulated in Table X.

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[1]These six texts are given in order of frequency. A complete list of the texts used is given in the appendix.

TABLE X

THE MAJOR SHORTCOMINGS OF THE GENERAL MATHEMATICS TEXTS AS
INDICATED BY FORTY-FOUR TEACHERS WHO BELIEVE THE GENERAL
MATHEMATICS TEXTS DO NOT MEET THE NEEDS OF THE STUDENT

Major Shortcoming of Texts	Number of Responses
Inadequate or Too General Coverage of Topics	17
Not Enough Drill Material	7
Problems Too Complicated	7
Not Enough Word Problems	4
Too Similar to Seventh and Eighth Grade Arithmetic	4
Problems Too Easy	2
Algebra and Geometry Are Overemphasized	1
Explanations Too Long	1
Insufficient Good Examples	1

The major difficulties according to those responding
could probably be summarized by stating that most teachers
of general mathematics find the content of general mathe-
matics texts not entirely suitable for meeting the needs of
the students. The comment on one questionnaire stated,
"The trouble with the general mathematics texts is that every
author and every publisher has his own idea as to what
should be included, and all we get is a disorganized mess."

The variety of texts and the comments stated would
indicate that many differences could be found in the course
content in different schools. A specific course of study
is not available on a statewide basis for the general
mathematics classes in the secondary schools of Wyoming.
In answer to the question, "Is a specific course of study

used in the general mathematics course?" forty-nine replied
"no" and six replied "yes". Only about one tenth of the
replies stated a specific course of study was being used
in the general mathematics classes. The courses of study
in use were prepared by the following:

1. Head of the Mathematics Department
2. General Mathematics Teacher
3. The Textbook Author
4. The University of Wyoming
5. Mathematics Teachers of the System Working
   Together (two replies)

In comparing the flexibility of the general mathe-
matics course with other mathematics courses, almost
unanimous results were obtained in answer to the question,
"How does the flexibility of the general mathematics course
compare with that of the other mathematics courses?" All
of the schools replying, except one, indicated the general
mathematics course was more flexible or that the general
mathematics course was adjusted to meet the needs of each
individual class. Several replies summarized the reason
for this greater flexibility by pointing out the wider range
of student ability between students in general mathematics,
as compared to the range of student ability in the other
mathematics courses.

These differences seem to carry over into the grad-
ing of students. Less than one third of the schools stated
that no special considerations in grading were given to the
general mathematics students. The other schools indicated
there were some differences between the grading in general

mathematics and other mathematics courses. Table XI

summarizes these responses

TABLE XI

A COMPARISON OF THE GRADING IN THE GENERAL MATHEMATICS COURSES WITH THE GRADING IN THE OTHER MATHEMATICS COURSES OFFERED BY WYOMING SECONDARY SCHOOLS

Statement of Comparison	Type of High School				Total
	Class I	Class II	Class III	Junior High	
Tends to be more lenient	15	5	3	1	24
No special consideration given in grading .	12	5	4	2	23
Places more emphasis on individual ability .	9	3	2	1	15
Places more emphasis on learning certain prescribed material . .	1	1			2
Tends to be more rigid	1				1

General mathematics seems to cover a wide variety
of subject matter areas. A wide range of student ability
is often found in the classes. In general, the courses seem
to lend themselves quite well to the use of resources other
than the textbook. Thirteen resources were listed on the
questionnaire and provision made for indicating to what
degree each one was used in the general mathematics classes.
The responses received seem to indicate that outside speakers
and field trips are used very little in the general mathe-
matics classes. Movies, strip film, or slides were used
to a certain degree in the general mathematics classes
of about two dozen schools. The resources in Table XII

were arranged in an order determined by combining the

responses for "frequently used" and "occasionally used."

TABLE XII

SUMMARY OF THE USE MADE OF THIRTEEN RESOURCES IN THE GENERAL
MATHEMATICS CLASSES OF THE SECONDARY SCHOOLS OF WYOMING

Resource	The Degree Used			
	Frequently	Occasionally	Seldom	Never
Protractors, compasses, etc.	27	22	1	
Budgets, time tables, etc.	11	27	5	
Reference texts	15	21	9	3
Models of solids, etc.	10	26	6	4
Bulletin board materials	9	22	6	9
Squared blackboard	11	13	3	17
Movies	2	12	9	19
Strip film or slides	2	10	12	16
Display cases or exhibits	2	8	3	30
Spherical blackboard	2	2	2	34
Calculating machines		2	5	33
Outside speakers		1	4	34
Field trips	1		11	26

Many educators seem to agree that good textbooks

and numerous other classroom materials help to improve any

course, but in the final analysis the teacher is of prime

importance. An effort was made to find out something about

the teachers of general mathematics in the Wyoming second-

ary schools.

Sixty-eight schools reported that a total of 121

teachers were teaching at least one mathematics course.

Sixty-three of these teachers were teaching a course in

general mathematics. All except two of the teachers of

general mathematics had a college degree, and 15.9 per cent of the degrees were masters degrees. From the standpoint of degrees, the general mathematics teachers of Wyoming seem to be well qualified.

The major fields of study of the teachers who reported teaching at least one course in general mathematics are given in Table XIII.

TABLE XIII

MAJOR FIELD OF STUDY FOR SIXTY-THREE TEACHERS OF GENERAL MATHEMATICS IN WYOMING SCHOOLS IN ORDER OF FREQUENCY

Major Field of Study	Number of Responses
Mathematics	29
Science	7
Physical Education	6
Social Studies	5
Commercial	5
Education	2
Engineering	2
Industrial Arts	1
History	1
Not Given	5

Less than one half of the general mathematics teachers indicated their major field of study was mathematics. About one sixth of the general mathematics teachers indicated their major field to be in an area closely related to mathematics. On the other hand, nineteen of those responding have their major field of study in some area which is not mathematics or a closely allied field. From comments received from some of the smaller schools general mathematics must sometimes be taught by a teacher not fully

qualified to teach mathematics. The other courses being
taught by teachers of general mathematics and the other
major responsibilities of the general mathematics teachers
are given in Table XIV.

TABLE XIV

COURSES BEING TAUGHT, IN ADDITION TO GENERAL MATHEMATICS,
AND OTHER MAJOR RESPONSIBILITIES OF SIXTY-THREE
GENERAL MATHEMATICS TEACHERS IN WYOMING

Other Courses Taught or Other Major Responsibility	Number of Responses
Mathematics Courses Only	19
Physical Education or Coach	11
Mathematics and Science Combined	8
Superintendent or Principal	8
Science Courses	5
Shop Courses	3
Commercial Courses	3
Audio Visual Coordinator	2
Other Courses	4

About one half of the teachers of general mathe-
matics are either teaching courses which are not closely
related to mathematics or have major responsibilities other
than teaching. Approximately one third of the general mathe-
matics teachers teach only mathematics courses. About one
third of the general mathematics teachers are involved with
physical education, coaching, or administration.

CHAPTER V

SUMMARY OF THE STUDY

This study was conducted for the purpose of obtaining information about the common practices in general mathematics in the secondary schools of Wyoming. This survey included only the common practices that existed in the general mathematics courses of the high schools and three-year junior high schools. No attempt was made to include courses offered below the ninth grade. The information presented was designed to give an overview of general mathematics in the secondary schools of Wyoming.

The questionnaire method of research was used; and the replies were carefully analyzed, tabulated, and reported as briefly and clearly as possible with the aid of numerous tables. A general overview of some other studies in the field of general mathematics was presented in Chapter II.

For convenience of the reader the major points of this study are summarized here:

1. The mathematics curriculum of most Wyoming schools seems to follow a traditional pattern of courses along with the addition of general mathematics in the ninth year in about one half of the schools. When only general mathematics or algebra are given in the ninth year algebra is given the preference.

2. All the secondary schools of Wyoming require at least one year of mathematics for graduation, and about one third of them require two years.

3. General mathematics is generally offered for ninth year students. Less than five per cent of the schools offer two successive years of general mathematics.

4. When students other than ninth-graders take general mathematics the reason is usually due to the student having failed some high school mathematics previously.

5. General mathematics in Wyoming schools is offered primarily for the student weak in mathematics. The better students are usually encouraged to take algebra instead of general mathematics.

6. The student's desire and the student's academic record are the two most often used factors for selecting the students that take algebra. Very little use is made of tests such as the Iowa Algebra Aptitude test in the Wyoming schools.

7. The principal and the student's eighth-grade teacher are the two persons that most often aid the student with registration.

8. There is very little agreement among teachers as to what texts should be used in general mathematics courses. Specific courses of study are seldom used, and considerable flexibility is evident in the general mathematics courses of Wyoming. Grading is generally more lenient in the general mathematics classes than in other mathematics classes.

9. General mathematics teachers make use of some common outside resources in their classes. Projected aids are used by a number of teachers, but outside speakers and field trips are almost wholly neglected.

10. From the standpoint of number of degrees the general mathematics teachers of Wyoming are well qualified. However, almost one third of them have their major field of study in an area not closely related to mathematics.

11. Approximately one half of the teachers of general mathematics either teach other courses which are not closely related to mathematics or they have major responsibilities other than teaching. About one third of the teachers of general mathematics are involved with physical education, coaching or administration.

On the basis of the findings of this study there
seem to be several areas where further study is needed in
order to modify and improve the existing situation in some
of the schools. Some of the weakness that seem to exist
in some general mathematics courses in Wyoming might be
partially remedied by:

1. A study regarding the desirability of offering two
   years of general mathematics, in addition to the
   usual sequence of traditional courses, in more
   Wyoming secondary schools.

2. A study to determine the causes of failure in high
   school mathematics with the aim of suggesting methods
   of reducing the number of students who must take
   general mathematics after having previously failed
   some mathematics course.

3. A study of the existing procedures used in selecting
   students for general mathematics and algebra with the
   aim of improving the methods currently being used.

4. A study of the content, textbooks, and resources
   materials of the general mathematics courses in
   Wyoming schools with the aim of preparing a course
   of study which would meet the needs of most of the
   general mathematics students in Wyoming.

5. A study of the preparation of general mathematics
   teachers with the aim of improving the qualifications
   of the teachers of the general mathematics courses
   in Wyoming.

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APPENDIX

LIST OF THE TWENTY-NINE TEXTBOOKS WHICH WERE BEING
USED IN THE GENERAL MATHEMATICS CLASSES OF
FORTY-NINE SECONDARY SCHOOLS IN WYOMING

Barton, Grover C. and Osborn, J. O. Home and Job Mathematics,
St. Louis: Webster Publishing Company, 1943-44.

Betz, William. Basic Mathematics, Boston: Ginn and Company,
1942.

Betz, William. Everyday General Mathematics, Boston: Ginn
and Company, 1953.

Betz, William. Everyday General Mathematics, Boston: Ginn
and Company, 1949.

Brueckner, Leo J. Arithmetic We Use, Chicago: Winston
Company, 1944.

Brueckner, Leo J. and Grossnickle, Foster E. Mathematics
We Use, Chicago: Bedford Publishing Company, 1948.

Brueckner, Leo J. and Mertan, E. L. Thinking With Numbers,.
Chicago: Winston Company, 1952.

Curry, Preston E. and Piper, Edwin B. Business Arithmetic,
Cincinnati: Southwestern Publishing Company, 1953.

Douglass, Harl R. and Kinney, L. B. Senior Mathematics, New
York: Holt Publishing Company, 1945.

Dunn, Flora M. Useful Mathematics, Boston: Allyn and Bacon
Company, 1937.

Edgerton, Edward I. and Carpenter, Dale. Elementary Algebra,
Boston: Allyn and Bacon Company, 1951. (used with
Refresher Arithmetic by Stein).

Edgerton, Edward I. and Carpenter, Dale. General Mathematics,
Boston: Allyn and Bacon Company, 1952.

Grossnickle, Foster E. General Mathematics, Chicago: Winston
Company, 1949 and 1950.

Hawkins, George E. and Tate, Gladys. Your Mathematics,
Chicago: Winston Company, 1948, 1949, 1950, and 1952.

Lasley, S. J. and Mudd, M. F. New Applied Mathematics,
New York: Prentice Hall Company, 1945 and 1950.

Lennes, N. J. New Practical Mathematics, New York: Mac
Millan Company, 1946.

LIST OF TEXTBOOKS CONTINUED

Lennes, N. J. Economic Mathematics, Boston: Allyn and Bacon Company, 1953.

Mallory, Virgil S. Mathematics for Everyday Affairs, Chicago: Sanborn Publishing Company, 1940.

Nelson, G. D. and Grime, H. E. Making Mathematics Work, Boston: Houghton Mifflin Company, 1950.

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Patton, David H. and Young, William E. Using Mathematics, Syracuse: Iriquois Publishing Company, 1952.

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Ruch, Giles M., Knight, F. B., and Hawkins, G. E. Living Mathematics, Chicago: Scott Foresman Company, 1938.

Schorling, Raleigh and Clark, J. R. Mathematics in Life, New York: World Book Company, 1946.

Stein, Edwin I. Fundamentals of Mathematics, Boston: Allyn and Bacon Company, 1952.

Stein, Edwin I. Refresher Arithmetic, Boston: Allyn and Bacon Company, 1948 and 1950.

Stein, Edwin I. Refresher Workbook in Arithmetic, Boston: Allyn and Bacon Company, 1952.

_____. Consumer Mathematics, (no other information given).

803 South Main
Sheridan, Wyoming
March 4, 1954

Dear Mathematics Teacher:

Under the sponsorship of Dr. James E. Short, Professor of Education, Montana State University, I am making a study of general mathematics as it is taught in Wyoming schools.

As a fellow mathematics teacher you know there are many problems in general mathematics that have not been solved. In fact there are many things we do not even know about general mathematics as it is taught in our own state.

This questionnaire is being sent to the high schools and junior high schools in Wyoming. It is hoped that as you go through the questions you will recognize many familar items and be able to tie them in with your own situation. Perhaps many of the questions will make you realize that some of your own problems are also those of other teachers throughout the state.

I feel many other teachers will be sincerely interested in the outcomes of this study. In fact a summary or report of some kind on this study will be made available if enough teachers indicate their desire for this information at the end of the questionnaire.

Individuals will not be indentified in this study so feel free to answer in any manner you wish. You are encouraged to use the back of the questionnaire for comments on any topic.

I feel certain that you are interested in improving your mathematics program and will be willing to devote the next five or ten minutes toward helping a study which could well supply much valuable information to the mathematics teachers of Wyoming.

Thank you very much for your help.

Sincerely,

Charles W. Popovich
Mathematics Teacher
Sheridan High School

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803 South Main
Sheridan, Wyoming
April 8, 1954

Dear Principal:

About three or four weeks ago the enclosed question-
naire was mailed to all the high schools and junior high
schools in Wyoming. The results of the questionnaire have
been very gratifying thus far.

To date the return has been 45 per cent, and this
second copy is being sent out in order to improve the valid-
ity of the survey. Many of the returns have been very re-
vealing thus far and it is hoped that a few more returns will
make the results sufficiently valid so that a summary or
report of the survey can be made. If you feel such a summary
would prove valuable please check in the blank provided at
the end of the questionnaire.

Since the first questionnaire may not have reached
the proper person please hand this one to an interested
teacher of mathematics or take the next few minutes to answer
whatever questions may apply and return in the enclosed
envelope.

Thank you very much for your assistance.

Sincerely,

Charles W. Popovich
Mathematics Teacher
Sheridan High School

GENERAL MATHEMATICS QUESTIONNAIRE

What is the approximate school enrollment?

How many teachers are teaching at least one mathematics course?

How many of these are teaching a course in general math?

Is a specific course of study used in the general math course?_____ If answer is "yes" who prepared it?

How does the grading in general math compare with that in other math courses?
_____Tends to be more lenient
_____Tends to be more rigid
_____Places more emphasis on individual abilities
_____Places more emphasis on learning prescribed material
_____No special consideration given in grading general math students
_____Other (specify)

What basic text(s) are used in the general math classes?
    TITLE   AUTHOR   PUBLISHER   YEAR

1._____
2._____

In your opinion has any one text been entirely satisfactory in meeting the needs of the general math students? (Specify)

If you answered "no" to the above question, please specify what you think are the major shortcomings of the general math texts?

How does the flexibility of the general math course compare with that of the other math courses?
_____More flexible than others
_____Less flexible than others
_____Adheres closely to a prescribed curriculum
_____Adjusted to meet the needs of each individual class
_____Other (comment)

In your opinion has the method of enrolling and selecting general math students been entirely satisfactory? (Comments Please)

-40-

Check the resources that are utilized to aid in meeting the needs of the students enrolled in general math and indicate to what degree used.

RESOURCE	FREQUENTLY	OCCASIONALLY	SELDOM	NOT USED
Other reference texts				
Field trips				
Outside speakers				
Strip film or slides				
Movies				
Squared blackboards				
Spherical blackboard				
Bulletin Board materials				
Calculating machines				
Exhibit or display cases				
Models of solids etc.				
Time tables, budgets, etc.				
Compasses, protractors, etc.				
Other (specify)				

Check the major reason(s) why students other than ninth graders take general math.

_____ Failed general math before
_____ Failed algebra I
_____ Scheduling difficulty in ninth year
_____ Took algebra I in the ninth year
_____ Taken to meet graduation requirement not previously fulfilled
_____ Student chose to take general math other year than the ninth
_____ Other (specify)

How many NINTH year students now enrolled in general math are NOT ninth year students?

Approximately what percent of the original enrollment in general math ordinarily receive failing grades the first semester?   the second semester?   both semesters?

Are the better students usually encouraged to take algebra instead of general math?   (Comment)

What math courses must a student take in order to graduate?

Do you feel the general math course is primarily a terminal course for the student weak in math?   (Comment)

How many of the students now enrolled in general math are NOT ninth year students?

Which of the factors listed below are used to determine who takes general math and who takes algebra?

_____ I. Q.
_____ Reading Grade Placement
_____ Arithmetic Grade Placement
_____ Mental Age (M.A.)
_____ Students desire
_____ Student's accademic record
_____ Statement from previous teachers
_____ Algebra Aptitude Test
_____ Other (explain)

If tests such as the algebra aptitude test are used, please indicate which ones, and if possible give the scores which are generally used as criteria to aid in grouping the students into general math or algebra I.

NAME OF TEST USED   SCORES USED AS CRITERIA, IF ANY

1._____

2._____

Which person(s) generally aids the most in determining in what course the students enroll? (explain briefly if unusual)

_____ General math teacher
_____ Homeroom teacher
_____ Eight-grade teacher
_____ Ninth-grade teacher
_____ Counselor
_____ Principal
_____ Registrar
_____ Student's Advisor
_____ Student's parents
_____ A combination of some of these in conference (specify)
_____ Other (comment)

Indicate below the year in which each course is offered in the USUAL sequence. If not offered EACH year as regular course specify how often.

COURSE NAME	NOT BEING OFFERED AT PRESENT	IN WHAT YEAR DO STUDENTS USUALLY TAKE THIS COURSE?			
		9th	10th	11th	12th
Algebra I					
Algebra II					
Plane Geo.					
Solid Geo.					
Trig					
Gen. Math I					
Gen. Math II					
Business Math					
Shop Math					
Senior Math					
Others					

Indicate the combination of courses taught by teachers of general math classes and list any special duties they may have in addition; such as superintendent, principal, coach, etc.

TEACHER #1   TEACHER #2   TEACHER #3

Indicate the amount of training and experience each teacher of general math has had.

	TEACHER #1	TEACHER #2	TEACHER #3
Number of years of college preparation			
Degrees held if any			
Major field of study			
Total years of teaching experience			

(Name of Your School)   (Name and Title of Person
                                filling out this
                                    Questionnaire)

Check here if you feel a summary of this study would be of value to you in your work. _____