QUALIFICATIONS OF THE MATHEMATICS TEACHERS IN IOWA'S
SECONDARY SCHOOLS 1957-1958

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Master of Science in Education

by
Joseph M. Deines
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QUALIFICATIONS OF THE MATHEMATICS TEACHERS IN IOWA'S
SECONDARY SCHOOLS 1957-1958

by

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CHAPTER I

INTRODUCTION

There never has been a more revolutionary event in the history of education than the arrival of "Sputnik." Russian success in the sciences has made the American people more conscious of the quality of education than at any other time in the history of the country. While educators have long advocated a reappraisal of our entire educational system, it took the success of another nation in launching the first earth-satellite to foster attention on the question of quality of education.

Basic to the question of quality of education is the matter of qualification of teachers. While high standards of certification are desirable for all of our teachers, it is imperative in this scientific age that our public education system have adequately trained mathematics teachers.

I. THE PROBLEM

It was the purpose of this study to: (1) determine the qualifications of the present mathematics teachers of approved Iowa high schools as indicated by their college courses in mathematics, and (2) obtain the opinions of the mathematics teachers in regard to the number of semester hours of college courses desirable for the successful teaching of high school mathematics.
II. PROCEDURE

Data for this study were secured from replies to questionnaires sent to the superintendents of approved Iowa high schools. See Appendix A. The superintendents in turn had each member of their high school staff who was teaching a mathematics course complete and return one of these questionnaires. Replies were received from seventy-seven and seven-tenths per cent of the school districts in the state.

The data gathered from the replies to the questionnaires were carefully arranged and examined in order to find the relationships between: (1) the mathematics teaching assignment and major area of concentration in college, (2) high school enrollment and major area of concentration of the mathematics teacher, (3) high school enrollment and the average hours of preparation in mathematics, (4) mean hours of preparation required by all states for certification and the required hours of preparation in Iowa, and (5) average recommended semester hours of college mathematics preparation as reported by present mathematics teachers and the average semester hours of mathematics preparation of the Iowa high school mathematics teachers.

In order to show the possible relationship between the size of high school and the amount of teacher preparation in mathematics, the number of schools reported in this study were divided into eleven groups according to size of enrollment: (1) Group A, enrollment of 600 and above, (2) Group B, enrollment 500-599, (3) Group C, enrollment 400-499, (4) Group D, enrollment 300-399, (5) Group E, enrollment 200-299, (6) Group F, enrollment 150-199, (7) Group G, enrollment 100-149,
(8) Group H, enrollment 75-99, (9) Group I, enrollment 50-74, (10) Group J, enrollment 25-49, (11) Group K, enrollment of 24 and below as shown in Table I. This classification was consistent with classifications used in studies by the Iowa State Department of Public Instruction. Bulletins edited and published by the State Department of Public Instruction were used to obtain information as to the certification requirements for teachers in the state of Iowa.

III. DEFINITIONS OF TERMS USED

In order that the reader may understand the language and interpret the tables used in this study, certain terms have been defined as follows:

Mathematics teacher. Throughout this report the term "mathematics teacher" was interpreted to mean any person who taught one or more courses in mathematics.

Major area of concentration. The major area of concentration used in this study referred to the subject matter field designated as the college major.

High school. The high school as used in this study was interpreted as meaning grades nine, ten, eleven, and twelve.

Group A high school. Group A high schools were high schools with an enrollment of 600 or more pupils.

Group B high school. Group B high schools were high schools with an enrollment of 500-599 pupils.
<table>
<thead>
<tr>
<th>Group</th>
<th>High School Enrollment</th>
<th>Number of Districts</th>
<th>Per Cent</th>
<th>High School Enrollment</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>600-above</td>
<td>25</td>
<td>3</td>
<td>44,854</td>
<td>33</td>
</tr>
<tr>
<td>B</td>
<td>500-599</td>
<td>10</td>
<td>1</td>
<td>5,410</td>
<td>4</td>
</tr>
<tr>
<td>C</td>
<td>400-499</td>
<td>12</td>
<td>1</td>
<td>5,405</td>
<td>4</td>
</tr>
<tr>
<td>D</td>
<td>300-399</td>
<td>35</td>
<td>5</td>
<td>12,264</td>
<td>10</td>
</tr>
<tr>
<td>E</td>
<td>200-299</td>
<td>60</td>
<td>8</td>
<td>14,013</td>
<td>10</td>
</tr>
<tr>
<td>F</td>
<td>150-199</td>
<td>58</td>
<td>8</td>
<td>10,258</td>
<td>7</td>
</tr>
<tr>
<td>G</td>
<td>100-149</td>
<td>147</td>
<td>21</td>
<td>17,969</td>
<td>13</td>
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<tr>
<td>H</td>
<td>75-99</td>
<td>106</td>
<td>14</td>
<td>9,167</td>
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<tr>
<td>I</td>
<td>50-74</td>
<td>146</td>
<td>20</td>
<td>9,040</td>
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</tr>
<tr>
<td>J</td>
<td>25-49</td>
<td>135</td>
<td>18</td>
<td>5,175</td>
<td>4</td>
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<tr>
<td>K</td>
<td>1-24</td>
<td>11</td>
<td>1</td>
<td>216</td>
<td>1</td>
</tr>
</tbody>
</table>

Total 745 100 133,771 100

NOTE: This table should be read as follows: Group A schools consist of those having an enrollment of 600 and above. There are 25 districts this size, representing 3 per cent of the 745 approved districts in the state. A total of 44,854 students or 33 per cent of all the high school students in the state attend Group A schools.

**Group C high school.** Group C high schools were high schools with an enrollment of 400-499 pupils.

**Group D high school.** Group D high schools were high schools with an enrollment of 300-399 pupils.

**Group E high school.** Group E high schools were high schools with an enrollment of 200-299 pupils.

**Group F high school.** Group F high schools were high schools with an enrollment of 150-199 pupils.
Group G high school. Group G high schools were high schools with an enrollment of 100-149 pupils.

Group H high school. Group H high schools were high schools with an enrollment of 75-99 pupils.

Group I high school. Group I high schools were high schools with an enrollment of 50-74 pupils.

Group J high school. Group J high schools were high schools with an enrollment of 25-49 pupils.

Group K high school. Group K high schools were high schools with an enrollment of less than 25 pupils.

Hours. The term "hours" was used to refer to one semester hour of college credit.

IV. LIMITATIONS

There are many qualities of a good mathematics teacher. This study considered only the measurable qualities of the major area of preparation of the mathematics teacher and the semester hours of preparation in mathematics. Other qualities, although important to successful teaching, were eliminated due to the difficulty of measuring them.

A second limitation was that the teachers in only 77.7 per cent of the schools replied to the questionnaire. The number of mathematics teachers in these unreported schools is, therefore, unknown.
V. RELATED STUDIES

Two related studies had previously been made in the field of mathematics concerning qualifications of mathematics teachers of Iowa's secondary schools.

A study was made by Bryant\(^1\) in 1942 and he found the following information: Fifty-four per cent of the 953 teachers were reported in his study to have a major in mathematics. Twenty per cent of the mathematics teachers had a Master's degree. There was growing consensus that all secondary school teachers should have at least a Master's degree.

Bryant stated in the summarization of this study that it was safe to infer that the qualifications of Iowa high school mathematics teachers, although not as high as might be desired, were more satisfactory than could be expected considering the teaching conditions. At the time this study was made, qualified teachers were difficult to obtain due to the war.

Nielsen made a study of the mathematics instruction in Iowa high schools in 1955. In this study he also considered the qualifications of Iowa's high school mathematics teachers. The study included only sixty high schools and was conducted by interviewing 155 mathematics teachers in these schools.

The following conclusions were reached by Nielsen in regard to the mathematics teachers' qualifications as part of his study: (1) the preparation of Iowa's high school mathematics teachers appeared strong,

\(^1\)Don E. Bryant, "Qualifications of Mathematics Teachers in Iowa High Schools" (unpublished Master's thesis, Iowa State College, Ames, 1942).
(2) all the teachers of this study had Bachelor's degrees and over eighty per cent had some graduate credit, (3) more than one-third of them held Master's degrees in mathematics, and (4) nearly one-half of the teachers had a major in mathematics and one-third more had a minor in mathematics.¹

CHAPTER II

RECOMMENDATIONS AND REQUIREMENTS FOR COLLEGE TRAINING FOR TEACHERS OF HIGH SCHOOL MATHEMATICS, 1957-1958

I. INTRODUCTION

Publications of authorities in the field of teacher education were reviewed for recommendations regarding the training of mathematics teachers. More specifically, the general education requirements, the professional education requirements, and the specialized education requirements for teaching were examined. These requirements and recommendations were summarized in order that comparisons of the qualifications of the mathematics teachers of Iowa high schools could be made with them.

II. GENERAL EDUCATION REQUIREMENTS FOR MATHEMATICS TEACHERS

In no profession is liberal education more important than in the field of education. This fact is usually accepted today in teacher education circles. Even the proponents of the traditional school of thought of teacher education and the liberal arts school of thought are in full agreement on this fundamental point.

The need for a broad general education as a prerequisite for mathematics teachers has been stressed in reports by various mathematics organizations in the United States.

Gruhn and Douglas have expressed the general sentiment on the desirability of a broad cultural education as follows:
The junior high school teacher of today should be a person of broad interests and background. He not only should be well-prepared in the subjects he is to teach, but he also should be interested and well informed in economics, political and social problems, international affairs, literature, music, art, and the theater. The development of such broad cultural interests should be the first consideration in the preparation of the junior high school teacher.  

Although Gruhn and Douglass were discussing the need for a broad general education for the junior high school teachers, their views apply equally well to high school teachers.

A similar point of view regarding the necessity of teachers having a broad liberal arts background is proposed:

A teacher to be of maximum service to the community in which he lives, should be recognized as an educated man to whom adult members of the community may turn for consultation on intellectual matters. He should be able to participate in community activities and assume his share of leadership. Certainly he cannot function satisfactorily if he is notably ignorant in what are commonly regarded as fundamentals of general culture. With these facts in mind, we advocate a breadth of training for teachers of mathematics which will ensure a degree of familiarity with languages, literatures, fine arts, natural science and social science, as well as mathematics.  

A teacher who is an expert or a specialist in his own field, but who is not at the same time a widely educated person, is likely to stress his own academic subject at the expense of all others. Such a tendency, altogether too common today, is contrary to basic principles of secondary education.

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The solution lies in requiring a broad education for all teachers. A liberally educated teacher will see his specialty in a broader perspective. He will be a better teacher because of his ability to view it as merely one portion of knowledge.1

The Commission on Teacher Education in 1946 said:

At least three-eights of the total time of a four year program should be given to work designed primarily to promote the ends of general education. This should be a minimum of forty-five semester hours in general education for a teacher who has earned a college degree.2

III. PROFESSIONAL EDUCATION REQUIREMENTS FOR TEACHING

No other feature of teacher education is more controversial than the professional education requirements for teaching. Two major schools of thought have evolved on this issue.

The traditional school of thought, generally called the academic school, minimizes the value and importance of professional education courses and holds that the prospective teacher should concentrate his time in subject matter courses.3

The second school of thought is that of the professional educator. This school of thought places great emphasis upon the value of prospective teachers enrolling in courses dealing with the history of education, philosophy of education, methods of teaching, psychology of growth and

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1 Ibid., p. 11.


3 Woodring, op. cit., p. 17.
learning, and other professional education courses, that will enable the
prospective teacher to better prepare for teaching.1

These two schools of thought have led to differing conceptions of
the proper curriculum for teacher education. The controversy is as yet
unresolved. Gruhn and Douglas stated what may be considered the pre-
vailing view today as follows:

The professional preparation of the teachers today is considered
to be fully as important as training in the subject areas. The
teacher's professional study should include as a minimum, some
attention to each of the following: (1) philosophy of education,
(2) principles and problems of curricular development, (3) educa-
tional sociology, (4) psychology of growth and learning, including
a study of motivation and interest, individual differences, and
problems of pupil growth and development, (5) mental hygiene,
(6) the history, objectives, organization and curriculum of the
secondary schools of America, (7) the philosophy, organization,
and procedures for guidance and extra-class activities, and (8)
methods of teaching and of evaluating pupil growth in the high
school.2

In addition, the Iowa State Department of Public Instruction
established the minimum number of hours of professional education courses
required for certification of secondary school teachers:

Common professional preparation required of every applicant
for a certificate to teach in Iowa's secondary schools.

All teachers have certain problems which they face in common,
irrespective of the age level of the pupils who are under their
supervision. One-fourth to one-half of the credit hours required
in professional education should be common to both prospective
elementary and secondary-school teachers.

The problem of teaching and learning with which all teachers are
concerned include providing for individual differences among pupils,
developing critical thinking, and making learning experiences
meaningful to pupils; thus, 'general education' is an essential

1 Ibid., p. 364.
2 Gruhn and Douglas, op. cit., p. 364.
unifying thread in the professional as well as the academic preparation of teachers. Our areas which are common for all teachers whether elementary or secondary have been identified by the Iowa Commission on Teacher Education and Professional Standards. These areas with some modifications are: (1) psychology of childhood and youth; (2) the school, its organization and administration, its curriculum and its broader social goals; (3) the understanding of the psychology of teaching and learning; (4) study of the school in its community setting; and (5) audio-visual education.

Additional areas of concern to all teachers are numerous. For example, the teaching profession has an organization structure and a code of ethics. The teacher-education curriculum should provide adequate preparation for professional memberships and responsibilities.¹

On the national level, a study by Armstrong and Stinnett indicated that the median hours of professional courses for state certification was eighteen semester hours of the one hundred twenty usually required for a college degree.²

IV. SPECIALIZED EDUCATION REQUIREMENTS FOR TEACHING

The emphasis on a broad liberal education and the need for a minimum professional education background are not to be made at the expense of specialized education for mathematics teachers. The mathematics teacher must have a broad technical background in subject matter to facilitate his doing an effective job of teaching in the classroom. He must have a knowledge of his subject broad and deep enough to master the situations arising in the classroom. He must have an understanding of the history and development of mathematics so that high school students


may learn the subject more effectively and get a better idea of the
fundamental meaning and usefulness of mathematics in cultural and
technical life.

In the revision of certification requirements for secondary
teachers in Oklahoma, the following recommendations were made:

In order to give the prospective mathematics teacher this
broad and integrated training in his field it is recommended
that he have a knowledge of the material ordinarily included in
the equivalent of nine semester hours of algebra, three semester
hours of trigonometry, six semester hours of geometry, three
semester hours of mathematics of finance, and three semester
hours of electives from the history of mathematics, calculus
or mathematical statistics.\(^1\)

The exact statement for the mathematics teaching "to teach math-
ematics in grades seven through twelve" in Oklahoma public schools was
as follows:

A minimum of twenty-four semester hours of college credit
in mathematics. High school credit in intermediate algebra
and solid geometry may be counted, respectively, for three
semester hours and two semester hours in meeting this
requirement.\(^2\)

Armstrong and Stinnett also summarized state certification
requirements for subject matter courses. They found the median state
requirement in semester hours of mathematics to be eighteen. The
median state requirement in education is equalled by the subject matter
requirement in mathematics.\(^3\)

\(^1\)James K. Zant, "The Revision of Certification Requirement for
Secondary Mathematics Teachers in Oklahoma," The Mathematics Teacher,
XLVII, No. 7, National Council of Teachers of Mathematics, November,
1954, p. 471.

\(^2\)Ibid.

The Iowa State Department of Public Instruction gives the approved standards for teachers of mathematics in grades nine through twelve as follows:

Fifteen semester hours in the field of mathematics. One semester hour of credit given for advanced algebra, trigonometry, or solid geometry pursued in high school with a maximum of three semester hours.¹

V. SUMMARY

Requirements and recommendations of authorities in the field of teacher education concerning the general, professional, and specialized education requirements for teaching were examined in order that a comparison of the qualifications of the mathematics teachers of Iowa high schools could be made.

Authorities in the field of teacher education recommended that the high school teacher have a bachelor's degree from an institution approved for teacher education. The prospective teacher should have approximately forty-five semester hours of college work in the general education field.

The median number of semester hours of college work in professional education courses required by all the states was eighteen. The median state requirements for the academic field of mathematics was eighteen semester hours.

The state of Iowa required fifteen semester hours of college mathematics for its mathematics teachers, plus a total of twenty semester hours of credit in professional education courses.

CHAPTER III

QUALIFICATIONS OF MATHEMATICS TEACHERS IN IOWA

HIGH SCHOOLS, 1957-1958

The purpose in this chapter was to determine the opinions of the mathematics teachers of Iowa as to the subject matter preparation necessary for successful teaching of mathematics. An additional purpose was to determine the qualifications of the mathematics teachers of Iowa high schools in terms of the opinions of the mathematics teachers, recommendations and requirements of competent authorities in the field of teacher education, and certification requirements for teaching in the state of Iowa.

The 984 mathematics teachers who returned the questionnaire were divided into eleven groups according to size of high school enrollment. Group A high schools had an enrollment of 800 and above; Group B schools had an enrollment of 500-599; Group C high schools had an enrollment of 400-499; Group D had an enrollment between 300 and 399; Group E schools had between 200 and 299 pupils; Group F were schools between 150 and 199; Group G had an enrollment between 100 and 149; Group H schools had 75 to 99 students; Group I had between 50 and 74 pupils; Group J had an enrollment of 25 to 49; Group K had 24 or less.

I. COLLEGE HOURS OF MATHEMATICS DEEMED ESSENTIAL BY HIGH SCHOOL MATHEMATICS TEACHERS, 1957-1958

Mathematics teachers' responses to the question of what they regarded as the total number of semester hours of mathematics preparation
are shown in Table II.

The average of the semester hours of subject matter preparation recommended by the 864 mathematics teachers who responded to the questionnaire was twenty-seven. This recommended average was twelve semester hours more than the state certification requirement of fifteen semester hours of mathematics preparation. Another fact brought out by the replies to this question was that there was little appreciable difference in the recommended semester hours of subject matter preparation among the mathematics teachers irrespective of school size. The highest average, thirty semester hours, was recommended by the teachers in Group B schools with enrollments of 500 to 599 students. The teachers in Group H schools, enrollment of 75 to 99, reported the lowest average recommendation—twenty-four semester hours.

One hundred twenty-two mathematics teachers did not express opinions on the question of teacher preparation in subject matter. Failure to comment may be viewed as an example of the uncertainty that exists in the minds of some mathematics teachers as to the amount of subject matter preparation necessary for successful teaching of the subject. Many of these teachers gave explanations for not making a statement. Listed below are a few of these explanations:

I find it hard to evaluate necessary college hours. However, for teaching purposes, the advanced courses do not seem very helpful. Methods of teaching, procedures, techniques, etc. would be more helpful.

It varies with the person. Some can't add up their class register without making a major project out of it.

I feel unqualified to indicate this. In addition to more semester hours, a real teacher must possess the ability to make her pupils understand mathematics.
### Table II

**College Hours of Mathematics Deemed Essential by High School Mathematics Teachers, 1957-1958**

<table>
<thead>
<tr>
<th>School Size by Enrollment</th>
<th>Number of Teachers</th>
<th>Average Number of Hours of Mathematics Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reported</td>
<td>Not Expressing an Opinion</td>
</tr>
<tr>
<td></td>
<td>Expressing an Opinion</td>
<td></td>
</tr>
<tr>
<td>Group A - 600-above</td>
<td>203</td>
<td>177</td>
</tr>
<tr>
<td>Group B - 500-599</td>
<td>24</td>
<td>22</td>
</tr>
<tr>
<td>Group C - 400-499</td>
<td>27</td>
<td>24</td>
</tr>
<tr>
<td>Group D - 300-399</td>
<td>75</td>
<td>70</td>
</tr>
<tr>
<td>Group E - 200-299</td>
<td>80</td>
<td>71</td>
</tr>
<tr>
<td>Group F - 150-199</td>
<td>72</td>
<td>66</td>
</tr>
<tr>
<td>Group G - 100-149</td>
<td>154</td>
<td>143</td>
</tr>
<tr>
<td>Group H - 75-99</td>
<td>103</td>
<td>87</td>
</tr>
<tr>
<td>Group I - 50-74</td>
<td>123</td>
<td>101</td>
</tr>
<tr>
<td>Group J - 25-49</td>
<td>116</td>
<td>97</td>
</tr>
<tr>
<td>Group K - 1-24</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>984</td>
<td>862</td>
</tr>
</tbody>
</table>

**Note:** This table should be read as follows: One hundred seventy-seven of the 203 teachers reported from Group A schools expressed an opinion. The average number of hours recommended was 27 semester hours.
So much depends upon the individual. Can it be measured entirely by the number of hours?

I do not know.¹

One teacher with two semester hours of mathematics preparation stated that he did not know, but he was sure that he did not have enough.²

II. IOWA HIGH SCHOOL MATHEMATICS TEACHERS WITH FEWER THAN AND MORE THAN FIFTEEN SEMESTER HOURS OF MATHEMATICS PREPARATION, 1957-1958

The number and percentage of mathematics teachers above and below fifteen semester hours of mathematics preparation is shown in Table III.

Eighty-four per cent of the 984 teachers included in this study had the fifteen or more semester hours of mathematics preparation required for certification by the State Department of Public Instruction. The remaining 16 per cent failed to meet this minimum requirement. A greater percentage of the mathematics teachers in the state's larger high schools were qualified than in the smaller high schools. More than five out of six of the mathematics teachers in school Groups A, B, C, D, E, F, and G were qualified with fifteen or more semester hours, whereas the ratio dropped sharply to approximately three out of four in each of the next three groups of schools, Groups H, I, and J. In Group K, the smallest high schools in the state, having high school enrollments of twenty-four or fewer pupils, only 57 per cent of the teachers reported that they had as many as fifteen semester hours of mathematics preparation. Ninety-nine

¹Explanations received by the writer from questionnaires.

²Ibid.
TABLE III

IOWA HIGH SCHOOL MATHEMATICS TEACHERS ABOVE AND BELOW MINIMUM REQUIREMENTS FOR CERTIFICATION, FIFTEEN SEMESTER HOURS OF MATHEMATICS, 1957-1958

<table>
<thead>
<tr>
<th>Size by Enrollment Group</th>
<th>Teachers with 15 or More Semester Hours of Mathematics</th>
<th>Teachers with 15 or Fewer Semester Hours of Mathematics</th>
<th>Total Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Per Cent</td>
<td>Number</td>
</tr>
<tr>
<td>A - 600-above</td>
<td>175</td>
<td>87</td>
<td>28</td>
</tr>
<tr>
<td>B - 500-599</td>
<td>24</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>C - 400-499</td>
<td>25</td>
<td>93</td>
<td>2</td>
</tr>
<tr>
<td>D - 300-399</td>
<td>71</td>
<td>95</td>
<td>4</td>
</tr>
<tr>
<td>E - 200-299</td>
<td>68</td>
<td>85</td>
<td>12</td>
</tr>
<tr>
<td>F - 150-199</td>
<td>64</td>
<td>89</td>
<td>8</td>
</tr>
<tr>
<td>G - 100-149</td>
<td>140</td>
<td>91</td>
<td>14</td>
</tr>
<tr>
<td>H - 75-99</td>
<td>79</td>
<td>77</td>
<td>24</td>
</tr>
<tr>
<td>I - 50-74</td>
<td>93</td>
<td>76</td>
<td>30</td>
</tr>
<tr>
<td>J - 25-49</td>
<td>84</td>
<td>72</td>
<td>32</td>
</tr>
<tr>
<td>K - 1-24</td>
<td>4</td>
<td>57</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>937</td>
<td>84</td>
<td>167</td>
</tr>
</tbody>
</table>

NOTE: This table should be read as follows: One hundred seventy-five or 87 per cent of the 203 mathematics teachers of Group A were qualified to teach mathematics in Iowa high schools. Twenty-eight, or 13 per cent, were not qualified.
of the 157 teachers of high school mathematics with fewer than fifteen semester hours of college mathematics preparation were teaching in high schools with enrollments of fewer than one hundred. The lower percentage of qualified teachers in the four smallest groups of schools provided for only 19 per cent of public high school students in the state.

Contrary to the belief that schools with the highest enrollment are staffed with the largest percentage of qualified personnel, Group A schools had 13 per cent of its mathematics teachers below certification requirements of fifteen semester hours or more of mathematics preparation. The classification that reported 100 per cent of the teachers with fifteen or more semester hours of college mathematics preparation was Group B, schools with an enrollment of 500 to 599.

III. AVERAGE SEMESTER HOURS OF MATHEMATICS PREPARATION OF HIGH SCHOOL MATHEMATICS TEACHERS, 1957-1958

The average semester hours of preparation in mathematics of the 984 Iowa mathematics teachers reported in this study is shown in Table IV.

The average semester hours of preparation of all 984 teachers was twenty-four. This was only three semester hours, or the equivalent of a one semester mathematics course, below the recommended average, twenty-seven semester hours of mathematics preparation, advocated by the teachers in the responses to the questionnaires. This average of twenty-four semester hours was well above the fifteen semester hours minimum required of all secondary mathematics teachers by the State Department of Public Instruction.
TABLE IV

AVERAGE SEMESTER HOURS OF MATHEMATICS PREPARATION OF
HIGH SCHOOL MATHEMATICS TEACHERS, 1957-1958

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of Teachers Reported</th>
<th>Average Semester Hours of Preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>203</td>
<td>36</td>
</tr>
<tr>
<td>B</td>
<td>24</td>
<td>32</td>
</tr>
<tr>
<td>C</td>
<td>27</td>
<td>26</td>
</tr>
<tr>
<td>D</td>
<td>75</td>
<td>28</td>
</tr>
<tr>
<td>E</td>
<td>80</td>
<td>24</td>
</tr>
<tr>
<td>F</td>
<td>72</td>
<td>24</td>
</tr>
<tr>
<td>G</td>
<td>154</td>
<td>23</td>
</tr>
<tr>
<td>H</td>
<td>103</td>
<td>20</td>
</tr>
<tr>
<td>I</td>
<td>123</td>
<td>22</td>
</tr>
<tr>
<td>J</td>
<td>116</td>
<td>20</td>
</tr>
<tr>
<td>K</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>964</td>
<td>24</td>
</tr>
</tbody>
</table>

NOTE: This table should be read as follows: The average semester hours of subject matter preparation of the 203 mathematics teachers of Group A schools was thirty-six.
Mathematics teachers of the state's largest high schools, those of Group A, reported the highest average semester hours of preparation. The 203 teachers of Group A schools averaged thirty-six semester hours of mathematics preparation. Conversely, the mathematics teachers of the state's smallest high schools, those of Group K, averaged only thirteen semester hours of preparation. In general, between these two extremes, the average semester hours of preparation increased as the size of high school enrollment increased.

IV. COLLEGE MAJORS

The college majors of the 984 teachers of mathematics included in this report are shown in Table V. Forty-two per cent of the 984 mathematics teachers of this study reported that they had college majors in mathematics. Twenty-four per cent had majors in science. No major was indicated on 3 per cent of the questionnaires returned. The remaining 31 per cent of the mathematics teachers had majors in the fields of English, 4 per cent; physical education, 11 per cent; business, 5 per cent; social studies, 7 per cent; junior high education, 1 per cent; industrial arts, 3 per cent; foreign languages, less than 1 per cent; and music, less than 1 per cent. More than half of the mathematics teachers showed their major interest in other fields than mathematics.

More than 50 per cent of the mathematics teachers of only three groups, Groups B, C, and D, reported majors in mathematics. Only 14 per cent of the seven mathematics teachers of Group K had majors in mathematics in college.


<table>
<thead>
<tr>
<th>Group</th>
<th>Mathematics</th>
<th>Science</th>
<th>English</th>
<th>Physical Education</th>
<th>Business</th>
<th>Social Studies</th>
<th>Junior High Education</th>
<th>Industrial Arts</th>
<th>Foreign Language</th>
<th>Music</th>
<th>No Stated Major</th>
<th>Number of Teachers Reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>48</td>
<td>20</td>
<td>4</td>
<td>10</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>203</td>
</tr>
<tr>
<td>B</td>
<td>66</td>
<td>25</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>C</td>
<td>51</td>
<td>19</td>
<td>4</td>
<td>11</td>
<td>11</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>D</td>
<td>61</td>
<td>13</td>
<td>1</td>
<td>15</td>
<td>3</td>
<td>3</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>76</td>
</tr>
<tr>
<td>E</td>
<td>47</td>
<td>25</td>
<td>10</td>
<td>11</td>
<td>5</td>
<td>9</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>F</td>
<td>47</td>
<td>25</td>
<td>10</td>
<td>12</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>72</td>
</tr>
<tr>
<td>G</td>
<td>42</td>
<td>25</td>
<td>3</td>
<td>15</td>
<td>3</td>
<td>6</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>154</td>
</tr>
<tr>
<td>H</td>
<td>34</td>
<td>32</td>
<td>1</td>
<td>8</td>
<td>5</td>
<td>7</td>
<td></td>
<td>4</td>
<td>2</td>
<td>8</td>
<td></td>
<td>103</td>
</tr>
<tr>
<td>I</td>
<td>33</td>
<td>26</td>
<td>5</td>
<td>13</td>
<td>7</td>
<td>7</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td>123</td>
</tr>
<tr>
<td>J</td>
<td>26</td>
<td>24</td>
<td>4</td>
<td>9</td>
<td>9</td>
<td>11</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>116</td>
</tr>
<tr>
<td>K</td>
<td>14</td>
<td>43</td>
<td>29</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>

All Teachers 42 24 4 11 5 7 1 3 * * 3 984

*Indicates less than 1 per cent.

NOTE: This table should be read as follows: Forty-eight per cent of the 203 mathematics teachers of Group A schools had a college major in mathematics, 20 per cent majored in science.
Two-thirds of the teachers of Group B, who all had fifteen or more semester hours of college mathematics preparation, reported a major in mathematics.

The mathematics teachers of the larger high schools reported a greater percentage with mathematics majors than the teachers of mathematics in the state's smaller high schools.

V. SUMMARY

Mathematics teachers of Iowa high schools made an average recommendation for twenty-seven semester hours of subject matter preparation, well in excess of the minimum requirement of fifteen semester hours for certification as set forth by the Iowa State Department of Public Instruction. Irrespective of the size of high school in which they were teaching, approximately twenty-seven hours of subject matter preparation in mathematics was the average recommended essential for successful classroom teaching. This figure of twenty-seven semester hours of college mathematics is twelve semester hours or approximately four semester courses in mathematics more than the fifteen semester hours required by the Iowa State Department of Public Instruction.

More than four out of five, or 84 per cent, of the 984 mathematics teachers reported in this study met the minimum of fifteen hours of preparation in mathematics required by the Iowa State Department of Public Instruction for certification to teach mathematics in Iowa secondary schools. A greater percentage of the mathematics teachers in the state's larger high schools were qualified than in the smaller high schools.
The average semester hours of preparation of all 984 teachers was twenty-four. Mathematics teachers in the state's largest high school, those of 600 pupils and above, reported the highest average semester hours of preparation. In contrast, the mathematics teachers of the state's smallest high schools, those of Group K, had the lowest average semester hours of subject matter preparation.

Only 42 per cent of the 984 mathematics teachers included in this report had college majors in mathematics. Twenty-four per cent of the mathematics teachers had college majors in science. Three per cent of the teachers did not state a college major. The remaining 31 per cent of the teachers who reported had college majors in the fields of English, physical education, business, social studies, junior high education, industrial arts, foreign language, and music.
CHAPTER IV

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This study was concerned with the qualifications of Iowa high school mathematics teachers for the 1957-1958 school year.

Nine hundred eighty-four mathematics teachers responded to a questionnaire sent to all of the 745 approved high school districts in the state. The following information was secured: (1) the mathematics teacher's opinion as to the total number of semester hours of subject matter preparation in mathematics deemed essential for successful classroom teaching; (2) the number of mathematics teachers in the state who met the minimum semester hours of college preparation required for certification; and (3) the college majors of Iowa high school mathematics teachers.

The 745 approved high school districts in the state were divided into eleven groups according to size of school enrollment: (1) Group A enrollment of 600 and above; (2) Group B enrollment of 500 to 599; (3) Group C enrollment of 400 to 499; (4) Group D enrollment of 300 to 399; (5) Group E enrollment of 200 to 299; (6) Group F enrollment of 150 to 199; (7) Group G enrollment of 100-149; (8) Group H enrollment of 75 to 99; (9) Group I enrollment of 50 to 74; (10) Group J enrollment of 25 to 49; (11) Group K enrollment of 24 and less. This grouping enabled comparisons to be made between the qualifications of the mathematics teachers and the size of the high school.
I. SUMMARY

Twenty-seven semester hours of college mathematics preparation was the average of the recommendations of the mathematics teachers of Iowa high schools, which was twelve semester hours more than the requirements for certification as set forth by the Iowa State Department of Public Instruction.

More than four out of five, or 84 per cent of the 984 teachers reported in this study, met the minimum of fifteen semester hours of specialized mathematics preparation required by the State Department of Public Instruction for certification to teach mathematics in Iowa's secondary schools. A greater percentage of the mathematics teachers in the state's larger high schools were qualified than in the smaller high schools.

The average semester hours of mathematics preparation of all 984 teachers of mathematics was twenty-four. This figure was nine semester hours greater than the fifteen semester hours required by the State Department, and only three semester hours fewer than the twenty-seven semester hours average recommendation made by the teachers who responded to the questionnaire.

Forty-two per cent of the 984 mathematics teachers included in this report had a college major in mathematics. Another 24 per cent had college majors in science. The remaining teachers of mathematics, approximately 34 per cent, had college majors distributed among the following: English, physical education, business, social studies,
junior high education, industrial arts, foreign language, music; 3 percent of the teachers did not designate a major.

II. CONCLUSIONS

After a careful analysis of the information obtained in this study, the following conclusions concerning the preparation of Iowa high school mathematics teachers seem justified:

1. Mathematics teachers in the state believe that the minimum semester hours of subject matter preparation required for certification should be greater than at present.

2. In terms of the present certification requirements of fifteen semester hours of mathematics, teachers of Iowa high schools are qualified.

3. In relation to the recommendations of authorities in teacher education as to teacher preparation, Iowa high school mathematics teachers appear to be well qualified.

4. Schools with less than one hundred high school students apparently cannot compete with larger high schools for the well-qualified mathematics teachers.

III. RECOMMENDATIONS

On the basis of the conclusions reached, the following recommendations are submitted:

1. Certification requirements for Iowa high school mathematics teachers should include more than a minimum of fifteen semester hours of mathematics.
2. Teacher training institutions should continue to insist upon their graduates having a broad general and professional background.

3. High schools with fewer than one hundred students should be reorganized into larger schools in order to make more adequate mathematics programs feasible.
BIBLIOGRAPHY

A. BOOKS


B. PUBLICATIONS OF THE GOVERNMENT, LEARNED SOCIETIES, AND OTHER ORGANIZATIONS


C. PERIODICALS


D. UNPUBLISHED MATERIALS


APPENDIX
QUESTIONNAIRE
Survey of Mathematics Teachers of Iowa

1. Name of mathematics teacher ________________________________

2. Name of high school ________________________________

3. Total years of teaching experience ________________________________

4. Type of teaching certificate ________________________________

5. Teaching assignment (Please indicate the number of classes of each mathematics course taught during the 1957-1958 school year)

<table>
<thead>
<tr>
<th>Number of Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Math</td>
</tr>
<tr>
<td>Algebra I</td>
</tr>
<tr>
<td>Algebra II</td>
</tr>
<tr>
<td>Plane Geometry</td>
</tr>
<tr>
<td>Solid Geometry</td>
</tr>
<tr>
<td>Advanced Algebra</td>
</tr>
<tr>
<td>Trigonometry</td>
</tr>
<tr>
<td>College Algebra</td>
</tr>
<tr>
<td>Business Math</td>
</tr>
<tr>
<td>Consumer Math</td>
</tr>
<tr>
<td>(other)</td>
</tr>
</tbody>
</table>

6. College Major (undergraduate) ________________________________

7. Major in Graduate College ________________________________

8. Mathematics courses taken in college (Please indicate the number of semester hours credit you have in each of the following college mathematics courses)

<table>
<thead>
<tr>
<th>Number of Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Math</td>
</tr>
<tr>
<td>College Algebra</td>
</tr>
</tbody>
</table>
9. Please indicate the number of semester hours in each subject which you think the high school teachers should take in college to prepare themselves adequately for their future job of teaching.
Dear Administrator:

Joseph Deines, who is a candidate for the Master of Science degree in Education at Drake University, in cooperation with the State Department of Public Instruction is conducting a survey of the qualifications of Iowa High School Mathematics Teachers for the 1957-1958 school year.

Since the success of the survey depends upon your cooperation, will you kindly have your High School (9-12) Mathematics Teachers complete the enclosed questionnaire and return it at your earliest convenience? A stamped self-addressed envelope is provided for this purpose.

It is realized that you and your teachers are extremely busy with your duties, but the questionnaire is so designed that it will only take a few minutes of your time to complete. We assure you that persons or schools participating in this study will not be identified in the final results.

Your cooperation in this study is appreciated.

Sincerely yours,

/s/ Arthur Carpenter
ARThUR CARPENTER
Assistant Superintendent -- Instruction