

THE UNIVERSITY OF MANITOBA

AN ANALYSIS OF RESULTS OF STANDARDIZED
PSYCHOLOGICAL AND ACHIEVEMENT TESTS OF
THE NINTH AND TENTH GRADE MANITOBA PUPILS
FOR THE YEARS 1947, 1948 AND 1949

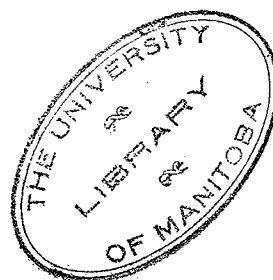
BEING A THESIS SUBMITTED TO THE COMMITTEE
ON POST-GRADUATE STUDIES IN PARTIAL
FULFILMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF
EDUCATION

BY

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CHAPTER 1

SECONDARY SCHOOL ORGANIZATIONS IN MANITOBA

The pupils in the Province of Manitoba receive their high school education in various types of schools: Collegiate Institutes, Collegiate Departments, Two-Room High Schools, One-Room High Schools, Continuation Schools and Junior High Schools. Collegiate Institutes are organized in many parts of Manitoba. This type of school employs four teachers or more who hold university degrees and may teach Grades IX to XI or Grades IX to XII. Collegiate Departments are similar to Collegiate Institutes except that in the former three teachers may be employed to teach Grades IX to XI or Grades IX to XII. Next in order comes the Two-Room High Schools where two teachers are employed to teach three or four Grades, IX to XI or XII and the principal is required to be a university graduate and hold a principal's certificate for a Two-Room High School or higher. The assistant must hold at least a First Class A certificate. In the One-Room, High Grades IX to XI may be taught and the teacher in charge must hold at least a First Class B certificate and a principal's certificate for a One-Room High School. In addition to these types, Continuation High Schools may be found in many rural points where Grades VII to XI may be taught in the same room and the teacher qualifications are the same as those for a One-Room High School. Where the enrollment in a One-Room rural school is low and the

teacher has the necessary qualifications, instruction in Grade IX work may be given. Pupils in remote parts of the Province and in areas where they are unable to receive regular classroom instruction, may receive their education in Grade IX and X subjects under the direction of the Correspondence Branch of the Department of Education. Another type of school organization found in the city and a few small town systems is the Junior High School. In this type Grades VII, VIII and IX are taught and the school is recognized as a Junior High School when there are at least three teachers or more employed for the teaching of these Grades.¹

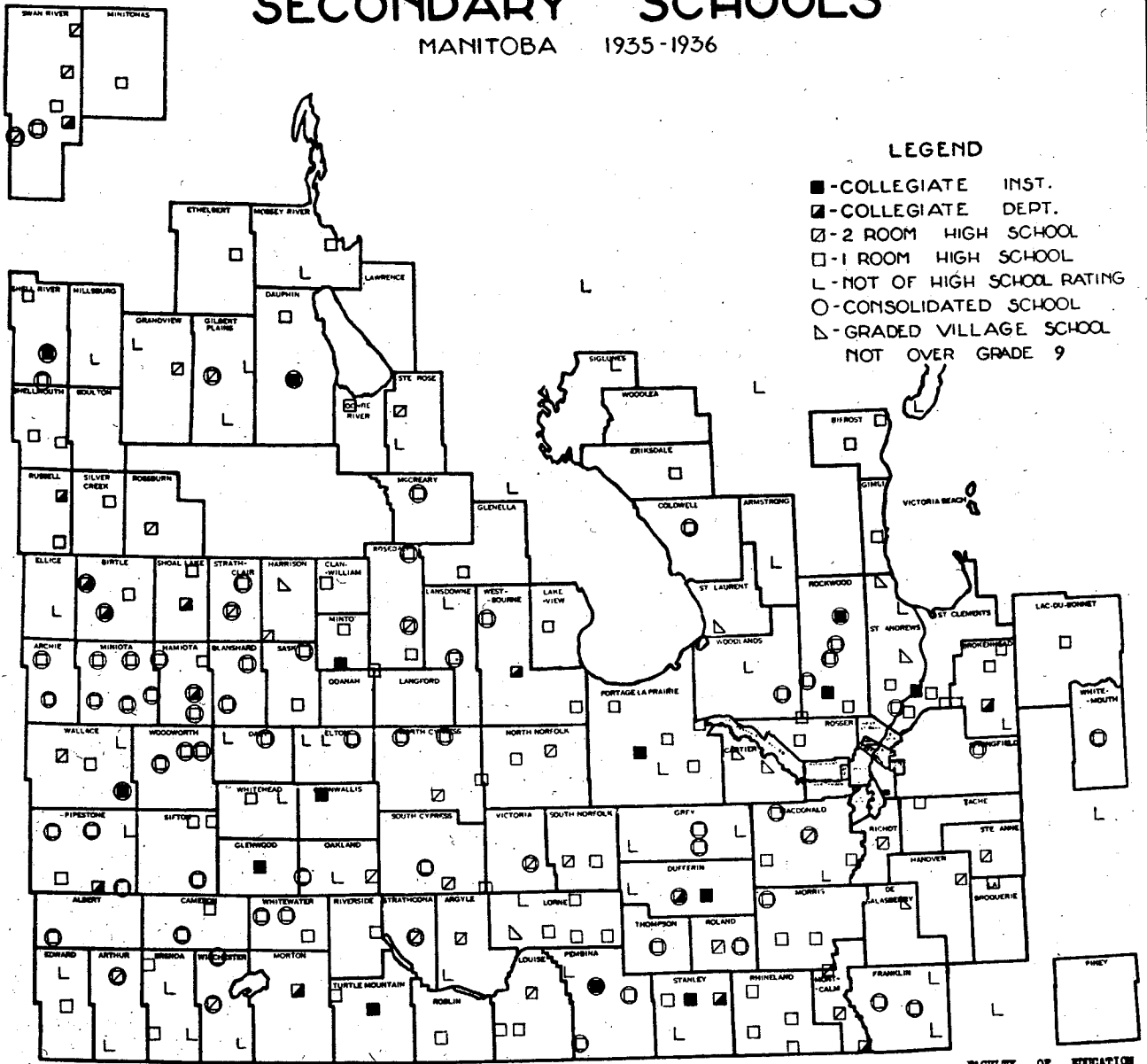
Throughout rural and urban Manitoba all schools are organized as continuous schools having all grades under the direction of one elected board of trustees for each school district. In rural and smaller urban centres elementary and secondary education are provided within the one school building. Only in the larger rural towns or cities is secondary education provided in separate buildings and under separate staff instruction. More important is the fact that complete departmentalization is possible in the collegiate institute and to a lesser degree in the collegiate departments and two-room high schools. Collegiate Institutes and Collegiate Departments only are required to employ a staff each member of which holds a university degree. Under these conditions it

¹ Regulations, Manitoba Department of Education, 1949 p.5

has been difficult to insure a reasonably uniform measure of instruction or to rely upon local estimates of pupil fitness for entrance to or promotion within the secondary school. This practical difficulty has been the implied justification for a provincial system of centrally administered secondary school examinations and has been a much debated problem for years.

Additional factors have complicated the problem of maintaining school standards. There are racial groups in whose homes a language other than English is spoken. There exists a wide variation in economic ability measured in terms of sub-marginal to wealthy land, the former frequently occupied by non-Anglo-Saxon peoples. Coupled with both is the educational perspective or ambition of the individual school district. The problem of variation in ability and effort is indicated roughly in Figures 1 and 2. Figure 1 is a map showing the distribution of all types of secondary schools in the Province and Figure 2 a map indicating the distribution of wealth in relation to the assessment per teacher in each municipality of the Province.

SECONDARY SCHOOLS MANITOBA 1935-1936



- LEGEND**
- - COLLEGIATE INST.
 - ▨ - COLLEGIATE DEPT.
 - ▬ - 2 ROOM HIGH SCHOOL
 - - 1 ROOM HIGH SCHOOL
 - L - NOT OF HIGH SCHOOL RATING
 - - CONSOLIDATED SCHOOL
 - ▴ - GRADED VILLAGE SCHOOL NOT OVER GRADE 9

DIAGRAM NO. 21 #

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Figure 1.

Woods, D.S., Education in Manitoba, Part 1, Preliminary Report. Published by Economic Survey Board, Province of Manitoba, February, 1938.

SCHOOL DISTRICT ASSESSMENT

RANGE IN ASSESSMENT PER CENSUS PUPIL (5-19 YRS)
MANITOBA 1936

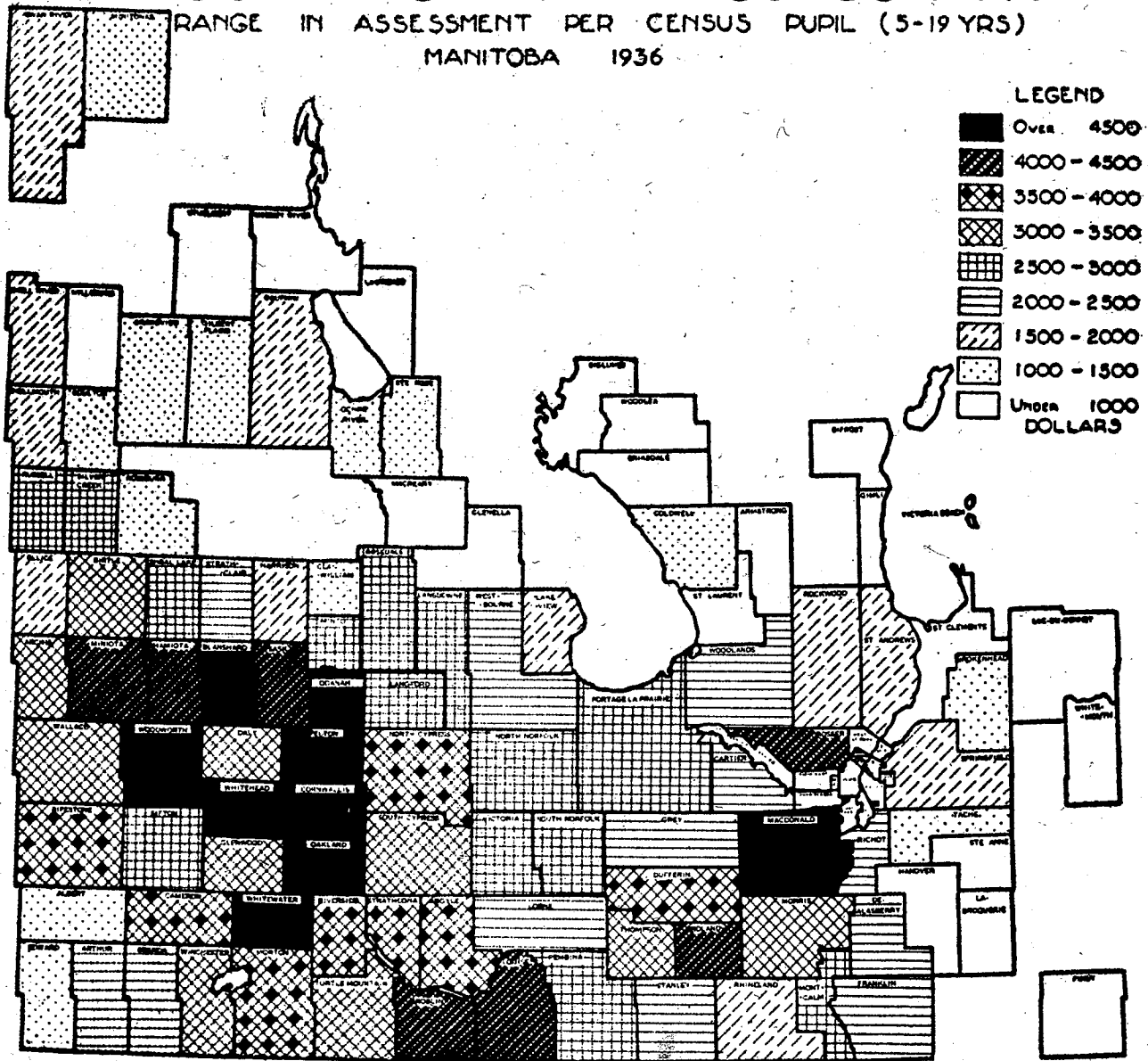


CHART NO. 16

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Figure 2.
Costs, Dates, Education in Manitoba, Part II,
Preliminary Report, Published by Economic Survey Board,
Province of Manitoba, February, 1938.

Provincial Examinations for Grade IX and X
During the Years 1947, 1948, and 1949

The practice of centrally supervised examinations for Grades IX and X was discontinued in Manitoba in the year 1932 and replaced by Inspectors' examinations. It is generally admitted that the latter did not provide a uniform standard of selection for entrance to the high school nor of progress during the first year. This could not be regarded as a serious matter were the quality and conditions of instruction generally acceptable and somewhat permanent in character. However, the situation in this regard became aggravated by the shortage of qualified teachers at this level over a considerable period of years leaving the schools in rural areas under frequent change in instruction and without any over-all provision for standardization at the point of admission to high school. As a measure of correction to this situation, psychological examinations, and standardized achievement tests were introduced in 1947 and continued in 1948 and 1949. The limitations of this testing programme will be examined later in this chapter.

Purpose of the Study

This thesis purports to estimate (1) existing variations in achievement as revealed by this testing programme, (2) the adequacy of the present testing programme as a means of portraying the variations in ability and effort of pupils upon entrance to and during the first year of high school in the village and town school districts of the Province. It

assumes that success in achievement applies only to the "General Curriculum" now the privilege of every secondary school whether or not individual schools are equipped to take full advantage of its "required" or "elective" subjects of study.

Administration and Marking of Tests

All tests used in this study were selected by a committee of School Inspectors in the Province. The Department of Education forwarded the tests to schools where pupils were enrolled in Grade IX and X classes. These tests were administered in mid-June of each year in accordance with the timetable provided by the Registrar's Office. All Grade IX test papers were returned to the Department of Education for marking. This procedure was followed with respect to the Grade IX tests in each of the three years. In 1949, however, standardized tests were arranged for the Grade X pupils, and these tests were administered and marked by the teachers and then the test papers were returned to the Department of Education for checking.

To insure uniformity of marking Grade IX tests, a committee of school teachers was appointed to work under the chairmanship of an Inspector of Schools. Test scores were recorded for each pupil on the Score Sheets provided by the Department of Education. On these Score Sheets also appeared letter grades given each pupil by the teachers on the years work as well as the age of the pupil in years and months in June of the year when the tests were written. The Score Sheets

and the marked test papers were grouped by the Inspectoral Divisions, and the type of school: Collegiate, Two-Room High, One-Room High, Junior High, rural and private were marked on each Score Sheet. The Correspondence Branch Score Sheets were grouped as one unit.

Types of Tests Used

In 1947, 1948, and 1949 the Department of Education administered three standardized tests to the Grade 1X pupils in the Province and in 1949 three standardized tests to the Grade X pupils. The following tests were used.

Henmon-Nelson Test of Mental Ability, Form: B, Grade 1X, 1947 and Form: C, Grade 1X, 1948.

Otis Self-Administering Test of Mental Ability. Intermediate Examination, Form: A, Grade 1X and X, 1949.

English Minimum Essentials by J. C. Tressler, Form: A, Grade 1X, 1947 and Form: C, Grade 1X, 1948.

Dominion Arithmetic Test (Fundamental Operations) Form: A, Grade 1X, 1947 and Form: B, Grade 1X, 1948.

Test of Mathematical Fundamentals by H. R. Beattie, Grades 1X and X, 1949.

Haggerty Reading Examination Sigma 3: Form A, Grade 1X, 1949.

American Council of Education Co-operative English Test.. Test C1: Reading Comprehension, Form: S, Grade X, 1949.

Further important details pertaining to these tests are indicated in Table 1.

TABLE 1

SUMMARY OF INFORMATION ON TESTS USED IN THE STUDY

Test	Working Time	Possible Score	Information as to Reliability
Henmon-Nelson Test of Mental Ability Forms: B and C.	30 min.	90	Coefficient of Reliability, Grade IX, .893
Otis Self-Administering Test of Mental Ability Intermediate Examination, Form: A	30 min.	75	Average $r = .948$
Dominion Arithmetic Test, Forms: A and B	35 min.	80	Grade VIII, $r = .97$
Tressler Minimum English Essentials Test, Forms: A and C	47 min.	90	not given
Beattie Test of Mathematical Fundamentals	25 min.	60	not given
Haggerty Reading Examination: Sigma 3	30 min.		Correlation on two trials .885
Co-operative English Test: Reading Comprehension, Form: S	40 min.	150	

The Henmon-Nelson Test of Mental Ability is available in three forms: A, B, and C. It is designed for Grades VII to XII. The Clapp-Young Self Marking system is employed. This Test consists of eighty multiple choice questions and one manual; the same norms are used for all three forms. The manual provides tables for converting raw scores into corresponding I.Q.'s and Mental Ages.

The Tressler English Test is so designed that a single score may be obtained on the whole test to show achievement in English. If used for diagnostic purposes, medians are provided for each of the seven independent tests as indicated in Table 11.

TABLE 11
 INFORMATION ON THE INDEPENDENT TESTS OF THE
 TRESSLER MINIMUM ENGLISH ESSENTIALS TEST

Independent tests	Number of questions	Scoring	Medians end of Gr.IX.
1. Grammatical Correctness	20	right minus wrong	7.6
2. Vocabulary	15	No. right	6.8
3. Punctuation and Capitalization	10	"	5.4
4. Sentence and Its Parts	10	"	4.4
5. Sentence Sense	10	"	7.6
6. Inflection and Accent	10	"	4.5
7. Spelling	15	"	8.6

The published norms for the whole Tressler English Test at the end of the ninth year are as follows: 25th. percentile, 36.1, median, 44.6 and 75th. percentile, 54.1. These norms were established in the American schools and designed for all three forms of the test.

The Dominion Arithmetic Test is constructed and published in Canada, and has as its objective to test the knowledge

of the fundamental operations in arithmetic. The manual provided for the test describes it as an achievement type, but also states that it has useful diagnostic possibilities. This test is made up of six component parts as indicated in Table 111.

TABLE 111
COMPONENT PARTS OF THE DOMINION ARITHMETIC TEST

Part	Score	Content
1. Four Primary Operations	20	(Addition, Subtraction, Multiplication and Division, five of each)
2. Weights and Measures	10	(Addition and Subtraction)
3. Fractions A	10	(Addition and Subtraction)
Fractions B	10	(Multiplication and Division)
4. Decimals A	5	(Addition and Subtraction)
Decimals B	5	(Multiplication and Division)
5. Percentage	10	
6. Decimals and Percentage	10	

A Table of Ontario Grade Norms is provided for each score. However, grade norms for Form A and Form B of the test are not identical.

The Beattie Test of Mathematical Fundamentals is also a Canadian test. It is designed for Grade VII to XII. This

test differs from the Dominion Arithmetic Test in composition and content. Problems are provided in the Beattie test but not in the Dominion Arithmetic Test. The Manual gives the percentiles, means and standard deviations for each Grade.

The two reading tests used in the 1949 study are tests having a wide reputation and use. The Haggerty Reading Examination is a general achievement type of test. Although it is made up of three parts: Vocabulary, Sentence Reading, and Paragraph Reading, norms are not provided for these parts, but for the whole test only. The manual for the test gives corresponding "reading ages" for each significant raw score and a table of scores for each grade level.

The A.C.E. Cooperative Test of English Comprehension is a test of Vocabulary, Speed of Comprehension and Level of Comprehension. Scales are provided for each of the separate parts and for the whole test. This test has been standardized in U.S.A. and different norms are provided for the Southern States. The norms for the Southern States are about two points lower than those for the remainder of the country.

The method of sampling and treatment of test results are indicated in detail in Chapter III of this thesis.

Limitations of Testing Programme

Different forms of one group intelligence test were administered to the Grade IX pupils in 1947 and 1948, and different group intelligence test was employed for the Grade IX and Grade X pupils in 1949. Two different forms of the same standardized test in English were administered to the

Grade IX pupils in 1947 and 1948, and two different standardized reading tests were used in 1949 for the ninth and tenth Grade pupils. In 1947 and 1948 different forms of the same arithmetic test were used for the Grade IX pupils, but in 1949 another standardized arithmetic test was used for both Grade IX and Grade X pupils. Comparisons were somewhat difficult due to the fact that the same standardized tests of intelligence and subject-matter were not used for the Grade IX pupils for each of the three years of the study and the results for the Grade X pupils were available for one year only. Nevertheless, if the results present a reasonably consistent pattern of variation, they would be valid for the purpose of this study.

Limitations and values of the intelligence or psychological examinations should be kept in mind. Mursell states that:

1. "They do not reveal a person's capacity for complex and sustained learnings."
2. "Our tests cannot directly reveal capacity for disentangling concepts from complex situations."
3. "Our tests cannot directly reveal capacity for consistent and considered choice between possible courses of action. This capacity clearly involves such traits as persistence, judiciousness, and self-confidence, which are partly intellectual and partly ethical."
4. "Our tests cannot directly reveal capacity for dealing sensibly and wisely with practical problems!"

5. "Our tests cannot reveal directly a person's capacity for controlled and effective methods of work."
6. "Our tests cannot directly reveal the depth, strength and subtlety of a person's appreciative reactions in ethical, social, or aesthetic matters."
7. "Above all, our tests cannot even begin directly to reveal capacity for producing original ideas and construction -- for initiative, for the original solution of problems, for creative endeavor. Indeed, the type of items used systematically discourages originality and places emphasis upon the production of expected 'correct' answers!"².

"The other side of the picture is that despite limitations which every judicious student of the subject is bound to recognize, the modern testing movement has achieved great and indubitable successes, both practical and theoretical." ³.

1. "It is in connection with the practical uses of psychological tests that the most obvious and unanswerable case can be made, always granted a proper interpretation of the results they yield, many eventualities can be foreseen, and many costly errors in dealing with human beings eliminated." ⁴.

The author proceeds to show that in a significant measure they may be used to forecast 'educational prospects' and have a definite value in connection with student selection of courses at college entrance. They may be used to determine a critical score "below which success is unlikely."

"The guidance counselor, the clinical psychologist, and the psychiatrist, find common and important uses for psychological tests. Such workers employ tests not so much for exact and final measurement, but for the refinement of observations." ⁵.

² Mursell, James L. Psychological Testing, New York: Longmans Green and Company, 1949, pp. 14-15.

³ Ibid., p.16.

⁴ Ibid., p.16.

⁵ Ibid., pp. 18-19

Much that has been stated with reference to psychological examinations is in a measure true of objective examinations in subject-matter areas, more especially if standardized over a population and under curriculum provisions peculiar to a province other than Manitoba. We need our own standardized tests. However, the standardized achievement test in basic studies deals with much factual knowledge common to all secondary school situations, and represents a scientific effort to estimate ability and knowledge, all of which renders their use valuable for comparative studies and for appraising the understanding of individuals.

Standardized achievement tests do not answer the question as to why this result or that result but they do help us to observe the variation in existing standards of learning in particular situations. To arrive at an answer as to why a certain state of achievement exists in a given area or school would necessitate a further study or series of studies. Even establishing the relationship between psychological and achievement tests would not explain the reason for existing variations across such a wide area. It would indicate that they do exist in significant or non-significant quantity and for the individual pupil would constitute a valuable measure of his general ability and achievement. As all Grade IX test papers were examined by a central committee and the school inspector was acquainted with the work of the pupil through the perusal of classroom marks, the psychological and standardized achievement examinations would furnish additional unbiased information as to pupil proficiency and could become an important factor in promotion and classification.

CHAPTER 11

REVIEW OF THE TESTING PROGRAMME IN BRITISH COLUMBIA

During the last three decades a large amount of information has been assembled on the results of achievement and psychological tests. Most of the published material is on studies made in U.S. Thus far it has been difficult to find published studies of testing programmes in other provinces of Canada. The writer is of the opinion that due to a greater similarity in curricula, texts, and population among most of the Canadian provinces, comparison of testing programmes and results between two Canadian provinces may approximate more parallel conditions than a comparison of results of a testing programme in Manitoba and U.S. Therefore, when in June 1949, "Canadian Education" published a report prepared by C.B. Conway on "Research and Testing in British Columbia",¹ the writer of this thesis decided to use this report as a piece of work having significance to the study made in this thesis and will quote at length therefrom.

The Report states that up to 1949 twenty-five surveys were made in British Columbia and that standardized achievement, and psychological tests have been used in this work, and that eighteen of the twenty-five surveys, or twenty-five per cent, were conducted below the G rade LX level. The testing programme in British Columbia has been more extensive than that in Manitoba, whereas the emphasis in British Columbia has been

¹ C.B. Conway, Research and Testing in British Columbia. Canadian Education, The Canadian Education Association, Vol. IV, No. 3, June 1949, p. 59.

on testing below the Grade IX level, in Manitoba, on the other hand, all testing has been conducted exclusively at the high school level, particularly Grade IX. In both provinces most of the testing has been carried out since 1946. The analysis of test results in Manitoba is done by inspectors, and their findings co-ordinated by the Chief Inspector of Schools. However, in British Columbia there is an established bureau of research to take care of this work. The organization of this bureau is described as follows:

"The British Columbia Division of Tests, Standards and Research was established in 1946. It is under the direction of a Director who has the rank of Inspector of Schools and is responsible to the Assistant Superintendent who is also Chairman of the Curriculum Committee. There are two permanent employees, one of whom is the secretary of the Division, and the other the bookkeeper and distributor of standardized tests. One to three temporary employees usually are engaged in tabulating or similar work; and, when testing is at its height, from 10 to 20 college-student markers are employed. The latter have been found to provide an excellent type of assistance."²

The author of the Report states that since the bureau has been established in British Columbia test surveys have been conducted on a Province-wide basis and that only a few surveys have been conducted on representative samples of pupils by selecting typical districts and testing almost all of the pupils in those districts.³ In Manitoba testing is also carried out on a Province-wide basis although Winnipeg and Brandon pupils have written different forms of the same tests at earlier dates

² Ibid., p. 60.

³ Ibid., p. 63.

making it difficult to establish provincial norms. Representative samples have been analyzed, but no attempt has been made to select specific districts for establishing provincial norms.

In both provinces the testing programme has followed a fairly identical testing pattern: achievement tests are supplemented by psychological tests. In his report Conway refers to psychological tests as scholastic aptitude tests. A summary of the British Columbia "scholastic aptitude" and achievement tests employed is given in Tables IV and V.

TABLE IV

B.C. SCHOLASTIC APTITUDE SURVEYS TO 1948-49⁴

Year	Grade	Test	Mean I.Q.	Mean M.A. (Sept.)	Mean C.A. (Sept.)	No. of Pupils
1946-47	XI	Otis Self-Adminis- tering, C.	104.6	15-6	16-5	5,585
1947-48	IX	Henmon-Nelson H.S., B.	107.1	15-7	14-7	8,960
1946-47	VIII	Otis Int. S.A., C.	103.5	14-1	13-8	8,541
1947-48	VIII	Henmon-Nelson H.S., B.	105.6	14-5	13-8	7,663
1948-49	VII	Pinter Gen. Ability Int. B.	99.6	12-8	12-8	5,566
1946-47	VI	Henmon-Nelson Elem. A.	105.2	12-4	11-10	7,992
1947-48	V	Henmon-Nelson Elem. B.	104.1	11-1	10-9	11,747

⁴Ibid., p.63.

TABLE V

B.C. ACHIEVEMENT TEST SURVEYS TO 1948-49⁵

Date	Test Given	Grade	Number Tested
May, 1948	Co-operative General Mathematics, X	XI-XII	6,630
May, 1949	B.C. General Science	XI-XII	4,050
Dec., 1946	B.C. (Co-operative) Reading Comprehension, S	XI-4	5,495
Mar., 1945	Progressive Achievement, Advanced B.	X-6	
Mar., 1948	B.C. (Co-operative) English Usage, Spelling, Vocabulary, Pm.	IX-6	1,218
Mar., 1948	B.C. (Co-operative) Science, Xm.	VIII-6	8,676
Oct., 1948	Metropolitan, T.	VII-2	5,485
Oct., 1948	B.C. (Metropolitan) Spelling, T.	VII-2	11,051
Oct., 1948	Ayres Handwriting Scale	VII-2	465 (Sample)
Jan., 1947	B.C. (Stanford) Int. Arithmetic, Dm.	VI-5	7,978 [#] (Non-Vanc.)
May, 1947	B.C. (Stanford) Int. Arithmetic, Dm.	VI-9	1,360 (Vanc.)
Jan., 1947	B.C. (Stanford) Int. Language Arts, Em.	VI-5	7,973
May, 1947	B.C. (Standord) Int. Language Arts, Em.	VI-9	1,360 (Vanc.)
Mar., 1948	B.C. (Stanford) Int. Reading, D.	V-6	11,826
Mar., 1948	Ayres Handwriting Scale	V-6	300 (Sample)
Nov., 1943	B.C. Arithmetic Computation, A & B		2,000
Mar., 1944	B.C. Arithmetic Computation, A & B	IV-V	2,100
	B.C. Arithmetic Computation, A & B	III-IV	1,900

⁵Ibid., p. 62.

[#] Non-Vancouver

Method of Administration and Marking of Tests
in British Columbia

With the establishment of the Bureau of Research in British Columbia the testing programme developed rapidly. In Table 11 we note that only two surveys were conducted in that Province prior to the establishment of the bureau in 1946. The administration and marking of the tests follows a fairly well established pattern. Conway reports that:

"..Standardized tests purchased from the publishers usually have been specially printed and directions have either been printed or issued in mimeographed form. The tests have been distributed to the school inspectors according to the enrolments in their inspectorates. The inspectors have given the tests themselves, or have distributed them to reliable principals and teachers for administration. The completed tests have been collected and checked in by the inspectors and have been returned to the Division for marking. In most cases they have been marked in the Division; but in some, they have been re-shipped for scoring by machine. On the whole hand-scoring has proved preferable even though it is more expensive. If a sufficient number of markers is hired the tests can be marked just as rapidly, and it has been found that results of machine-scoring are not directly comparable to those obtained when the scoring is done by hand⁶

In Manitoba standardized tests are distributed to schools directly from the Registrar's Office of the Department of Education. No special publication of these tests has been attempted in the Province though directions have been specially printed to insure uniformity of administration. The tests have been administered by principals in high schools

⁶ Ibid., p.61.

and teachers in rural schools. In 1949 Grade X tests were marked by the teachers, but all Grade IX tests have been marked by a central committee. This committee is composed of teachers. The employment of teachers has been made possible as all tests have been marked during the summer holidays and it has been found that this type of work gives the teachers some insight into the testing programme in the Province. All scoring has been done by hand and no attempt has been made to use tests that may be scored by a machine. By and large the administration of tests and marking follows fairly similar lines in both provinces.

It is interesting to note that no surveys involving tests of specific aptitudes or of personality have been attempted in either province. Conway points out that:

"Such tests may be tried out later, but up to the present it has been considered advisable to use tests of proven validity."⁷

The Report underlines the fact that since surveys of achievement had not been made in the past, it was necessary to make comparisons between British Columbia Provincial norms and the U.S. norms, but that a great body of material has been accumulated which will make future comparisons possible.

Conway⁸ reports that the same tests may be given again under similar circumstances and if changes in curriculum have been made, it will be possible to determine whether these changes have been justified. He maintains that even if the native

⁷ Ibid., p. 64.

⁸ Ibid., p. 64.

ability of the pupils should prove different when these tests are re-administered, that it will be possible to eliminate the effect of this factor on future test results. When the large number of pupils that have been tested and the care with which the tests were administered are taken into consideration, this should assure that the differences found in the future will constitute reliable data for comparative purposes.

Results of the British Columbia Surveys

In analyzing the results of the achievement test surveys the author comes to the following conclusions:

- 1." That there is a tremendous range in terms of grade-levels in every subject and in every grade that has been tested.
2. That achievement in Science is higher in Junior High School than in the corresponding grades of elementary schools.
3. That British Columbia is above the U.S. norm in Speed of Reading and Level of Comprehension in Grade XI; in Mathematics in Grades XI and XII; and in Reading, Mathematics and Language in Grade X.
4. Weaknesses are indicated, however, in Grade IX Spelling, Sentence Structure, and Mathematical Fundamentals.
5. Grade VIII is distinctively above the U.S. norm in Science, as is Grade VII in all of the fundamentals covered by the Metropolitan Achievement Test.
6. Weakness in Language Usage seems to be becoming evident in the lower grades of elementary school, as is a weakness in Arithmetic Computation.
7. The problem-solving ability of the pupils has been distinctly higher than their computational ability in all grades.

8. Handwriting is now two grades below the Ayres 1917 norms."⁹

The conclusions reached in British Columbia on the results of psychological tests should prove valuable in appraising the study made in Manitoba as both provinces used tests by the same authors in testing mental ability of the pupils or as Conway refers in his report, "scholastic aptitude". The report lists the following conclusions:

1. "Scholastic aptitude survey results have indicated that in general our pupils are about 5 points above the commonly-accepted norm of 100 I.Q. Such superiority is to be expected because certain pupils in all school systems are institutional cases or are so retarded that they never reach the intermediate grades. The most obvious result, however, is the fact that certain tests are more difficult than others: or rather, that they have been standardized on populations of varying ability. The Pintner General Ability Test, for example, seems to have been standardized on a population distinctly better than that used for the other tests employed in our surveys."¹⁰
2. An important outcome of our surveys is the indication that results are never quite as favourable when complete coverage is obtained as when testing is done on voluntary basis. Schools with the highest achievement are those in which the most testing is done. If only a fraction of the population is tested, the fraction must be very carefully chosen so that it is a sample that is truly representative of the whole."¹¹
3. "The selection must be done in a central office instead of locally. This is not because of any attempt on the part of the teachers or others to mislead authorities. It is due to the fact

⁹ Ibid., pp. 64-65.

¹⁰ Ibid., p. 65.

¹¹ Ibid., p. 65

that achievement usually is lowest in the schools that are most difficult to test. The small out-of-the-way schools are those most likely to be missed and their achievement usually is least satisfactory."¹²

4. "Province-wide surveys have been conducted frequently enough to make it possible to select equivalent areas with considerable success. Nevertheless, complete coverage definitely is preferable, and province-wide surveys will continue to be made whenever it is possible."¹³

The writer of this thesis will attempt to analyze the results of the psychological tests to determine if the same tendency appears in Manitoba with respect to the Henmon-Nelson and the Otis mental ability tests.

Provincial Norms

The British Columbia report emphasizes the fact that provincial norms have more value for future and present comparisons than the published standardized test norms. This is in some measure due to the fact that there is a great deal of variation in achievement from one community to another, as well as a great deal of variation in the scholastic aptitude of the pupils. The differences that effect the results of psychological tests may be due to social inheritance or the environmental background of the pupils. Differences in achievement may also be observed which may be caused by differences in curricula, texts or emphasis. Therefore, the groups studied may be above the published U.S. norms in one subject-

¹² Ibid., p. 65.

¹³ Ibid., p. 67.

matter field and below in another. When provincial norms are used for making comparisons of local results, assurance is thereby given that at least those differences that may be due to length of school year, curricula, texts or test standardization have been eliminated to a certain degree.

Another factor that makes the use of provincial norms more advisable is brought about by the fact that often supposedly equivalent forms of the same test are not 'equivalent'. Conway¹⁴ reports that it was found that the Otis, Higher Form C, seems more difficult than either Form A or Form B. In some cases when equivalent forms are used the central tendency may be the same but the distribution of scores may differ, and therefore, a pupil who attains the same percentile rank on both forms may have different I.Q. scores. He suggests that in recording results of psychological examinations care should be taken to record the form of test used. Experience in British Columbia has shown that the I.Q. is satisfactory for secondary school pupils as a measure of potential ability, but in the elementary schools errors in interpretation and pupil placement may be common if the I.Q.'s are not supplemented with corresponding Mental Age scores.

Additional values of provincial norms and scholastic aptitude tests were found in British Columbia in connection with the recommendation of pupils for university entrance without writing departmental examinations. In accredited schools pupils who received 67 per cent or higher in each school subject could be recommended for university entrance.

¹⁴ Ibid., p. 68.

However, it was found that pupils who received a grade of 66, 65 or even 60 per cent from the teachers rarely failed to obtain a pass of 50 per cent on departmental examinations. Recommending pupils on the basis of 67 per cent proved successful and the privilege was extended to accredited schools to recommend pupils who obtained 58 per cent for the term work. It was found, however, that the eight point margin over the pass mark of 50 per cent proved too narrow "when the reliabilities of examination and teachers' grades were concerned".¹⁵ It was found that in some schools all the pupils failed in departmental examinations save those that were recommended, and consequently the method of recommendation was altered. On the new basis 60 per cent of the pupils who obtained 58 per cent or higher on school examinations were subject to recommendation. It was found that small classes and highly selected groups were common, and, since the onus of selection of pupils for recommendation fall on the teacher, some teachers were unwilling to accept the responsibility as no rule was formulated that the teachers could follow in all cases. It appears that the teachers were unable to decide whether a score exceeded by 60 per cent of the whole group should be the criterion for recommendation, or the score exceeded by 60 per cent of the university entrance pupils. Again we quote Conway to show how this difficulty was overcome. He comments:

"The availability of distributions of I.Q.'s based on surveys of the province made it possible to offer a solution to this rather confusing situation. It was obvious that when a course had been taken by only a few highly-selected students, and it was felt that the

¹⁵Ibid., p. 68.

quality of instruction has been good, a higher proportion of the candidates might be recommended."16

He says further:

"The assumption could be made that, in general, classes with high scholastic aptitude would have high achievement. Therefore, in the absence of standardized achievement test scores, the proportion of high I.Q.'s could be used as a basis for determining the number to be recommended. The criterion that finally was adopted was an I.Q. of 112. In a small class the proportion of candidates to be recommended would be roughly the same proportion as there were candidates with I.Q.'s above 112. Some of the students in a class might have I.Q.'s higher than that, but if their achievement proved to be distinctly lower than that of other pupils they would not be recommended. Some students would have I.Q.'s below 112, but, because of their rank in class, they would be eligible for recommendation."17

Conway concludes that:

"..recommendation should be based on achievement and not on I.Q., but the proportion of high I.Q.'s in a class could be used to give an indication of the number of pupils who probably would be successful."18

It is interesting to observe that a similar situation arose in Manitoba in connection with the acceleration of pupils in 1949. The criterion used for accelerating the top twenty per cent of the Grade X pupils was the results of the Otis Mental Ability test supplemented by achievement on two standardized tests and the school record.

Problems of the Testing Programme

The author of the British Columbia report concludes that the testing program has encountered certain problems. One of these problems is a deficiency of achievement tests that would

16 Ibid., p. 69.

17 Ibid., p. 69.

18 Ibid., p. 69.

have curricular validity in the Province. He seems satisfied that there is an adequate store of good tests of fundamental skills, but not of tests for specific subject-matter areas. To overcome this shortage British Columbia has organized a programme of test construction, however, the limiting features of this programme seem to be that a test has to be administered at least three times before it can be standardized. The second problem, and one to which the author attaches considerable importance is the lack of comparable information on testing done in other provinces.

In succeeding chapters the writer of this thesis will attempt to analyze the results of the tests used in this study and appraise further any similarity that may exist in the two provinces.

A Manitoba Study

Another study, unpublished, was made of the progress of a group of students graduating in June of 1947 from the Lord Roberts Junior High School, Winnipeg. This study undertook to examine the modified battery of tests given the Grade IX pupils of Winnipeg to ascertain the worth of such a group of tests in determining future success in Grade XI. The study arrived at the following conclusions:

"If we study the scores made by these pupils in the Grade X and Grade XI examinations, we note that not only is there a remarkable agreement in the ranking of pupils on the Departmental objective tests as compared with ranking on the scores obtained on their High School tests but also that there was almost complete agreement in rating those pupils who showed superior scholarship

in Grade XI and those who failed to pass that grade."¹⁹

The tests which would appear to be most indicative of success or failure as determined by a comparison of scores in the battery of tests given in Grade IX with the scores on the final Grade XI school examinations are: (1) Mental Ability (2) Reading Comprehension. The following correlations were obtained:²⁰

1. Group Test of Intelligence and Grade XI scores	.74
2. Reading Comprehension and Grade XI scores	.68
3. Language Test and Grade XI scores	.55
4. Fundamentals in Mathematics and Grade XI scores	.60
5. General Knowledge and Grade XI scores	.53

¹⁹ John Scurfield, "University of Manitoba, Unpublished Paper". 1950, p.7.

²⁰ Ibid., p.5

CHAPTER 111

AGE DISTRIBUTION AND SAMPLING

Age Distribution

Age distributions were made for Grade IX and X pupils, on the basis of sampling explained later in this chapter. The results are tabulated in Tables VI and VII and illustrated by Figures 3, 4 and 5.

Table VI indicates that the average age for Grade IX pupils remained relatively constant for the three years under discussion and that the Grade X age average was approximately one year above that of the age group for Grade IX in any one of the three years 1947, 1948 and 1949.

TABLE VI
QUARTILES AND MEANS OF CHRONOLOGICAL AGES OF
MANITOBA GRADE IX AND X PUPILS EXPRESSED
IN YEARS AND MONTHS

Group	N	Q1	Md.	Q3	Mean
Grade IX 1947	1742	14-10	15-6	16-1	15-6
Grade IX 1948	1644	15-1	15-6	16-2	15-6
Grade IX 1949	1513	14-11	15-5	16-1	15-6
Grade X 1949	1736	15-11	16-5	17-0	16-6

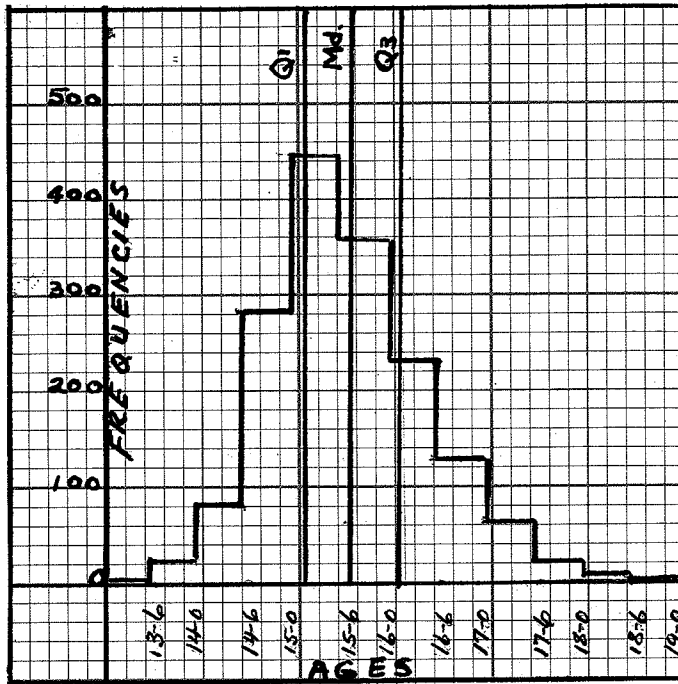


Figure 3.

Distribution of 1644 chronological ages for the Manitoba Grade IX pupils, 1948

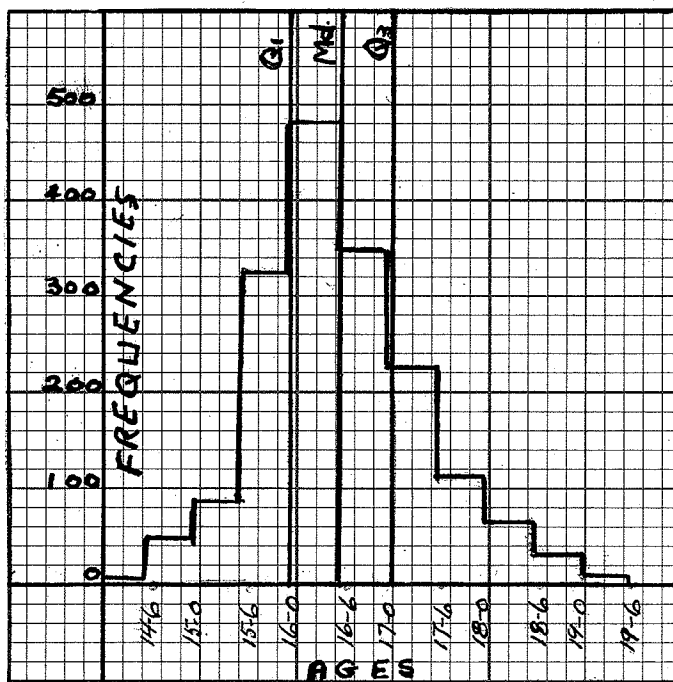


Figure 4.

Distribution of 1736 chronological ages for the Manitoba Grade X pupils, 1949

TABLE VII

DIFFERENT AGE GROUPS OF GRADE 1X AND X PUPILS
IN MANITOBA EXPRESSED AS PER CENTAGES

Age Group	Gr. 1X 1947	Gr. 1X 1948	Gr. 1X 1949	Gr. X 1949
19				.63
18	.57	.60	.92	5.35
17	5.56	5.16	7.20	19.87
16	20.43	22.14	18.43	47.63
15	45.12	49.26	46.39	24.25
14	26.00	21.22	25.11	2.13
13	2.12	1.58	1.24	

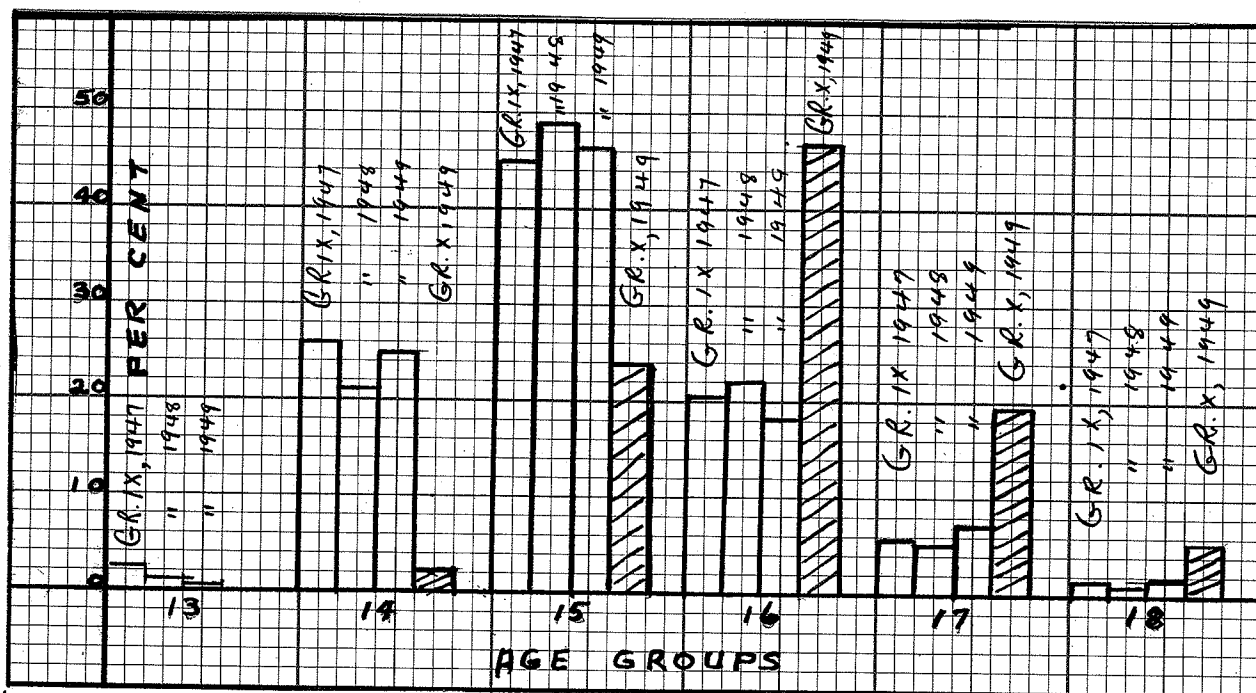


Figure 5.

Distribution of age groups in terms of percentage of the Manitoba Grade 1X and Grade X pupils.

The British Columbia mean chronological age for the Grade IX pupils in September, 1947 is reported as fourteen years and seven months, therefore, we may assume that in June it would be fifteen years and five months which is practically the same as that established for the Manitoba Grade IX enrolment.

The Method of Sampling

The studies of pupil marks on psychological examinations, achievement tests and teacher letter rating were made by the writer on the examination results of three successive years. The method of sampling for comparative study was altered somewhat for each year as the writer added to his experience without contemplating the present study. This accounts for the variation in method reported in the section now under consideration. The procedure renders comparisons more difficult and makes greater detail of treatment essential. However, the writer can but analyze and compare the results of each year's study as they were approached at the time. Had the present study been planned in the beginning over the three year period one standard method could have been decided upon and applied throughout.

To determine the reliability of the Tressler English Tests, the Dominion Arithmetic Tests, the Beattie Arithmetic Test and the Haggerty Reading Examination, test papers were drawn at random, two from each of the larger Inspectoral Divisions and one from each of the two smaller Divisions making

a total of fifty papers per sample. The Hoyt method was employed in calculating reliability and the coefficients of reliability are indicated in Table VIII

TABLE VIII

COEFFICIENTS OF RELIABILITY (r_{tt}) FOR TESTS OF ENGLISH, ARITHMETIC AND READING AT THE GRADE LX LEVEL

Sample	N	Tressler English r_{tt}	Dominion Arithmetic r_{tt}
1947			
1	50	.86	.90
2	50	.87	.88
1948			
1	50	.98	.93
2	50	.93	.92
.....			
		Haggerty Reading r_{tt}	Beattie Arithmetic r_{tt}
.....			
1949			
1	50	.93	.92
2	50	.98	.93

To determine correlations between mental ability, raw scores and the Tressler English, the Haggerty Reading, and the

25 Cyril Hoyt, "Testing Reliability Estimated by Analysis Variance", Psychometrica, Vol. 6, No. 3, June, 1941.

two arithmetic tests; and between I.Q.'s and the English and Dominion Arithmetic raw scores, the Grade IX samples for the year 1947 were selected in the following manner:

1. The scores of the first 100 names of the 14 year old rural school pupils appearing on the Score Sheets were used to make a sample of rural pupils.
2. The scores of the first 80 names of the 16 year old rural pupils appearing on the Score Sheets were used to make a sample of 16 year old rural school pupils.
3. To get Junior High samples the scores of every second name appearing on the Score Sheets of 14 year old pupils were tabulated until a sample of 100 was reached, and in the same manner the scores of the 16 year old Junior High group were selected until a sample of 91 was reached.
4. The first 114 names of the 17 year old group appearing on the Score Sheets of 15 Inspectoral Divisions yielded scores for the sample.
5. Every second name appearing on the Score Sheets of pupils recommended for failure was selected to yield scores for this sample of 100 names.
6. A sample of 100 names was selected to represent the Collegiates by taking the scores of every third name appearing on the Score Sheets of 17 Collegiate in the Province.
7. Every fourth name on the Score Sheets of 15 Inspectoral Divisions to make a sample of 100 for the Two-Room High group.
8. Every fourth name on the Score Sheets of 15 Inspectoral Divisions to make a sample of 100 for the One-Room High group.

In 1948 every tenth name was used from the Score Sheets of Collegiates, Two-Room High, One-Room and Junior High until a sample of fifty was secured for each type of school. Correlations were calculated between mental ability and English and between mental ability and arithmetic raw scores. Correlations were also correlated between I.Q.'s and English

and I.Q.'s and arithmetic scores for these samples, and for all names of Inspectoral Divisions A and B.

Score Sheets were used from ten Inspectoral Divisions to get the chronological age distribution of the population studied. The Divisions selected were considered to represent a cross section of the Province. Identical Divisions were not employed for this analysis in each of the three years as some Divisions were in the process of change each year. However, in each case the number studied represented approximately one-third of the population.

Samples were used to analyze responses to each question in the arithmetic tests. These samples were the same as those used to determine the reliability of the tests. In 1949 the Grade IX and X arithmetic samples were compared question by question. The 1947 and 1948 arithmetic samples were compared in the same manner.

Analysis of the Tressler English test was made for each of the seven separate parts of the test. Eleven Inspectoral Divisions were used in 1947 and ten in 1948 as representative samples of the population studied. Medians for each of the separate parts of the test were calculated for these samples and compared graphically with the published medians. Similarly five Inspectoral Divisions were used as additional samples to compare the separate parts of the test for each year.

Treatment of Test Results

The scores included in this study to establish norms for the population are derived from the rural and smaller city school

systems in Manitoba. The Correspondence Branch scores were considered separately and the scores for the Winnipeg and Brandon schools were not available, as they used a modified form of the tests and administered them at an earlier date. For convenience the scores of the Collegiate Institutes and Collegiate Departments were grouped together under the title of "Collegiates". Separate analysis was made of the more significant types of schools in the Province: Collegiate, Two-Room High, One-Room High, Junior High Schools and Correspondence Branch. Though the scores of private and rural schools were taken into consideration in arriving at the Provincial norms, they were not singled out for specific study.

Tabulations of test scores were made according to frequency distributions of five intervals. This method was adhered to each year. Results were first tabulated for each Inspectoral Division with scores for all types of schools set out separately. All results from the Inspectoral Divisions were summed and the population frequency distribution determined. In like manner the distributions were summed to secure a single distribution for each type of school.

Quartiles were calculated for each group and the median was used for preliminary comparisons. This was deemed necessary as the norms for the Tressler English Test were expressed as quartiles. Median scores were also available for the Henmon-Nelson and the Beattie Arithmetic tests.

The mean and the standard deviation for each group was

also calculated, in order that comparisons could be made to determine if any statistically significant difference existed among the groups compared. To find the standard error of the mean, the formula $\frac{\sigma(Pop)}{\sqrt{N}}$ ¹ was employed, and to find the standard error of difference between means the formula $\sigma_{M_1 - M_2} = \sqrt{\sigma_{M_1}^2 + \sigma_{M_2}^2}$ ² was used. The critical ratio (t) greater than 1.96 was considered significant at the 5% level and that greater than 2.57 at the 1% level.

Percentiles were calculated for some distributions and ogive curves drawn. These were used to compare the results of the Henmon-Nelson Tests with the published norms, and to show the distribution of reading ages and grade norms on the Haggerty Reading Examination.

In 1947 correlations were calculated for the groups described on page 35, and in 1949 for scores in three Inspectoral Divisions.

At the Grade X level correlations were calculated between the vocabulary section of the test and the total score for the A.C.E., Reading Comprehension Test. Scores from four Inspectoral Divisions and scores for ninety Correspondence Branch pupils were used in this project.

The Product-Moment correlation form of five intervals was used for determining the coefficient of correlation.

Mental ability raw scores were converted into corresponding I.Q.'s in 1949 and the results studied in ten

¹ E. F. Lindquist, A First Course in Statistics, New York: Houghton Mifflin Company, 1938, p. 108.

² Ibid., p. 120

Inspectoral Divisions, considered representative of the population. In the previous two years the mean raw score and the quartile and median raw scores for the mental ability tests were also converted into I.Q.'s by using the corresponding chronological ages. The distribution of chronological ages was calculated for the ten Inspectoral Divisions to obtain information as to the age groups each year and in each grade, and to find the degrees of constancy existing from year to year and between Grade IX and X.

In 1948 three groups were selected for specific study: (1) pupils recommended for failure by the teachers, (2) pupils with I.Q.'s of 115 or higher, and (3) pupils making 25 or less on the Tressler English Test. The achievement of these groups was evaluated in terms of standardized test results.

In 1949 the Grade IX Q1 and Q3 mental ability groups were compared to determine whether the pupils with higher mental ability raw scores showed improved achievement in the reading and arithmetic test results. At the Grade X level the Q3 mental ability group was compared with the established norms for the population to estimate whether or not the group showed superior achievement in arithmetic and vocabulary tests.

In order to determine if any relationship existed between ranks accorded each pupil on the year's work and mental ability scores, achievement of Grade IX pupils with mental ability raw scores below the 25th percentile was compared with the achievement of Grade IX pupils with mental ability raw scores above the 75th percentile. This comparison was made by using the

letter grades reported on the Score Sheets by the teachers. The letter grades used in Grade IX were: H(High), G(Good), S(Satisfactory), and W(Weak). In Grade X the achievement of the pupils with mental ability raw scores above the 75th. percentile was evaluated in terms of teacher ranks A, B, C, D, and E. The weak ranks in Grade IX and the E ranks in Grade X were analyzed to ascertain the subject matter areas on which the pupils received these ratings more frequently.

CHAPTER IV

SUMMARY OF ACHIEVEMENT ON THE MENTAL ABILITY TEST

Mental Ability Grade IX

Nearly five thousand mental ability raw scores were analyzed for the Grade IX population in each of the three years included in this study, and nearly four thousand raw scores at the Grade X level in 1949. As the quartiles and medians were calculated in the preliminary analysis, these will be reported in terms of raw scores.

TABLE IX

QUARTILES OF THE MENTAL ABILITY RAW SCORES OF THE NINTH GRADE PUPILS IN MANITOBA, 1947 ON THE HENMON-NELSON TEST OF MENTAL ABILITY FORM: B

Group	N	Q1	Md.	Q3
Population	4,343	47.30	54.50	60.40
Collegiates	933	47.58	54.71	61.04
Two-Room High	524	45.62	52.37	58.92
One-Room High	602	47.30	53.50	60.50
Junior High	680	50.53	57.71	63.42
.....
Correspondence Branch	586	44.55	52.00	60.17

Table IX shows that the median for the Collegiates falls close to the population median of 54., but that the



medians for the Two-Room and One-Room High groups and Correspondence Branch are about two points lower. On the other hand the median for the Junior High group is about three points higher than that for the population studied. A somewhat similar condition may be noted at the first and third quartile, though the Two-Room High group has lower scores at those points than the One-Room High.

In 1948 a different form of the Hermon-Nelson Mental Ability Test was written and similar groups compared in Table X.

TABLE X

QUARTILES OF THE MENTAL ABILITY RAW SCORES OF THE NINTH GRADE PUPILS IN MANITOBA, 1948 ON THE HENMON/NELSON TEST OF MENTAL ABILITY FORM: C

Group	N	Q1	Md.	Q3
Population	4,075	44.08	52.68	61.79
Collegiates	1,174	45.34	53.76	63.19
Two-Room High	5,611	42.63	50.58	58.84
One-Room High	695	42.69	51.72	60.68
Junior High	639	47.79	55.57	63.75
Correspondence Branch	504	42.45	51.98	60.98

The results for this test show that the population median for 1948 is about two points lower, 52.68 as compared with 54.50 for 1947. An approximate difference of about two

points is evident for all groups and equivalence in achievement is apparent for the Two-Room High, One-Room High and Correspondence Branch, with the Two-Room High again having a lower Q3 score. The Junior High group results are higher than those for the other groups both in 1947 and in 1948.

In 1949 the Otis Intermediate Examination was administered to the Grade IX population. The summary of results is tabulated in Table XI.

TABLE XI

QUARTILES OF THE MENTAL ABILITY RAW SCORES OF THE NINTH GRADE PUPILS IN THE PROVINCE OF MANITOBA, 1949 IN THE OTIS MENTAL ABILITY TEST INTERMEDIATE EXAMINATION FORM: A

Group	N	Q1	Md.	Q3
Population	4,217	54.98	61.12	66.45
Collegiates	1,364	55.47	61.60	66.95
Two-Room High	565	52.56	59.56	65.45
One-Room High	684	54.61	60.7 8	66.31
Junior High	584	57.74	62.95	67.46
Correspondence Branch	500	52.04	60.39	64.65

The median raw scores of the Henmon-Nelson and the Otis Tests are not directly comparable. However, comparisons are possible if raw scores are converted into corresponding I.Q.'s. Therefore, if the median ages in Table VI are used

to convert the median mental ability raw scores the median I.Q.'s are as follows: Hermon-Nelson, 1947, 106; Hermon-Nelson, 1948, 105 and Otis 1949, 107. The median I.Q.'s, therefore, do not show any significant variation from year to year.

Mental Ability Grade X.

In 1949 the Otis Test was also administered to the Grade X pupils. Table XII gives significant information in terms of the raw scores.

TABLE XII

QUARTILES, MEDIAN, MEAN, STANDARD ERROR OF THE MEAN AND STANDARD DEVIATION OF THE MENTAL ABILITY RAW SCORES OF THE MANITOBA GRADE X PUPILS, 1949 ON THE OTIS INTERMEDIATE EXAMINATION FORM: A

N	Q ₁	Md.	Q ₃	Mean	S.E.M	S.D.
3,605	60.81	65.69	69.33	64.50	.13	7.65

The difference between the median and the mean in Table XII is very slight, however, the median for the Grade X population is about four points higher than the median for the Grade IX population as shown in Table XI. If, however, we convert the mean and median raw scores for the Grade X population by using the mean and median chronological ages established in Table XVI of this study we get a mean I.Q. of 107 and a median I.Q. of 108. In order to verify the conversion of the median and mean chronological ages into corresponding I.Q.'s, I.Q.

scores for about one-half of the Grade X population, and about one-third Grade LX population was analyzed in 1949 to determine the median and mean I.Q.'s. The information for this analysis is given in Table XLII

TABLE XLII

QUARTILES, MEDIAN, MEAN, STANDARD ERRORS OF MEANS AND STANDARD DEVIATIONS OF I.Q. SCORES OF THE MANITOBA GRADE LX AND X PUPILS, 1949

N	Q ₁	Md.	Q ₃	Mean	S.E. _M	S.D.
Grade X 1897 (Scores)	103.55	108.63	110.17	107.40	.16	7.45
Grade LX 1576 (Scores)	100.29	107.62	113.48	106.25	.24	9.55

We may conclude that the calculations of I.Q.'s by conversion are accurate as they give us the same results as those summarized in Table XLII, arrived at by direct analysis.

¹
In his study Conway reports a mean I.Q. of 107.1 for the B.C. population at the beginning of Grade LX on the Henmon-Nelson Mental Ability Tests. The mean I.Q. established in this study is almost equal that of B.C. A slightly higher mean I.Q. score for the Grade X population suggests that some degree of selectivity had taken place.

¹ Op. cit., p. 62

Types of School

Further analysis was made to ascertain if the differences that appear in the mean scores of the different types of school are statistically significant, for which purpose the means, the standard error of the means and the standard deviations were calculated for each group. Table XIV summarizes the results:

TABLE XIV

MEANS, STANDARD ERRORS OF MEANS AND STANDARD DEVIATIONS OF THE MENTAL ABILITY RAW SCORES FOR THE FOUR GRADE IX-SCHOOL GROUPS COMPARED

	Collegiates	Two-Room High	One-Room High	Junior High
1947				
N	933	524	602	680
Mean	54.10	52.50	52.50	56.50
S.E _M	.30	.59	.40	.39
S.D.	10.00	13.65	9.80	10.05
1948				
N	1,174	561	695	639
Mean	54.05	50.25	52.54	56.10
S.E _M	.41	.49	.45	.44
S.D.	14.20	11.65	12.05	11.25

Table XLV (Continued)

	Collegiates	Two-Room High	One-Room High	Junior High
1949				
N	1,364	565	684	584
Mean	60.95	58.40	59.60	62.16
S.E.M	.22	.38	.34	.29
S.E.	8.10	9.11	8.95	7.05

In Table XLV the mean difference among the four High School groups selected for study are practically the same as that when the median was employed for the purpose of comparison. However, in order to determine if the differences that do appear are statistically significant, the standard error of difference between means was calculated. A critical ratio (t) of 1.96 was considered significant at the five percent level, and a critical ratio greater than 2.57 significant at the one percent level.

The calculation establishes that there is no significant difference between One-Room High and Two-Room High school groups in 1947 and 1948 as indicated by the results of the Henmon-Nelson tests but, that there is a difference in achievement among all the groups in 1949. The achievement of the Junior High groups is definitely highest and the Collegiates next in order. It is reasonable to generalize by stating that the pupils in the suburbs and larger towns in Manitoba show somewhat higher achievement in psychological examinations than do pupils in the smaller rural high schools.

To compare still further the results of the Henmon-Nelson tests for the G grade IX population, percentile curves were drawn. Norms in terms of percentiles are not published for the Otis Test, hence a similar comparison could not be made. Figure 6 shows the population norms and the published norms for the Henmon-Nelson tests.

In each year the curves for the Manitoba Grade IX population are higher than the published norms for the test. This may suggest that the test was standardized on samples inferior in mental ability to the Manitoba samples of population, or that there is a higher degree of selectivity in Manitoba at the Grade IX level. As there is less tendency toward selectivity in the United States in the earlier high school grades than is true of Canada, in all probability the latter assumption is the correct interpretation of this variation in results. In Figure 6 the curve for the 1948 sample is lower than that for 1947 until it reaches the 60th percentile and then slightly higher. It is difficult to conclude whether there is a definite difference in the mental ability of the populations studied each year or whether this difference may be due to some variation in the two forms of the test.

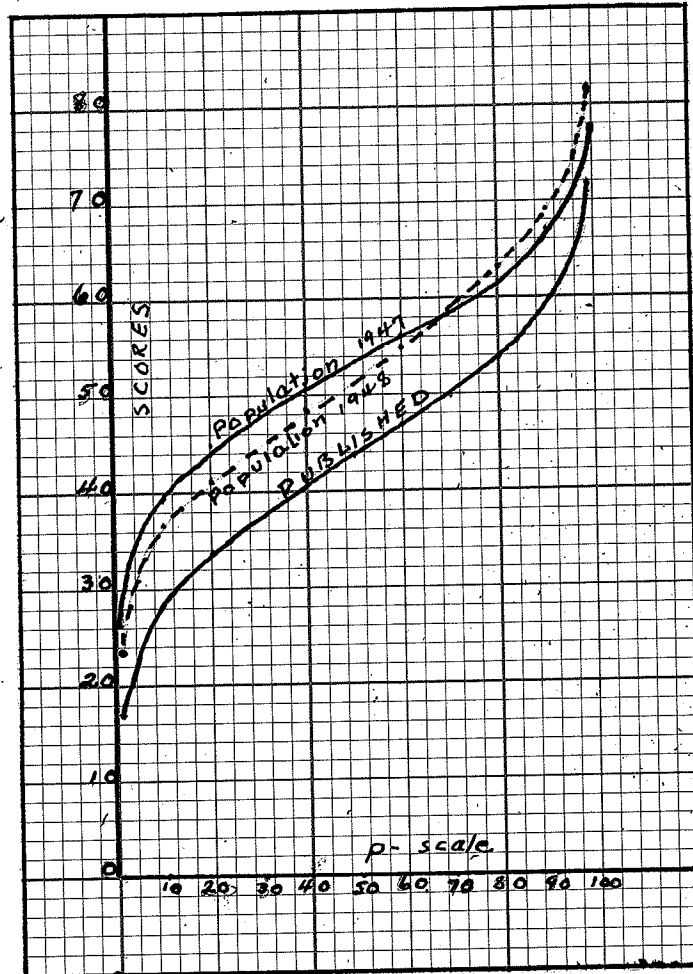


Figure 6.

Percentile curves of 4,343 raw scores, 1947 and 4,075 raw scores, 1948 on the Henmon-Nelson Mental Ability Test for the Manitoba Grade IX samples and the published norms.

CHAPTER V

ANALYSIS OF RESULTS OF THE TRESSLER ENGLISH TEST

Two different forms of the Tressler English Test were administered to the Manitoba Grade IX pupils in 1947 and 1948. This test is composed of seven separate parts: Grammatical Correctness, Vocabulary, Punctuation and Capitalization, Sentence and its Parts, Sentence Sense, Inflection and Accent, and Spelling. According to Dora Smith:¹

unweighted composite tests in punctuation sentence structure, grammar and word usage show higher validity than do any of the single tests representing the same categories.

This test should present a reasonably valid picture of achievement in English.

In this chapter the writer will attempt to analyze the achievement of the population studied, types of schools and groups and try to determine if any specific weakness exists in the separate parts of the test. One set of norms is published for each of the two forms of the test. These norms are intended to show achievement at the end of the ninth year, that is, Grade IX. In the first place we shall examine the extent of agreement of all the Grade IX pupils in Manitoba with the exception of the Correspondence Branch group, with the published norms. This comparison is shown in Table XV, and the distribution of scores of the Grade IX pupils in Figures 7 and 8.

¹ Dora Smith, "Educational Diagnosis". Thirty-fourth Year Book, Bloomington Illinois: Public School Publishing Company, 1935, Pp. 253-54.

TABLE XVII

COMPARISON OF NORMS ON THE TRESSLER ENGLISH TEST

	Population 1947	Population 1948	Population
N	4,312	4,323	
Q1	31.00	27.00	36.1
Md.	39.70	36.21	44.6
Q3	48.00	45.88	54.1
Mean	39.700	37.50	
S.E.M	.18	.19	
S.D.	12.40	12.85	

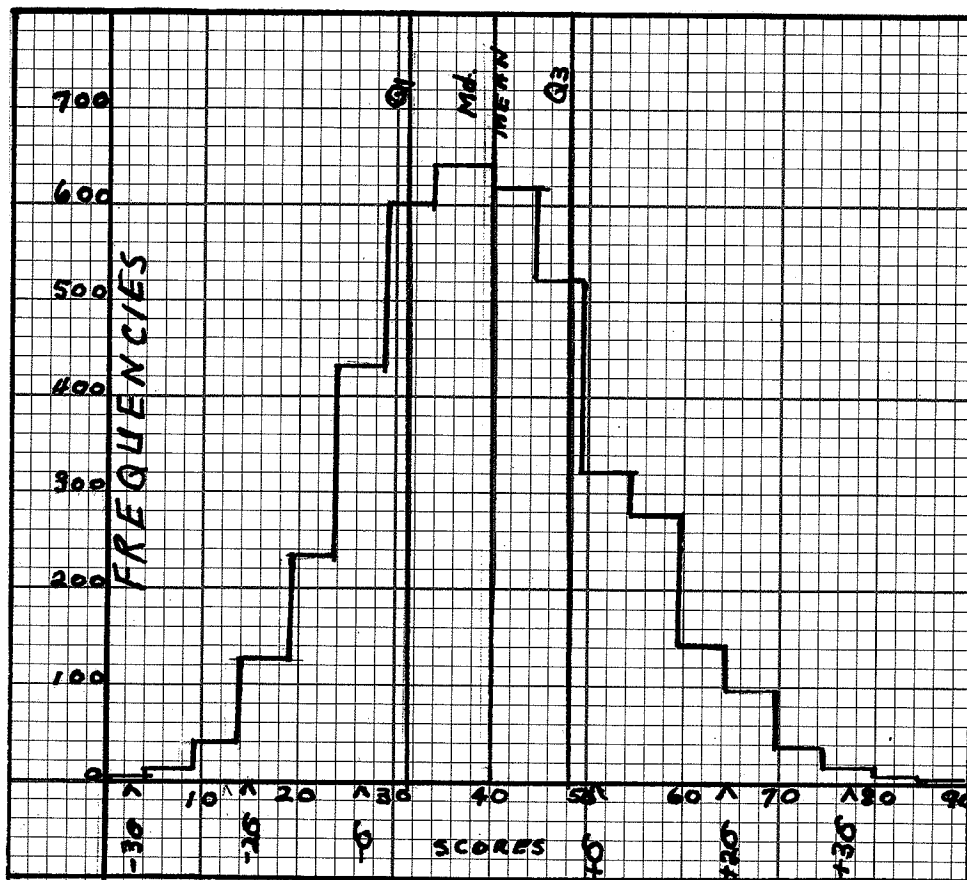


Figure 7 .
Distribution of raw scores in the Tressler English Test Form: A for 4,312 Manitoba Grade IX pupils in 1947.

The distribution of scores in Figure 7 shows the achievement of the Manitoba Grade LX pupils to be below the published norms on the average of about six points.

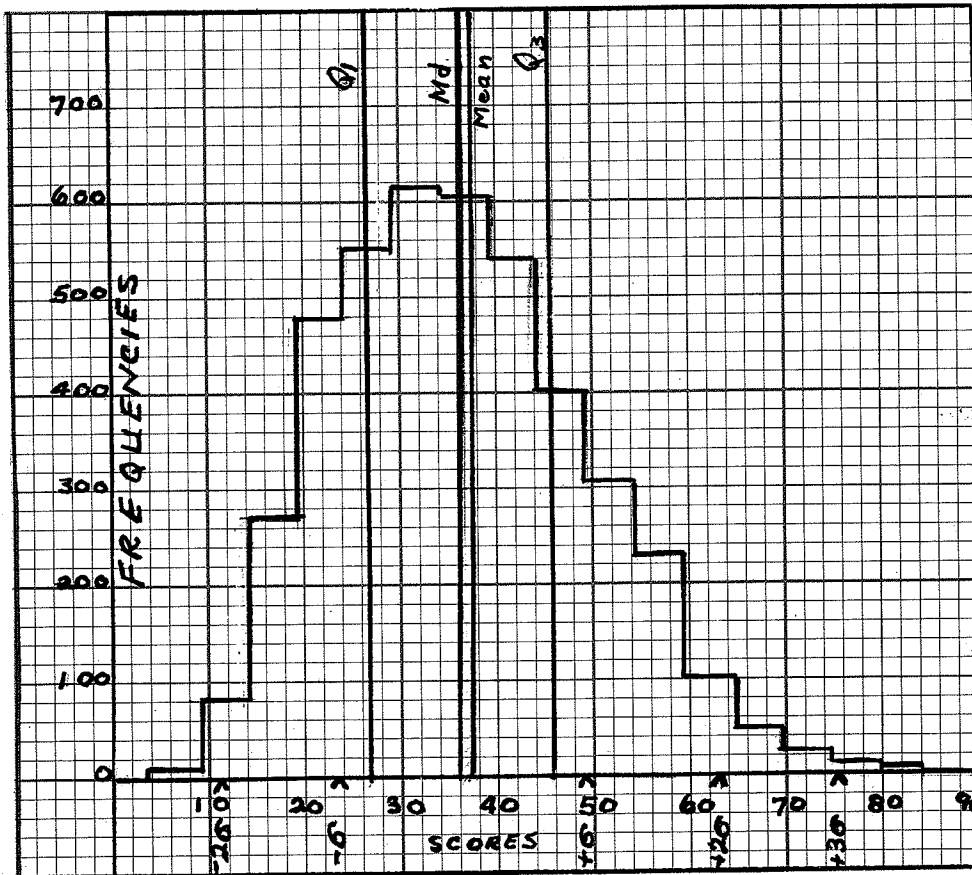


Figure 8.

Distribution of raw scores on the Tressler English Test Form: C for 4323 Manitoba Grade LX pupils, 1948

By inspection one may detect that the distribution of scores in Figure 8 have a slight positive skewness. The achievement of this group is below that of the 1947 population, with the median score being about three points lower, and nearly nine points below the published norms.

Types of Schools 1947

To compare the achievement of the different types of schools in the Province, quartiles and medians were calculated and are reported in Table XVI.

TABLE XVI

QUARTILES AND MEDIANS FOR THE DIFFERENT TYPES OF SCHOOLS ON THE TRESSLER ENGLISH TEST FOR THE NINTH GRADE MANITOBA PUPILS 1947

Groups Compared	N	Q ₁	Md.	Q ₃
Population	4,312	31.00	39.70	48.00
Collegiates	935	30.80	40.00	50.00
Two-Room High	534	28.53	37.55	46.66
One-Room High	608	30.55	37.94	46.88
Junior High	685	39.78	47.66	56.83
.....
Correspondence Branch	618	29.67	38.42	48.61

The Junior High School group shows achievement above the published norms, but all the other groups fall below, and with the exception of the Collegiates, below the quartiles and median of the total population. It is interesting to note, however, that the Correspondence Branch pupils show a very slight advantage over the Two-Room High and One-Room High groups. These three groups may be considered to represent areas more rural in character than do the Collegiates.

Types of Schools 1948

In 1948 identical groups were again compared for achievement in the same English test with the number of scores for each group approximately as large as in the 1947 analysis. The distributions for 1948 are given in Table XVII

TABLE XVII

QUARTILES AND MEDIANS FOR THE DIFFERENT TYPES OF SCHOOLS ON THE TRESSLER ENGLISH TEST FORM: C FOR THE NINTH GRADE MANITOBA PUPILS 1948

Groups	N	Q1	Md.	Q3
Population	4,323	27.11	36.21	45.88
Collegiates	1,156	28.01	37.42	41.74
Two-Room High	577	26.03	35.31	44.22
One-Room High	743	24.46	33.78	44.06
Junior High	621	32.39	41.09	50.68
.....
Correspondence Branch	550	23.93	33.23	43.56

The Junior High group shows lower achievement in 1948 than in 1947, and the median and quartiles of this group are below the published norms by about three points. The Collegiates have higher Q1 and median scores than the Q1 and median of the population, but the other three more distinctly rural groups have scores below the population norms.

The Test reveals parallel results in each of the two years, even although the attainment in 1948 is lower than that

in 1947. In Chapter IV (Tables IX and XII) attainment in mental ability of the 1948 population is lower than the attainment of the 1947 population, but it is difficult to conclude whether this lower attainment of the 1948 group in the two tests is due actually to lower mental ability of the group or that the forms of the same tests used in 1948 are more difficult.

The differences among groups which appear in Tables XVI and XVII were tested to determine if they are statistically significant and accordingly the means, the standard errors of means and standard deviations were calculated. These calculations for the 1947 and 1948 groups appear in Tables XVIII and XIX. Critical ratios and significance levels are summarized in Table XX.

TABLE XVIII

MEANS, STANDARD ERRORS OF MEANS AND STANDARD DEVIATIONS OF THE GROUPS COMPARED ON THE TRESSLER ENGLISH TEST OF THE NINTH GRADE MANITOBA PUPILS, 1947

Groups	N	Mean	S.E.M	S.D.
Population	4,312	39.70	.18	12.40
Collegiates	935	40.70	.44	13.57
Two-Room High	534	37.60	.56	13.15
One-Room High	608	36.40	.48	12.00
Junior High	685	47.86	.45	13.03
.....
Correspondence Branch	618	38.84	.52	13.32

TABLE XLX

MEANS, STANDARD ERRORS OF MEANS AND STANDARD DEVIATIONS ON THE TRESSLER ENGLISH TEST FORM: C FOR THE MANITOBA NINTH GRADE PUPILS, 1948

Groups	N	Mean	S.E. Mean	S.D.
Population	4,323	36.60	.19	12.85
Collegiates	1,156	37.50	.36	12.40
Two-Room High	577	35.20	.50	12.10
One-Room High	743	34.55	.48	13.10
Junior High	622	41.50	.51	12.90
.....				
Correspondence Branch	550	33.63	.55	12.95

If the mean is used for comparing the types of schools their position remains unchanged from that established by using the median for comparison. The scatter from the mean as represented by standard deviations differs only about one point and indicates that there is very little difference in the homogeneity of each group.

We may infer from Table XX that each year the Junior High group has shown the highest achievement in the English test, with the Collegiates coming second and that there is no difference in achievement between the Two-Room High and One-Room High Schools. Table XI represented these groups as having a comparatively equal mental ability average.

TABLE XX

STANDARD ERROR OF THE DIFFERENCE BETWEEN MEANS ON THE
TRESSLER ENGLISH TEST FOR THE NINTH GRADE PUPILS,
1947 and 1948

Groups Compared	$M_1 - M_2$	$\sqrt{\sigma_{M_1}^2 + \sigma_{M_2}^2}$	t	Significance Level
1947				
Collegiates and				
1. Two-Room High	3.10	.71	4.36	.01
2. Junior High	7.16	.63	11.36	.01
3. One-Room High	4.30	.65	6.61	.01
Two-Room High and				
1. One-Room High	1.20	.73	1.64	not sig.
2. Junior High	10.26	.76	14.36	.01
One-Room High and				
1. Junior High	11.46	.66	17.36	.01
.....				
1948				
Collegiates and				
1. Two-Room High	2.30	.61	3.77	.01
2. One-Room High	2.95	.60	4.91	.01
3. Junior High	4.00	.63	6.29	.01
Two-Room High and				
1. One-Room High	.65	.69	.91	not sig.
2. Junior High	6.30	.71	8.87	.01
One-Room High and				
1. Junior High	6.95	.70	9.92	.01

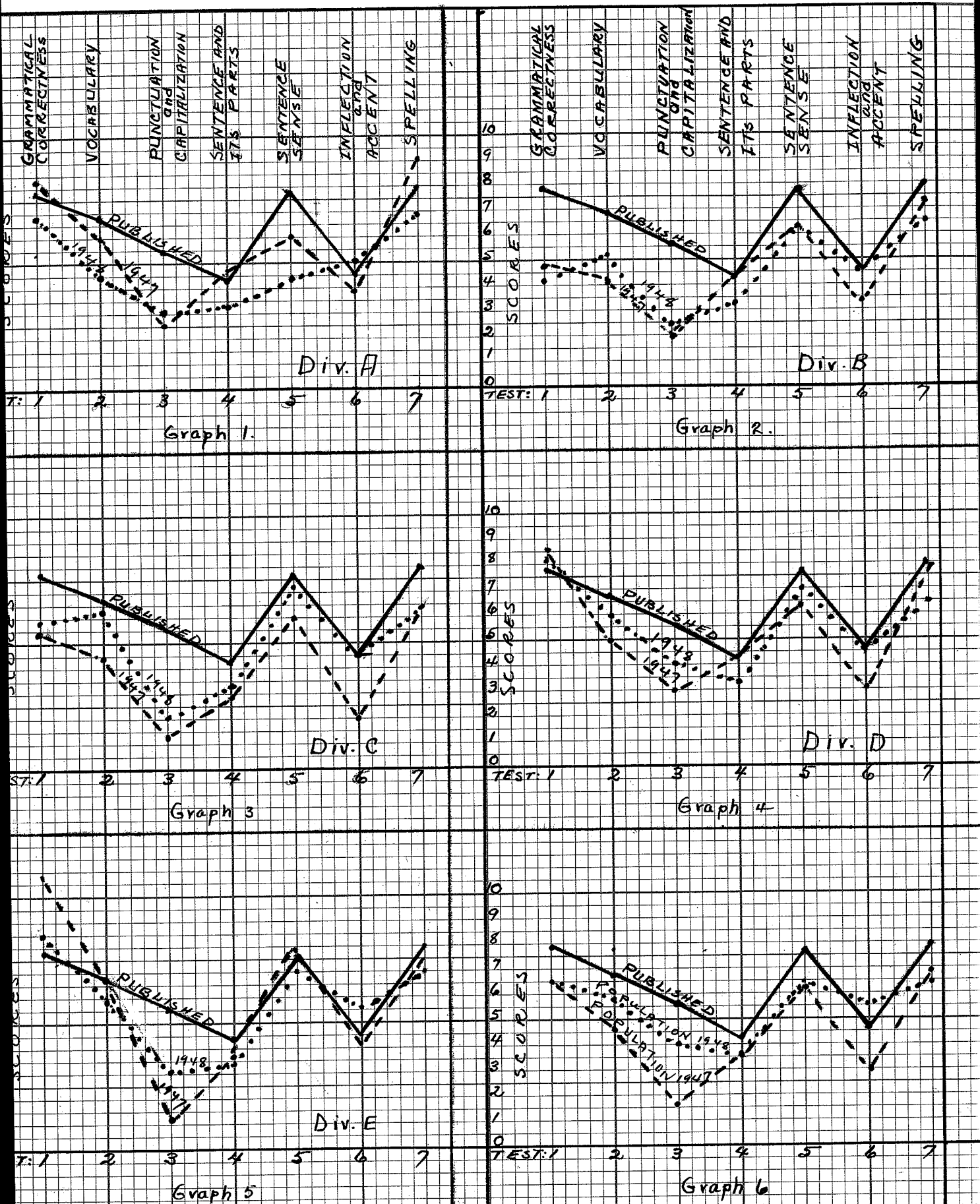


Figure 9.
 Comparison of Tressler English separate test
 medians for Grade IX Manitoba pupils 1947 and 1948.

Further analysis of the results was made to determine if any specific weaknesses existed in English and accordingly median scores were calculated for each of the seven independent tests using the scores of eleven Inspectoral Divisions as a representative sample. Comparison of the 1947 and 1948 results are shown by means of Graph 6, Fig. 9. in which the published norms also appear. A two year comparison for the five Inspectoral Divisions listed as A, B, C, D, and E and represented by Graphs 1, 2, 3, 4, and 5 also appear in Fig. 9.

It is evident, as shown in Fig. 9, that most medians in 1947 and 1948 are below the published norms and that the greatest weakness appears in Punctuation and Capitalization, with Vocabulary and Inflection and Accent in second position. In his study Conway² reports this weakness in Capitalization among the Grade IX pupils of British Columbia and Dora Smith³ writes:

"..of some fourteen elements of composition considered in numerous studies of pupil errors in English, Capitalization ranks commonly about fifth in difficulty and punctuation first."

In the Tressler English Test, however, Punctuation and Capitalization are combined in one test and no attempt was made in this analysis to separate these elements, however, a glance at graphs 1 to 5 representing the five separate Inspectoral Divisions will show particular weakness in the Punctuation and Capitalization part of the test. The remaining independent tests vary from Division to Division. In Divisions D and E, Grammatical Correctness, for example, is higher than the published median. This tendency is evident

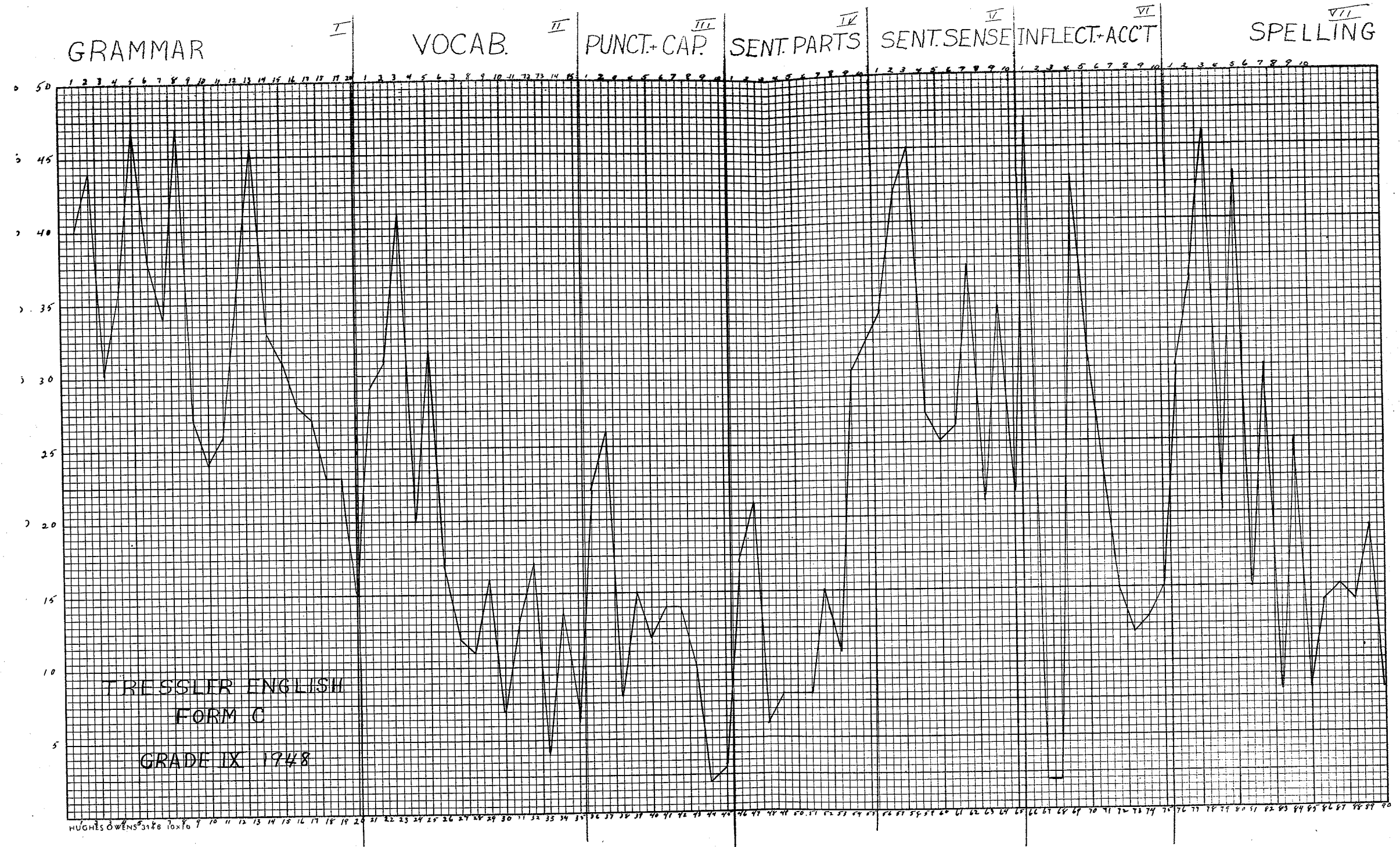


Figure 10.
Showing the number of correct responses in a sample of fifty on the Tressler English Test for the Manitoba Grade IX pupils, 1948.

in 1947 and 1948. It is interesting to note that in Division E there is a predominance of male teachers who stress the teaching of formal grammar. The graphs show an improvement in Inflection and Accent and Vocabulary in 1948. The weaknesses were discussed in 1947 and it is reasonable to assume that the elements which showed weakness in 1947 were stressed by the Inspectors and the teachers and hence the improvement.

A glance at Fig. 10 which is an analysis of a sample of fifty test papers question by question shows that the independent elements of the test that show weakness in Fig. 9 also show weakness when the sample is analyzed question by question.

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CHAPTER VI

ANALYSIS OF RESULTS OF TWO ENGLISH TESTS

Reading Grade LX

A total of 4,216 G rade LX scores were used to establish norms for the population taking the Haggerty Reading Examination Sigma 3, Form: A. Achievement of different types of schools was also determined and the data appear in Table XXI.

TABLE XXI

QUARTILES, MEANS AND STANDARD DEVIATIONS FOR THE POPULATIONS STUDIED AND TYPES OF SCHOOLS FOR THE GRADE LX MANITOBA PUPILS ON THE HAGGERTY READING EXAMINATION

Group	N	Q ₁	Md.	Q ₃	Mean	S.E _M	S.D.
Population	4,216	76.64	89.54	102.50	88.50	.29	18.80
Collegiates	1,464	79.31	91.68	104.28	91.35	.46	17.60
Two-Room High	539	70.72	83.94	98.41	84.00	.81	18.90
One-Room High	693	75.15	88.45	100.71	87.55	.69	18.10
Junior High	589	83.85	94.94	107.15	94.85	.13	16.20
Correspondence Branch	503	72.84	86.27	100.23	85.94	.87	18.55

The mean for the population studied is 88.50, which is 4.5 points higher than the published norm of 84. This suggests that the achievement in reading in the Province is satisfactory. The Correspondence Branch pupils have a mean higher than the published norm. The Collegiate and the Junior High pupils have slightly higher achievement, but the students in Two-Room and

One-Room High Schools are below the other groups and the mean for the population. This difference deserves further study. The standard of reading appears to be significantly higher in the Junior High group, with seventy-five percent of the students scoring above the published norm for the Grade. Further analysis of achievement in reading was made by computing the percentiles for the population and drawing an ogive curve.

Figure 11 gives the grade and age norms for the distribution of reading scores. Thirty-eight percent of the pupils are below the Grade IX norm and sixty-eight percent are above the published norm for Grade IX. We may again emphasize the fact that the test indicates a satisfactory level of achievement in reading for the whole Grade IX population. It is, however, evident that there exists a considerable range in reading ability. The weak pupils score as low as the Grade VI level, the strong as high as the Grade XII level. In fact, about twenty-five percent have an achievement equal to the Grade XII norm or above. No doubt it is difficult to fit students representing these two extremes and expect them to carry an equal study load. Twenty-four percent of the students, according to Figure 11, are below the Grade VIII level. One may conclude that these pupils are not prepared to carry the necessary reading in Level 1 of our secondary schools programme. It may be inferred that the teaching of reading at the Junior High level requires thorough appraisal and correction.

1. A programme for the retarded.
2. Provision for pupils reading at the required Grade level, and

3. A programme of instruction in higher reading skills for the superior readers.

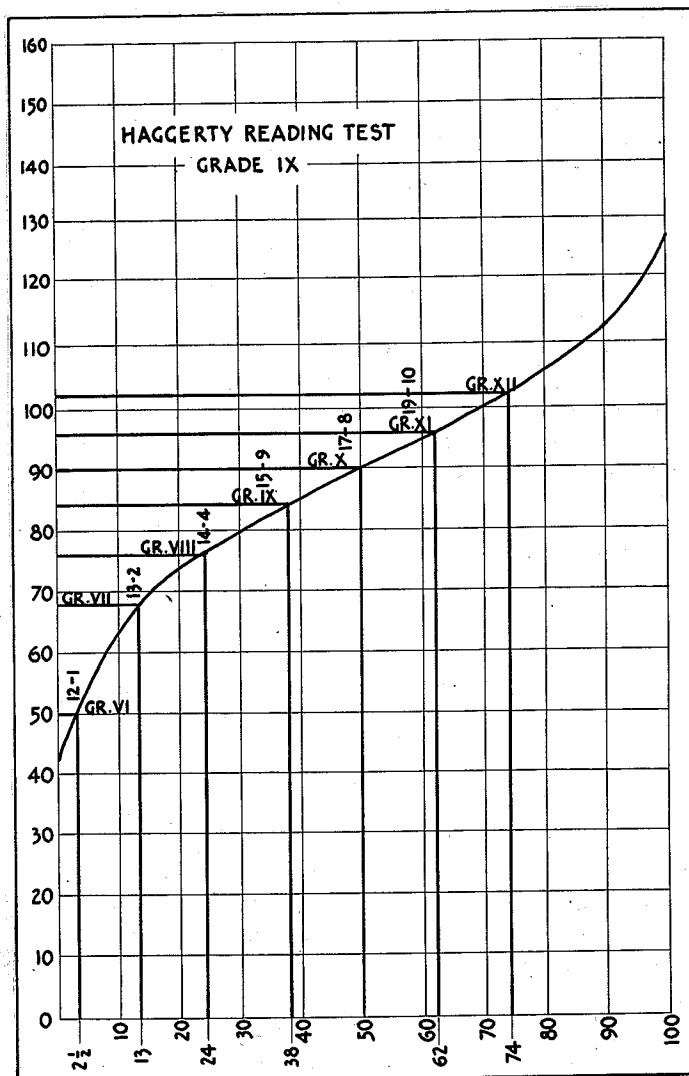


Figure 11

Percentile curve showing distribution of Grade and age norms for the Grade IX Manitoba pupils, 1949.

In order to be able to carry out this programme teachers will have to carry out suitable diagnosis.

"The teacher of silent reading knows the value of diagnosis through objective measurements; he charts progress and graphs results. He does not rely on personal impressions alone, knowing that subjective

data must be re-enforced by objective data if he is to secure an accurate picture of the pupil. The teacher of reading can no more afford to ignore laboratory tests than can the skilful physician. Correct diagnosis of reading difficulties is the logical preface to remedial measures."¹

It was hoped that the teachers would make use of the results of the Haggerty Reading Test in planning a programme of remediation for students starting Level 1 and those who failed Grade 1X. Principals had the total reading score on the test for each pupil. These scores appeared on the Score Sheet. By comparing the scores with the ogive curve the teacher could determine the reading level of each pupil and arrange a suitable programme. To provide further assistance in this project quartiles were determined for each part of the test: Vocabulary, Sentence Reading, and Paragraph Reading. There are no norms given for these separate parts, but norms for the population were established and the "quartiles" and means are given in Table XXII. Teachers, therefore, may use these to help them locate specific weaknesses for individual pupils.

TABLE XXII

QUARTILES, MEANS AND STANDARD DEVIATIONS
ESTABLISHED FOR EACH PART OF THE HAGGERTY
READING EXAMINATION SIGMA 3 FORM A,
GRADE 1X, 1949

	Q1	Md.	Q3	Mean	S.E.M	S.D.
Vocabulary	26.56	31.79	36.78	31.60	.19	7.30
Sentence Reading	19.66	24.46	29.67	24.05	.18	7.20
Paragraph Reading	30.17	35.52	41.49	35.30	.19	7.65

¹ Stella S. Center and Gladys L. Persons, Teaching High School Students to Read, New York: D. Appleton-Century Company Inc., 1937, p.127

Reading Test Results Grade X, 1949

A total of 538 test booklets were re-scored to find the central tendency for the A.C.E. Reading Comprehension Test. The established mean for this sample was 48.15 with a standard error of the mean of .41 and a S.D. of 9.65. The published mean and S.D. for the test at the end of Grade X are given as 47.6 and 9.2 respectively. This sample would, therefore, indicate a satisfactory standard of achievement at the end of Grade X. In view of what has been discovered in Grade IX it would indicate that reading ability is an important factor in the elimination of pupils at the end of Grade IX and selection for Grade X.

To obviate the re-scoring of all test booklets correlations between the total reading score and the vocabulary score were computed. Scores of four Inspectoral Divisions and the Correspondence Branch were used as separate samples.

TABLE XXIII

CORRELATIONS OF VOCABULARY SCORES AND TOTAL
READING SCORES A.C.E. READING COMPREHENSION
TEST FORM S, G RADE X, 1949

Sample	N	r.
1	97	.84
2	127	.83
3	125	.89
4	112	.90
5	90	.84

In Table XXIII co-efficients of correlations range from .83 to .90. All these may be considered as highly significant, and accordingly vocabulary scores regarded as normal.

Vocabulary scores appeared on the Score Sheets, and an analysis of these scores was made for the population studied. Table XXIV summarizes the data.

TABLE XXIV
VOCABULARY A.C.E. READING COMPREHENSION TEST
FORM S, GRADE X, 1949

	Q ₁	Md.	Q ₃	Mean	S.E _M	S.D.
Population (3,573 scores)	39.97	45.92	53.01	46.30	.17	10.00
Published	41.00#	47.00#	53.00#	47.5		9.60

Interpolated

Although the vocabulary results seem to compare closely with the published norms, nevertheless, twenty-five percent of the Grade X pupils are below the Grade VIII published mean of 39. On the other hand, the top twenty-five percent are above the published Grade XII mean of 53.8. Achievement at Grade X level is very similar to that at the Grade IX level. Hence every effort should be made to arrange a suitable reading programme for weaker pupils in Grade X.

CHAPTER VII

ANALYSIS OF RESULTS OF TWO STANDARDIZED ARITHMETIC TESTS

In this chapter an analysis is made of the scores of the Dominion Arithmetic Test and the Beattie Mathematical Fundamentals Test. The scores on the Dominion Arithmetic Test for the Grade IX, 1947 group are compared with the Grade IX, 1948 group. The analysis of the Beattie Test has to do with the Grade IX and Grade X results for 1949. Grade IX findings are used to determine whether any difference in achievement exists among the five types of schools.

Dominion Arithmetic Test

Comparison of results was first made by using the quartiles and the median. These data appear on Tables XXV and XXVI.

TABLE XXV

QUARTILES AND MEDIANS FOR THE GROUPS COMPARED ON THE
DOMINION ARITHMETIC TEST FORM: A FOR THE NINTH
GRADE MANITOBA PUPILS, 1947

Groups Compared	N	Q1	Md.	Q3
Population	4,345	54.60	62.05	67.80
Collegiates	933	53.73	62.60	69.45
Two-Room High	534	55.17	62.40	68.40
One-Room High	620	53.78	62.27	69.42
Junior High	656	53.78	62.27	68.40
Correspondence Branch	618	53.73	62.60	69.45

TABLE XXVI

QUARTILES AND MEDIANS FOR THE GROUPS COMPARED ON THE
DOMINION ARITHMETIC TEST FORM: B FOR THE NINTH
GRADE MANITOBA PUPILS, 1948

Groups Compared	N	Q1	Md.	Q3
Population	4,378	55.81	62.81	68.66
Collegiates	1,168	56.00	62.28	68.04
Two-Room High	585	55.34	63.27	69.37
One-Room High	734	55.60	62.56	68.40
Junior High	660	58.55	64.54	69.81
Correspondence Branch	524	52.46	60.75	66.45

No significant difference exists between median scores of the various groups compared, nor do groups differ from the median for the population. Differences at the Q1 and Q3 levels do appear but they are not significant. However, in 1948, the Junior High and the Two-Room High groups have improved median scores and the Correspondence Branch two points lower. The number of pupil scores in the sample for the population studied each year do not differ significantly. Although the median scores in each year are nearly equal, it is impossible to determine whether the achievement is equal since the manual gives different Grade norms for each form. A comparison of quartiles and medians on the basis of grade norms is made in Table XXVII.

TABLE XXVII

COMPARISON OF 1947 AND 1948 GRADE IX RESULTS ON THE
DOMINION ARITHMETIC TEST ON THE BASIS OF PUBLISHED
GRADE NORMS

Groups Compared	Q ₁		Md.		Q ₃	
	1947	1948	1947	1948	1947	1948
Population	8.5	8.9	9.2	9.5	9.7	10.1
Collegiates	8.4	9.0	9.2	9.5	9.9	10.1
Two-Room High	8.6	8.9	9.2	9.6	9.8	10.2
One-Room High	8.4	8.9	9.2	9.5	9.9	10.2
Junior High	8.4	9.2	9.2	9.7	9.8	10.2
Correspondence Branch	8.4	8.6	9.2	9.4	9.9	9.9

On the basis of the Ontario norms, therefore, the achievement of the 1948 Grade IX groups is better than that for 1947. There is an improvement in achievement of about three months, the greatest improvement being noticeable in the first quartile. However, the Ontario Grade Norms show that approximately seventy-five percent of the Manitoba Grade IX pupils are below standard. Two conclusions may accordingly be made: either the Manitoba pupils are weak in arithmetic as compared with the Ontario pupils, or that the Ontario standards are too high for testing the achievement of pupils following the Manitoba curriculum.

Percentile curves were drawn to compare the achievement

of the population studied in 1947 and 1948 on the basis of Ontario Grade Norms and appear in Fig. 12.

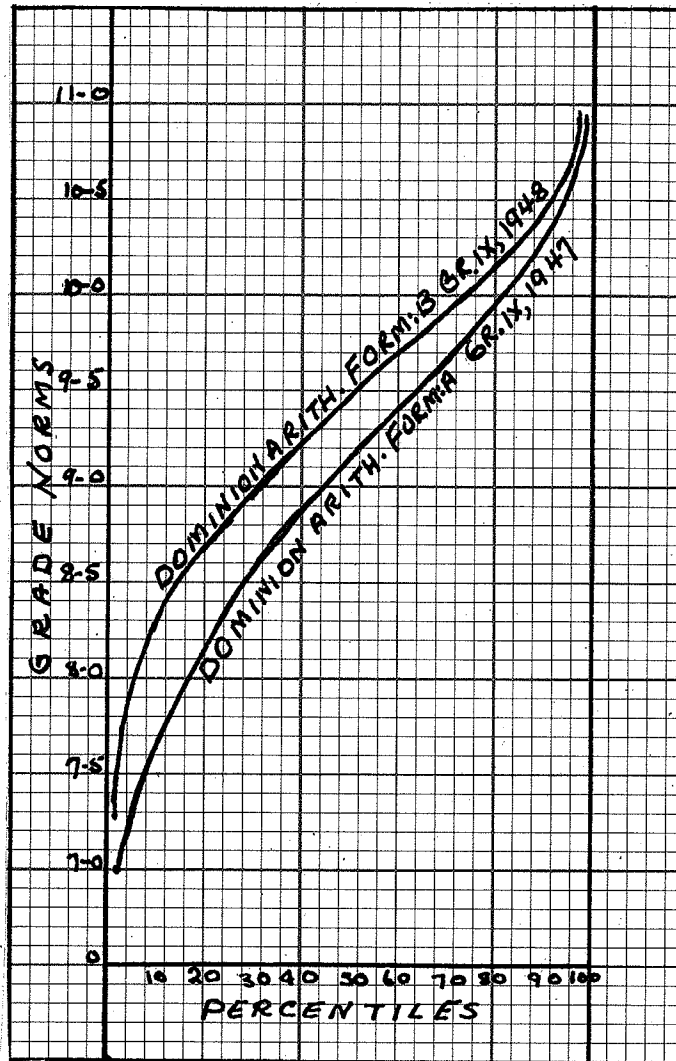


Figure 12.
Percentile curves of the Grade 1X population 1947 and 1948 on two different forms of the Dominion Arithmetic Test.

Additional calculations were made to determine whether any statistically significant difference could be found among the groups compared for which purpose the standard error of difference between two means was employed. The means, standard errors of means and standard deviations are tabulated in Table XXVII.

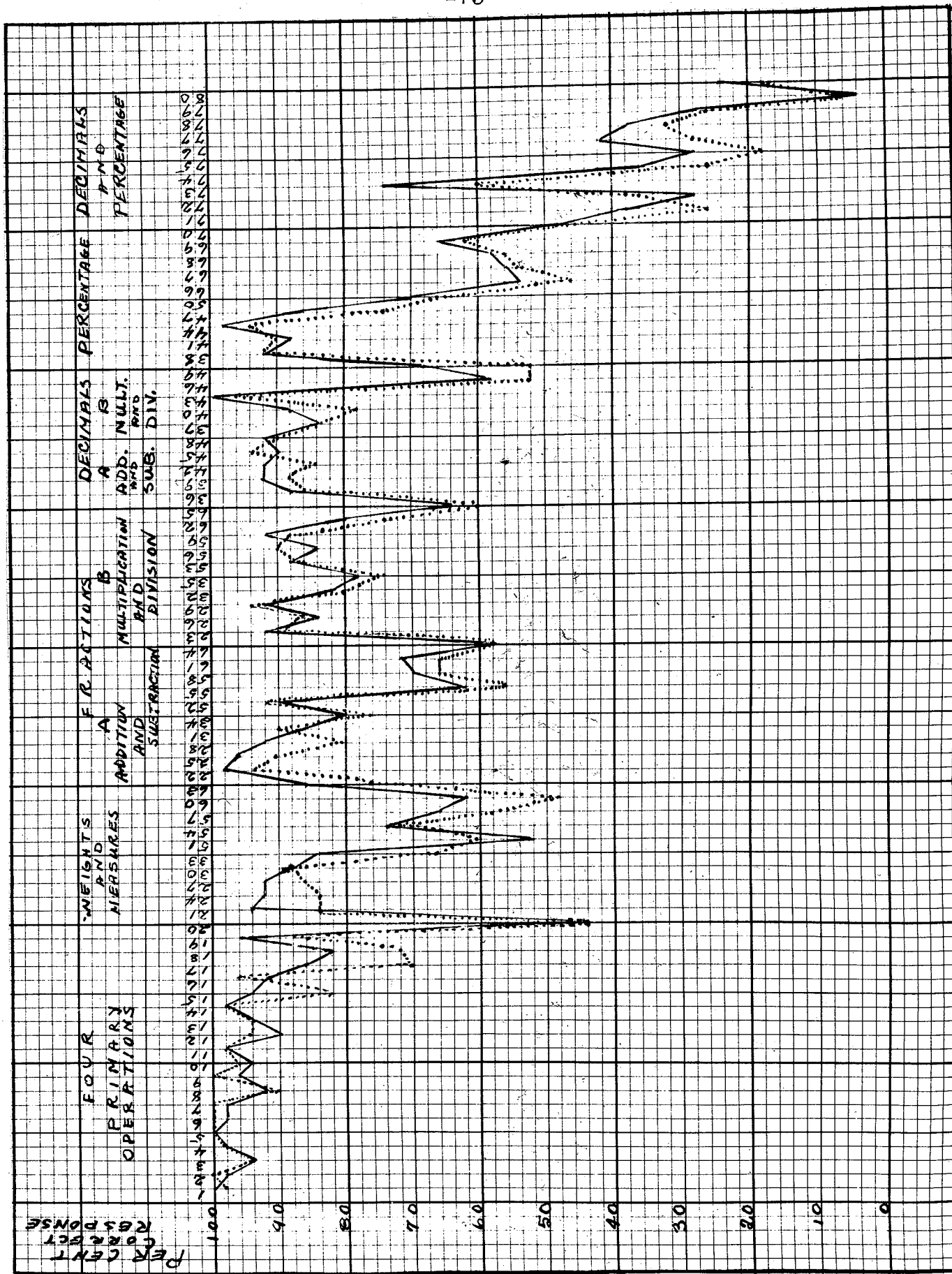


Figure 13.
 Showing Responses to Each Question for Two
 Samples on the Dominion Arithmetic Test, 1947.

TABLE XXVIII

MEANS, STANDARD ERROR OF MEANS AND STANDARD DEVIATIONS
OF GRADE IX GROUPS, 1947 and 1948

Group	N	Mean	S.E.M	S.D.
1947				
Population	4,345	60.45	.16	10.65
Collegiates	933	60.30	.36	11.15
Two-Room High	534	60.15	.47	10.85
One-Room High	620	60.30	.43	10.75
Junior High	656	62.70	.36	9.25
Correspondence Branch	618	61.05	.44	10.95
1948				
Population	4,378	62.90	.11	9.60
Collegiates	1,168	61.92	.26	9.17
Two-Room High	585	61.18	.42	10.20
One-Room High	734	60.95	.37	10.10
Junior High	660	63.05	.32	8.25
Correspondence Branch	524	58.65	.43	9.90

When the mean is used to estimate variability, the Junior High groups rank highest in achievement each year and, the Correspondence Branch pupils lowest in 1948.