

A FOLLOW-UP STUDY TO DETERMINE  
THE EFFECT OF ENRICHMENT PROGRAMS IN A HIGH SCHOOL  
UPON ACHIEVEMENT AT UNIVERSITY

A Thesis

Presented to

the Faculty of Graduate Studies and Research  
University of Manitoba



In Partial Fulfillment  
of the Requirements for the Degree of  
Master of Education

by

JOHN DOUGLAS MACFARLANE

August, 1961

## THESIS ABSTRACT

### Problem

The purpose of the study was to determine whether there were any significant differences in achievement for each of the first two years of higher education among three groups of bright students from the same high school where, during the Grade Eleven year, one of these groups received enrichment in the form of an extra subject; another received enrichment in the form of extra depth to the regular program, and the third group, serving as a control, received no special training.

The subjects of the experiment were one hundred students all of whom were in Grade Eleven in Kelvin High School, Winnipeg, Manitoba, during the academic year 1957-58, and most of whom entered the University of Manitoba after graduation from Grade Eleven.

### Method

The class taking an extra subject consisted of thirty-one students and was known as the Augmented Group. The class probing more deeply into the subjects of the regular program had an enrolment of thirty-eight, and was called the Enriched Group. The Control Group consisted of

thirty-one bright students in various regular classes.

During the academic year 1958-59, about one-quarter of each group, twenty-five students in all, took Grade Twelve, mainly at Kelvin. Sixty-six students, approximately two-thirds of each group, enrolled in First Year at the University of Manitoba. By the end of Second Year, in 1960, about eighty-five per cent of each of the special groups remained, but the Control Group was down to half of its original size.

Achievement was measured by means of final examination results. The Department of Education and the University made available normative data consisting of mean and standard deviation for each examination, which permitted the conversion of marks to Z-scores, a statistical device that put all examination results on the same scale with equal units of measurement. These Z-scores were averaged, both for each student and for each group, in Grade Twelve, in First Year, and in Second Year. Similar data had been found for Grade Ten in order to establish pre-treatment status, and for Grade Eleven, to measure immediate post-treatment effect.

Three groups at each of three levels provided nine mean Z-scores representing average achievement. Taking the groups in pairs at each level, the null hypothesis of the

equality of these means was tested. F-tests were used to show homogeneity of variances, and these were followed by t-tests in order to determine the significance of the differences in the mean Z-scores.

The t-tests were repeated on pre-treatment, immediate post-treatment, and follow-up data on limited groups, which were composed only of students who had completed Second Year.

### Findings

The limited groups, totalling seventy-four students, produced approximately the same results as the complete groups, but with the advantage of initial equality of achievement. On the basis of these limited groups, then, there was equality of achievement in Grade Ten, before treatment. The groups were again equal in mean achievement three years later, in Second Year. During the intervening two years, each of the special groups exhibited some superiority: the Augmented in Grades Eleven and Twelve, the Enriched in First Year.

The investigation of similar studies revealed that enrichment in high school produced superior results in high school, but not at college.

## Conclusions

1. No consistent pattern of superiority for enrichment in general, nor for either form of enrichment tested in this experiment, is evident.

2. The findings of several other studies have been verified; enrichment for bright students can produce superior results in high school, but not, in the long run, at university.

3. The immediate benefits in high school of enrichment by an extra subject did not carry over to university.

4. The Control Group did not compare well with the other two. At no time did it exhibit any significant superiority in achievement: it was either inferior or equal. Its drop-out rate at university was much higher than that of the other groups.

5. Enrichment by added depth to the regular program, which appeared to be not very successful in high school, did produce superior results in the first year at university.

## ACKNOWLEDGEMENT

This thesis was prepared under the direction of Dr. W. H. Lucow, Associate Professor of Education at the University of Manitoba. Dr. Lucow, in addition, gave permission for a report that he had helped prepare to be the starting point of this study. Throughout the course of carrying out, evaluating, and reporting this experiment, he has provided constant guidance.

Mr. R. J. Cochrane, Principal of Kelvin High School, made school records available, and provided information regarding the composition of the special groups.

Mr. R. C. Armatage, Assistant Registrar, University of Manitoba, made student records available and provided normative data for university examinations. Mr. L. S. Bennett, Registrar, and Mr. H. J. MacDonald, Research Director, both of the Manitoba Department of Education, also made student records available and provided normative data for Grade Twelve examinations.

Miss J. Sneizek, secretary, Kelvin High School, located school records as needed.

Miss Joan MacFarlane, the writer's niece, provided information regarding the whereabouts and occupation of most of the students of the study.

Dorothy MacFarlane, the writer's wife, provided patient understanding and encouragement, as well as practical assistance in the form of tabulating scores and checking tables.

Without the assistance of all these persons, the thesis could not have been completed in its present form. Their contributions are gratefully acknowledged.

August, 1961

J. D. MacFarlane

TABLE OF CONTENTS

	Page
LIST OF TABLES . . . . .	vii
Chapter	
I. THE NATURE AND BACKGROUND OF THE INVESTIGATION .	1
The Problem	
The Setting of the Study	
The General Course	
Matriculation in Manitoba	
Kelvin School	
The Augmented Class	
The Enriched Class	
Higher Education in Manitoba	
The Previous Study	
Objectives of the Current Study	
Other Studies	
II. A REVIEW OF THE LITERATURE . . . . .	9
The Importance of the Study	
The needs of the gifted and of society	
Measurement of educational outcomes	
The Nature of Enrichment	
The Nature of Follow-up Studies	
The Terman study of genius	
Special Provisions for Gifted Students	
Enrichment vs. acceleration	
The Identification of Gifted Students	
Talented Youth Project	
Administrative policy	
Assessment of Enrichment Programs	
Opinion	
Studies showing no advantage from enrichment	
Studies showing some advantage from enrichment	
Design of a study	
Educators' interpretation of the results of studies	
Summary	
III. THE DESIGN OF THE EXPERIMENT . . . . .	29
Purpose	
The Experimental Population	
Augmented Group	

TABLE OF CONTENTS - Continued

Chapter	Page
Enriched Group	
Control Group	
Achievement Criteria	
Before-treatment status	
Standard scores	
The criterion of group performance	
Z-score data tables	
The Treatments	
Augmented Group	
Enriched Group	
Control Group	
Effects of non-experimental variables	
Status immediately after treatment	
Status Beyond Grade Eleven	
Chronology	
Locating students	
Criteria of achievement	
Conversion of marks to Z-scores	
Students outside Manitoba	
Statistical Techniques	
Sampling	
Probability	
The null hypothesis	
The F-test	
The t-test	
Tests of Significance	
Limited groups	
Hypotheses	
 IV. PRESENTATION AND ANALYSIS OF DATA . . . . .	 47
Status of Groups Immediately After Treatment	
Tests of significance	
Interpretation	
Location and Achievement of Groups in the	
Follow-up Years	
Disposition of students	
Differences of means after Grade Twelve,	
First Year, and Second Year	
Interpretation of differences of means	
Tests of Significance with Limited Groups	
Size and mean achievement of limited groups	
Hypotheses of equal mean Z-scores	
Interpretation of differences of means	
 V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS . . . . .	 62
Summary	

TABLE OF CONTENTS - Continued

Chapter	Page
Conclusions	
Limited groups vs. complete groups	
General conclusions	
The Augmented Group	
The Enriched Group	
The Control Group	
Summary of conclusions	
Speculation and Recommendations	
BIBLIOGRAPHY . . . . .	69
APPENDIX	
A. TABLES OF MARKS, NORMATIVE DATA, AND Z-SCORES .	73
B. THE PREVIOUS STUDY . . . . .	102

## LIST OF TABLES

Table	Page
I. Significance of the Differences Among the Groups in Grade Ten . . . . .	48
II. Significance of the Differences Among the Groups in Grade Eleven . . . . .	48
III. Disposition of the Hundred Students of the Study, 1958-59 . . . . .	50
IV. Disposition of the Hundred Students of the Study, 1959-60 . . . . .	51
V. Significance of the Differences Among the Groups in Grade Twelve . . . . .	53
VI. Significance of the Differences Among the Groups in First Year . . . . .	53
VII. Significance of the Differences Among the Groups in Second Year . . . . .	54
VIII. Significance of the Differences Among the Limited Groups in Grade Ten . . . . .	58
IX. Significance of the Differences Among the Limited Groups in Grade Eleven . . . . .	58
X. Significance of the Differences Among the Limited Groups in First Year . . . . .	59
XI. School Marks for the Augmented Group in Grade Ten, Kelvin School, April, 1957 . . . . .	74
XII. School Marks for the Enriched Group in Grade Ten, Kelvin School, April, 1957 . . . . .	75
XIII. School Marks for the Control Group in Grade Ten, Kelvin School, April, 1957 . . . . .	76
XIV. Measures of Central Tendency for Kelvin School as a Whole for Grade Ten in April, 1957 . . . . .	77
XV. Z-scores for the Augmented Group in Grade Ten, Kelvin School, April, 1957 . . . . .	78

LIST OF TABLES - Continued

Table	Page
XVI. Z-scores for the Enriched Group in Grade Ten, Kelvin School, April, 1957 . . .	79
XVII. Z-scores for the Control Group in Grade Ten, Kelvin School, April, 1957 . . .	80
XVIII. Composite School Marks for the Augmented Group in Grade Eleven, Kelvin School, April, 1958 . . . . .	81
XIX. Composite School Marks for the Enriched Group in Grade Eleven, Kelvin School, April, 1958 . . . . .	82
XX. Composite School Marks for the Control Group in Grade Eleven, Kelvin School, April, 1958 . . . . .	83
XXI. Measures of Central Tendency for Composite School Marks for Kelvin School as a Whole, Grade Eleven, April, 1958 . . . . .	84
XXII. Z-scores for the Augmented Group in Grade Eleven, Kelvin School, April, 1958 . . . .	85
XXIII. Z-scores for the Enriched Group in Grade Eleven, Kelvin School, April, 1958 . . . .	86
XXIV. Z-scores for the Control Group in Grade Eleven, Kelvin School, April, 1958 . . . .	87
XXV. Measures of Central Tendency for Subjects of Grade Twelve and First Year at the University of Manitoba, June, 1959 . . . .	88
XXVI. Marks in Grade Twelve and First Year University for the Augmented Group, June, 1959 . . . . .	89
XXVII. Marks in Grade Twelve and First Year University for the Enriched Group, June, 1959 . . . . .	90
XXVIII. Marks in Grade Twelve and First Year University for the Control Group, June, 1959 . . . . .	91

LIST OF TABLES - Continued

Table	Page
XXIX. Z-scores in Grade Twelve and First Year University for the Augmented Group, June, 1959 . . . . .	92
XXX. Z-scores in Grade Twelve and First Year University for the Enriched Group, June, 1959 . . . . .	93
XXXI. Z-scores in Grade Twelve and First Year University for the Control Group, June, 1959 . . . . .	94
XXXII. Measures of Central Tendency for Subjects of Second Year at the University of Manitoba, April, 1960 . . . . .	95
XXXIII. Marks in Second Year University for the Augmented Group, April, 1960 . . . . .	96
XXXIV. Marks in Second Year University for the Enriched Group, April, 1960 . . . . .	97
XXXV. Marks in Second Year University for the Control Group, April, 1960 . . . . .	98
XXXVI. Z-scores for the Augmented Group in Second Year University, April, 1960 . . . . .	99
XXXVII. Z-scores for the Enriched Group in Second Year University, April, 1960 . . . . .	100
XXXVIII. Z-scores for the Control Group in Second Year University, April, 1960 . . . . .	101

## CHAPTER I

### THE NATURE AND BACKGROUND OF THE INVESTIGATION

#### The Problem

The purpose of this study is to determine whether there were any significant differences in achievement for each of the first two years of higher education among three groups of bright students from the same high school where, during the Grade Eleven year, one of these groups received enrichment in the form of an extra subject; another received enrichment in the form of extra depth to the regular program, and the third group, serving as a control, received no special training.

The subjects of the experiment were one hundred students all of whom were in Grade Eleven in Kelvin High School, Winnipeg, Manitoba, during the academic year 1957-58, and most of whom entered the University of Manitoba after graduation from Grade Eleven.

#### The Setting of the Study

The General Course.-- High school students in this province are governed by a curriculum that is authorized by the provincial Department of Education; details for the year

in question may be found in the Programme of Studies.<sup>1</sup> While in theory there is considerable freedom of choice of both courses and subjects, in practice, one course and a relatively small group of subjects are selected by the vast majority of students. This course, known as the General Course, is the prerequisite for entrance to the University of Manitoba.

In Grade Eleven, required academic subjects in the General Course are: English, mathematics, history, and a science; options include an additional science and a foreign language. The most popular combination of subjects, and that chosen by most of the students of this study, is: English, history, mathematics, chemistry, physics, French. In a few cases, Latin is chosen instead of French, or biology instead of one of the listed sciences, or even two foreign languages and only one science.

The six subjects listed above, with the possible alterations as shown, will be known in this thesis as the "regular program."

Matriculation in Manitoba.-- Successful completion of the General Course in Grade Eleven results in the grant-

---

<sup>1</sup>Programme of Studies for the Schools of Manitoba. Senior High Schools 1957-58. (Department of Education. The Queen's Printer for Manitoba, 1957).

ing of Junior Matriculation standing which permits entry to First Year in Arts or Science at the University of Manitoba.

Junior Matriculants may, if they wish, take the General Course in Grade Twelve which, if completed successfully, gives Senior Matriculation standing. Grade Twelve and First Year at the University of Manitoba are equivalent in terms of qualification, as either permits entry to Second Year.

Kelvin School.-- The building has been in continuous use as a high school since its completion in 1910. It is located in the River Heights district of Winnipeg, an area populated largely by upper middle-class families. The majority of fathers of Kelvin students are in professional, managerial, or proprietorial occupations; details may be found on pages 138 - 141 of Appendix B.

For the year of the original experiment, all instructors of academic subjects in the school had at least one university degree, professional training, and considerable teaching experience.

#### Special Classes for Bright Students at Kelvin

The Augmented Class.-- In 1955, the principal of the school, Mr. R. J. Cochrane, instituted a special class in

Grade Eleven for bright students. This class was to take the regular program, as previously defined, and an additional subject - either Latin or biology. The necessary time was to be found by reducing the normal time allotment for each subject. Interested students were invited to make application, and selection was based on a combination of school marks, I.Q., and teacher ratings on attitude and effort.

The scheme was considered successful, and is now a permanent feature of the school.

The Augmented Class of 1957-58, consisting of thirty-one students, constitutes one of the experimental groups of this study.

The Enriched Class.-- In 1957, a second special class for bright students entering Grade Eleven was instituted. This one was to have a contrasting type of enrichment: added depth to the subjects of the regular program.

A careful selection of staff members was made, and meetings were held at which enrichment techniques were discussed. Funds were made available for the purchase of materials required. Membership was again by application, and only students of above average ability were accepted.

This class did not appeal to students as much as did the Augmented Class. In succeeding years, the number of applicants declined progressively with the result that the

group was discontinued in 1960. The findings of this study may indicate that popularity is not always a measure of worth.

The original Enriched Class of 1957-58, numbering thirty-eight, constitutes the second special group of this experiment.

### Higher Education in Manitoba

The organization of higher education in Manitoba is ideally suited to a study of this type. All university education in the province is under the jurisdiction of the University of Manitoba. The result is that, regardless of the institution attended, standard courses are followed and standard examinations written.

The University of Manitoba is by far the largest institution of higher learning in the province; the others, collectively, are known as the affiliated colleges. Nearly all of them are located in Greater Winnipeg.

Most of the hundred students being studied did go on to higher education, and very few of them left the province for it. Thus, to a very large degree, the achievement at university of the students of the study was based on a background of common courses and examinations.

### The Previous Study

In order to compare the immediate effectiveness of the two enrichment programs as shown by school marks in Grade Eleven, a study was made by Dr. W. H. Lucow of the Faculty of Education, University of Manitoba, late in 1958, using data available as of April of that year. Although the complete report is attached as Appendix B, a brief description of the study and its findings is pertinent here.

The main concern of the investigation was the relative academic performances in Grade Eleven of the Augmented and Enriched Classes for the school year 1957-58. In order to complete the comparison, a Control Group composed of thirty-one bright students in regular classes was used. By finding mean examination marks for all students in the grade, and for each of the special groups separately, both in Grade Ten and in Grade Eleven, it was possible to determine the status of each group both before and after treatment. From these data, certain conclusions were drawn regarding the relative improvement of the groups.

There were two main findings:

1. The Augmented and Enriched Classes were not significantly different from each other in mean achievement in Grade Ten. The Control Group was below them significantly.
2. After the experiment in Grade Eleven, the Aug-

mented Class emerged significantly higher than the other groups who were now equal in mean achievement.

### Objectives of the Current Study

The main objective of the current study was to determine whether there were any significant differences in mean achievement between the groups at the end of each of the first two years of higher education.

More specifically, the following null hypotheses were tested at each of three levels - Grade Twelve, First Year and Second Year at the University of Manitoba:

1. The means of the final standing scores of the Augmented and Enriched Groups were not significantly different.
2. The means of the final standing scores of the Augmented and Control Groups were not significantly different.
3. The means of the final standing scores of the Enriched and Control Groups were not significantly different.

### Other Studies

The consideration of background material now shifts to an examination of what is already known regarding the problem. Reports of achievement of special classes similar

to those in this study have appeared in journals and in dissertations written outside of Manitoba. Chapter II gives a review of the literature.

## CHAPTER II

### A REVIEW OF THE LITERATURE

Evidence, in the form of the findings of previous studies and the opinion of experts, will be presented in the following areas:

1. The importance of the study.
2. The nature of enrichment.
3. The nature of follow-up studies.
4. Special provisions for gifted students.
5. The identification of gifted students.
6. Assessment of enrichment programs.

#### The Importance of the Study

Literature on enrichment programs was reviewed for the purpose of finding answers to three main questions:

1. Is enrichment desirable?
2. How may enrichment be evaluated?
3. Have enrichment programs provided superior training for bright students?

The needs of the gifted and of society.-- Numerous articles in popular periodicals provide ample evidence that the quality of education is a matter of deep concern in

both the United States and Canada today. This concern seems to include a realization that past practices have tended to neglect students of above average ability. The President of Harvard, James B. Conant, speaking in 1952 on the shortcomings of American public schools, stated: "To my mind, first and foremost among these shortcomings is their failure to be sufficiently concerned with the intellectually able youth."<sup>1</sup> In discussing the democratic approach to education, another educator has said, "There is nothing so unequal as the equal treatment of unequals."<sup>2</sup>

Studies have shown that not only gifted students and their parents but also community leaders in many fields favor special provision for the talented. By means of a questionnaire submitted to one hundred bright students and their parents, Hays determined that seventy-five per cent of the group approved of election of an additional academic subject and of ability grouping.<sup>3</sup> In an effort to obtain significant opinion as to what should be done with regard to the education of intellectually gifted students at the

---

<sup>1</sup>Charles E. Bish, "Can We Provide a Better Program for the Able Student?" The National Association of Secondary Schools Principals Bulletin, 42:16, December, 1958.

<sup>2</sup>Ibid.

<sup>3</sup>Donald G. Hays, "Educational Decision-Making by Superior Secondary-School Students and Their Parents," Dissertation Abstracts, 21:547, September, 1960.

secondary school level, Smith sent questionnaires to 3500 selected individuals such as Parent Teacher Association executives, labor leaders, principals and education professors.<sup>4</sup> The majority of 1459 replies favored the establishment of high standards of achievement with rigorous training in a hard core of required subjects for all gifted students. Thus public opinion, as indicated by these samples, favors getting the best out of the best students.

Measurement of educational outcomes.-- If education is to be considered a science, then, as a matter of course, its methods and results must be examined critically and objectively. To what extent is this the case? Carter feels that this is an area of weakness in education.<sup>5</sup>

In summary, one may note that the evaluation of special programs of education for the gifted suffers from the same limitations as evaluation of other programs of education. The problem involves subjectivities, and conclusions necessarily rest upon rendered judgments. Lack of adequate measuring devices and of accepted criteria makes appraisal difficult. The researchers have been critical, and have used the methods available. A survey of the evidence makes clear that the special programs for education of the gifted are regarded by the investigators, and by the gifted themselves, as providing valuable educational experiences for which the cost and trouble involved are amply justified.

---

<sup>4</sup>Gjertrud H. Smith, "Professional and Lay Attitudes Toward the Education of the Intellectually Gifted High School Student," Dissertation Abstracts, 20:939, September, 1959.

<sup>5</sup>Harold D. Carter, "Gifted Children," Encyclopedia of Educational Research (3rd ed.), 589.

This current study presents experimental evidence on the question of the value of enrichment for bright students, thus partially filling the gap mentioned by Carter.

### The Nature of Enrichment

Goldberg has pointed out that educators are by no means agreed as to just what constitutes enrichment:

No matter how adequately a school may handle the problems of grouping, grade placement, or even guidance, the major question in educating talented youngsters still remains unanswered: How should the actual course content and teaching method be differentiated for these students? The glib answer is, enrich the curriculum. But enrichment, like the weather, is something everybody talks about but few do anything about. We don't really know what enrichment is. Does it mean accelerated coverage of a standard course of study followed by advanced content in a given discipline, such as completing elementary algebra in the eighth year and thus, in the twelfth year, having time for a course in calculus? Or does it mean digging more deeply or extensively in selected areas, for example, studying original documents of some historical period? Or does it mean increased independent and creative work in some field of individual interest? Perhaps the very word enrichment is a misnomer; perhaps what is needed is not embellishment of existing course content but different content. Despite the plethora of "promising practices" suggested by and for teachers, these questions remain unanswered.<sup>6</sup>

Steps are being taken to gain fundamental knowledge

---

<sup>6</sup>Miriam L. Goldberg, "Recent Research on the Talented," Teachers College Record, 60:156, December, 1958.

about the nature of enrichment. Passow has described the work of the Horace Mann-Lincoln Institute of School Experimentation of Teachers' College, Columbia University, in the field of planning for talented youth.

With school personnel, the Staff is exploring the nature of enrichment in order to develop, if possible, a theoretical framework within which will be found guides for answering such questions as these: What is enriching? What kinds of learning experiences should gifted youngsters have that average children do not have? And conversely, what part of the learning that is considered necessary for most youngsters is not essential for talented children? The underlying theoretical base must help curriculum planners determine the ways in which the educational needs of talented youngsters are similar to and different from those of other students.<sup>7</sup>

In the light of these admissions of ignorance regarding the nature of enrichment, to define enrichment is indeed difficult. For the purposes of this thesis, any attempt to cater to the needs of bright students by means of adjustments to the curriculum will be considered as enrichment.

#### The Nature of Follow-up Studies

A follow-up study may be defined as an investigation which compares and contrasts characteristics of individuals at a certain stage of their development with the same

---

<sup>7</sup>A. Harry Passow, "Planning for Talented Youth: A Research Project," Educational Leadership, 13:253, January, 1956.

characteristics at an earlier stage. To be successful, such a study has two basic requirements: (1) locating a sufficiently large and representative group of the original subjects, and (2) obtaining valid and reliable information about them.

The vast majority of follow-up studies reported in the literature deal with opinions, feelings and other nonmeasurable characteristics. As a result, the questionnaire, being the most appropriate means of securing this kind of information, has been used extensively.

A few studies which are concerned primarily with academic performance at two levels will be discussed in detail in the section on assessment of enrichment programs.

The Terman study of genius.-- Undoubtedly the follow-up study which serves as a model of its kind was that conducted by Lewis M. Terman and associates, dealing with very bright children.<sup>8</sup> The subjects selected for study were chosen with extreme care. Intelligence tests were administered, followed by interviews with both the children and their parents. Of some quarter million children considered, 1528 were chosen, being entirely within the top one per cent

---

<sup>8</sup>Lewis M. Terman, and Melita H. Oden, The Gifted Child Grows Up (Vol. IV of Genetic Studies of Genius, ed. Lewis M. Terman. 4 vols; Stanford: Stanford University Press, 1947).

of the general population in intelligence, as indicated by the tests used. By means of interview, questionnaires and further tests, considerable information was obtained about each child in the areas of medical history, educational, social and emotional growth, interests and aptitudes.

Then in 1927, 1936, 1940, and 1945, as many as possible of the subjects were located, and, on each occasion, further questionnaires and tests were completed. Despite the passage of twenty-four years and the upsetting influence of a world war, Terman was successful in obtaining replies to 95.3 per cent of the questionnaires sent out in 1945. If the last known address failed to locate a subject, the investigators resorted to such sources as relatives, former employers, city directories and university alumni records.

It is the methods and not the findings of Terman's study that are significant for this investigation. Fortunately, the local situation was such that an equally high proportion of subjects was located with much less difficulty.

#### Special Provisions for Gifted Students

Passow has pointed out the basic nature of various provisions for the gifted:

Educational experiences for gifted students may differ from those of other children in at least three

ways: breadth or depth; in tempo or pace, coming at an earlier developmental stage or in less time; or in kind, being extra and of different nature from the usual program."<sup>9</sup>

Alterations in breadth, depth, or kind of education involve changes in the curriculum, hence may be considered to be enrichment. Quickening the tempo or pace has come to be known as acceleration. In confining this study to enrichment procedures, is a more widely accepted method of providing for gifted students being overlooked?

Enrichment vs. acceleration.-- Applbaum obtained the opinion of bright students and the principals of the schools they attended on the relative merits of enrichment and acceleration.<sup>10</sup> He sent questionnaires to 2804 Merit Winners representing the top one to two per cent of high school seniors in the United States in 1956, and determined by means of competitive examinations in a nation-wide talent hunt. Replies were received from 67 per cent of the students and 45 per cent of the principals. Their opinion clearly favored enrichment.

---

<sup>9</sup>A. Harry Passow, "Enrichment of Education for the Gifted," Fifty-seventh Yearbook of the National Society for the Study of Education, Part II, (Chicago, Illinois: 1957), p. 197.

<sup>10</sup>Morris J. Applbaum, "A Survey of Special Provisions for the Education of Academically Superior Students," The National Association of Secondary Schools Principals Bulletin, 43:26, October, 1959.

Only 7 per cent of principals and 6 per cent of students reported the practice of completing high school in fewer years utilized to a considerable extent. And only 25 per cent of students and 16 per cent of principals recommended this as a practice of considerable value.

On the other hand, 15 per cent of students and 38 per cent of principals reported independent study and research as utilized to a considerable extent, and 81 per cent of students and 73 per cent of principals recommended it as being of considerable value. Differentiated home work was recommended as being of considerable value by 42 per cent of students and 54 per cent of principals.

Similar findings were reported for other enrichment activities, thus indicating a majority favoring enrichment procedures as the more satisfactory means of providing for gifted students.

#### The Identification of Gifted Students

In providing enrichment for 69 Grade Eleven students out of a population of 326, the principal of Kelvin School assumed that 21 per cent of the students of that grade were capable of benefitting from such a program. Terman selected 1528 gifted children for study from a population of 250,000, approximately 0.6 per cent.<sup>11</sup>

---

<sup>11</sup>Terman, op. cit., p. 7.

Talented Youth Project.--- The minimum degree of giftedness of the subjects of any study of bright children will depend, to some extent, on the nature of the undertaking and the device that is used to measure ability. Passow quotes the operational definition used in the Talented Youth Project: "Talent is the capacity for superior achievement in certain areas of endeavor which have consistently advanced civilization."<sup>12</sup> It has the advantage of providing flexible criteria for determining who is talented.

Administrative policy.--- Williams approaches the problem of identification from the point of view of the administrator:

It would be a mistake to limit a school program for the gifted to those students with I.Q.'s above 170, or even above 140. Even if intelligence tests were completely accurate tools of measurement, and they are not, the establishment of a high figure as a cut-off line would still be unrealistic. Taking Terman's figures for the frequency of I.Q.'s at different levels, the schools could expect to find only 3 out of 10,000 children with I.Q. above 170, and approximately .6 per cent above 140. Even if these figures are doubled, the resulting number of cases is too small to warrant more than an occasional personalized counselor-pupil type of program.

For several reasons it seems much more realistic to

---

<sup>12</sup>A. Harry Passow, "Planning for Talented Youth: A Research Project," Educational Leadership, 13:250, January, 1956.

consider children in the upper 10 to 15 per cent of the school population as subjects for special consideration."<sup>13</sup>

Although the proportion of Kelvin students in special classes for the gifted is greater than the maximum suggested by Williams, this is likely justified by the generally high socio-economic status of the parents of Kelvin students and the consequently higher than average I.Q. of the student body.

#### Assessment of Enrichment Programs

Opinion.-- As has been mentioned, there is little objective evidence regarding the effectiveness of enrichment, despite its widespread use. By and large, the recipients of its claimed benefits seem to feel that they did indeed profit from enrichment. By means of a questionnaire, Barbe asked 703 adult graduates of special classes for gifted children in Cleveland for their opinion of such special classes.<sup>14</sup> Of 456 replies, 47 per cent approved with enthusiasm and 37 per cent approved with hesitancy. Only 2 per cent were strongly opposed.

---

<sup>13</sup>Clifford W. Williams, "Characteristics and Objectives of a Program for the Gifted," Fifty-seventh Yearbook of the National Society for the Study of Education, Part II, (Chicago, Illinois: 1957), p. 155.

<sup>14</sup>Walter B. Barbe, "Evaluation of Special Classes for Gifted Children," Exceptional Children, 22:61, November, 1955.

Studies showing no advantage from enrichment.--- One investigation, significant for its statement of purpose, was that conducted by Abramson to determine the influence of ability grouping in high school on performance in college.<sup>15</sup> He selected four New York City schools which grouped pupils of high intelligence and achievement as follows:

1. Heterogeneous classes - all levels of ability represented. This provided the control group.
2. Honor classes for one or two subjects.
3. An honor school which provided honor classes for most major subjects.
4. A special high school for gifted students.

Matched samples of forty-eight graduates were chosen from each school. It was assumed that there were no marked differences among the schools in curricula, methods of enrichment, or teaching. Achievement in college in specific subject areas was examined by grades earned in courses classified by judges as representing comparable content and level. This, surely, was a vulnerable point in the study. What judges are competent to declare courses in different institutions equal as to content and level with a degree of

---

<sup>15</sup>David A. Abramson, "The Effect of Ability Grouping in the High School Upon Achievement in College," Dissertation Abstracts, 20:221, July, 1959.

precision necessary for a statistical study?

The major finding, based on a statistical analysis, was that no significant differences were observed in the college achievement of graduates who experienced ability grouping in high school and those who had been grouped heterogeneously. The study concluded with the recommendation that future research be directed toward more marked changes in curricula and/or methods of teaching the high-ability student.

Shreve undertook to determine whether the graduates of a special college preparatory high school in an urban school system were superior to the graduates of three comprehensive high schools<sup>16</sup> in the same school system with respect to achievement on certain standardized tests and grade-point averages<sup>17</sup> earned during the freshman year in three universities.<sup>18</sup>

Immediately upon completion of high school, members

---

<sup>16</sup>A comprehensive high school is one offering a variety of courses to students of all levels of ability.

<sup>17</sup>A grade-point average is a measure of achievement based on alphabetical ratings. A value is assigned to each letter, e.g. A=4, B=3, etc.

<sup>18</sup>John W. Shreve, "A Study of the Effectiveness of Two Types of High School Programs in Preparing Youth for Academic Success in College," Dissertation Abstracts, 18:967, March, 1958.

of the special school were matched with members of the comprehensive schools to determine scholastic differences, as indicated by four standardized tests.

At the end of the freshman year graduates of the two types of schools were again matched and differences in mean scores on standardized tests and grade-point averages were analyzed to determine whether they were statistically significant. The five and one per cent levels of significance were accepted as "significant" and "very significant" respectively.

The main findings were:

1. Immediately after high school, the special group was superior to a significant degree in English and social studies. The comprehensive school group were significantly superior in science.

2. Five differences in eighteen points of comparison at one college were significant, favoring the special-school students. At another college, a single significant difference favored the comprehensive school students. At the third college, results were inconclusive.

It was concluded that graduation from the special school is no guarantee of higher college marks than would be earned by a student of similar ability who had graduated from one of the comprehensive schools.

The two studies considered thus far have indicated

no advantage for special treatment for the gifted. However, other studies have shown such special treatment to produce superior results.

Studies showing some advantage from enrichment.---

Using students with an I.Q. of 120 and up at a high school in North Carolina, Caraway measured the effect of special classes on academic achievement.<sup>19</sup> Special classes for the gifted were set up in all the major subject areas, but each student was placed in no more than two special classes per day, making comparisons possible. It was found that the academic achievement of gifted students in special classes surpassed the academic achievement of the same gifted students in regular classes.

In order to evaluate the effectiveness of special classes in the social studies at a university high school, Hoyt matched a sample of thirty-five intellectually superior students from these special classes with a sample of public school students from regular classes.<sup>20</sup> A follow-up inves-

---

<sup>19</sup>Sarah H. Caraway, "A Study of the Program for Gifted Students in Needham B. Broughton High School, Raleigh, North Carolina," Dissertation Abstracts, 20:2708, January, 1960.

<sup>20</sup>Daniel B. Hoyt, "A Follow-Up Study of Intellectually Superior Graduates of University High School, State University of Iowa, From 1940 Through 1954, with Emphasis Upon the Social Studies," Dissertation Abstracts, 19:1672, January, 1959.

tigation determined the significance of the difference in performance between the regular class and special class students in social studies courses given at the junior college level.

It was found that there was a difference at the two per cent level of significance favoring the performance of special class subjects over regular class subjects.

Using as subjects moderately gifted children of the public high schools of Cedar Rapids, Iowa, Doolin tested the hypothesis that a special program for these children would not cause positive educational change that was significantly above the growth of a similarly advanced group in a regular class without any special program.<sup>21</sup>

He found that the homogeneously grouped pupils excelled to a significant degree, the pupils in the regular classroom in achievement in areas closely related to the subject-matter material as measured by standardized tests.

Design of a study.-- One study was of interest mainly because of its excellent design.<sup>22</sup> The purpose was to deter-

---

<sup>21</sup>Ruie B. Doolin, "An Experiment with Moderately Gifted Children in the Public High Schools of Cedar Rapids, Iowa," Dissertation Abstracts, 16:1384, August, 1956.

<sup>22</sup>Robert J. Bauldauf, "A Comparison of the Extent of Educational Growth of Mentally Advanced Pupils in the Cedar Rapids Experiment," Journal of Educational Research, 52:181, January, 1959.

mine whether the use of an extended and enriched curriculum in the regular classroom contributes more to educational growth than the normal or typical curriculum.

The pupils in the experimental and control groups were randomly drawn by sections from a master list of all pupils with an I.Q. of 125 (California M.M.T.)<sup>22a</sup> or higher of fourth, fifth, sixth and seventh grade class sections of the Cedar Rapids school system. The experimental (curriculum enrichment program) groups were located in two grade schools and one junior high school. The control (typical program) groups were located in two other grade schools and one other junior high school. A total of ninety-five pupils were selected on the above basis.

All pupils in the study were tested the first two weeks in October 1954, and were re-tested during the last two weeks of May 1955. California Achievement Tests supplemented by the California Tests of Social and Related Sciences were used to measure educational achievement.

The hypothesis to be tested was that there was no significant difference in mean achievement test results for pupils of the curriculum enrichment program group (experimental schools) in the subjects of their grade as compared with the mean achievement test results for the pupils of the typical program (control schools).

---

<sup>22a</sup>California Mental Maturity Test.

A t-test was used with the level of significance set at 5 per cent. The results showed some significant differences in favor of the curriculum enrichment groups.

Educators' interpretation of the results of studies.--

Two studies investigating the effect of enrichment in high school on performance in college showed no significant benefits from the special treatment. In all cases but one, experiments showing significant gains compared groups of students at the high school level who had and who had not received enrichment. This would seem to indicate that enrichment procedures currently in use can help superior students to perform in school better than they otherwise would have, but have no significant effect on performance at college.

Some educators have interpreted results such as these as an indication of the failure of enrichment as a means of providing for the gifted. This statement appears in the summary of a panel discussion by a group of principals: "Very distressing these days is the mounting evidence that arbitrary measures to provide for the needs of gifted students produce inconclusive - or more often - definitely negative results."<sup>23</sup>

---

<sup>23</sup>Wilson Ivins, "How Can the Senior High School Best Provide for the Academically Talented Student?" The National Association of Secondary Schools Principals Bulletin, 43:27, April, 1959.

Alpren goes a step farther and assigns reasons for the presumed failure of enrichment in homogeneous classes:

Two problems have emerged for teachers attempting to provide for these classes containing the same pupils. One revolves about the diversity of talents of the pupils. It has led to the recognition that interests and abilities can be effectively pursued and realized upon by a very small percentage of pupils in all school areas. The second problem relates to the first. In classes where teachers are expected to enrich their programs, the amount of work expected of pupils has proved too exhaustive and out of proportion to their needs of leading balanced lives."<sup>24</sup>

#### Summary

It should now be possible to answer the three questions raised at the beginning of this chapter regarding the desirability, evaluation and success of enrichment. A majority of bright students and their parents, educators, and leaders in the community agree that enrichment of the curriculum for the gifted is a good thing. However, the available evidence indicates that enrichment programs are not automatically successful; indeed, studies show that enrichment procedures currently in use are providing training which produces, in some cases, superior high school graduates, but not superior college students.

---

<sup>24</sup>Morton Alpren, "Trends in Special Classes for Gifted Adolescents," The National Association of Secondary Schools Principals Bulletin, 44:136, October, 1960.

In the studies reported, full details of the methods by which enrichment programs were evaluated are lacking. However, several common elements were observed: the experimenters tested the hypothesis that there was no significant difference between groups which had had different training; they then, on the basis of statistical evidence, accepted this hypothesis or rejected it at a stated level of confidence.

In the following chapter, the design of this experiment is described.

## CHAPTER III

### THE DESIGN OF THE EXPERIMENT

#### Purpose

This study is concerned with the relative effectiveness of two forms of enrichment in Kelvin High School, as measured by subsequent performance at higher levels of education. These forms of enrichment are, briefly, an extra subject on the one hand, and extra depth to the regular program on the other. The average achievement of each of three groups of superior students in Grade Twelve or First Year University in 1959, and Second Year University in 1960 was measured by means of averaging standard scores based on final examination marks. The three groups of students, all in Grade Eleven in Kelvin High School in 1958, represent two experimental classes, each receiving one kind of enrichment, and a Control Group, undergoing no special treatment.

The purpose of this study was to determine what significant differences in achievement, if any, existed among these three groups of bright high school students at the end of Grade Twelve and First Year University, and again at the end of Second Year University.

### The Experimental Population

The hundred students selected for study were all in Grade Eleven in Kelvin High School, Winnipeg, in the school year 1957-58, divided about equally into three groups.

Augmented Group.-- This was composed of thirty-one successful applicants for a special class which took the regular program plus an extra subject. Only the best applicants were accepted, selection being based on the probability of success in this demanding course. Such factors as innate ability, past performance, work habits and attitudes were all considered.

Enriched Group.-- The second special class for able students was to have enrichment in another sense; that is, greater depth in each of the subjects of the regular program. Initially, membership was by application, and some of the most promising graduates of Grade Ten did apply. However, there were insufficient applicants for a complete class; and so, candidates who had been turned away from the Augmented Group and other students of above average ability were invited to join. Membership in this Enriched Group eventually reached thirty-eight.

Control Group.-- For purposes of comparison, a Control Group of thirty-one bright students in various

regular classes was set up. Although the best available, they were initially inferior to students of the other groups, as will be shown later.

In view of the methods of selection, these groups could not be considered random samples, either of the Kelvin Grade Eleven population of 1957-58, or even of Kelvin's bright Grade Eleven students of that year. However, subsequent statistical tests showed that all groups could be considered as belonging to the same population.

#### Achievement Criteria

Before-treatment status.-- The relative levels of academic ability of the three groups in the fall of 1957, at the beginning of their Grade Eleven year, were established by performance on April examinations in Grade Ten. There are several reasons why this provided a satisfactory standard. In the first place, all students of the study took both Grades Ten and Eleven at Kelvin. Secondly, all students wrote the April examinations, and all persons in the school taking a particular subject wrote the same examination. Thirdly, Kelvin teachers customarily hold informal conferences immediately after examinations to discuss marking standards, thus making for uniformity. Students attaining a satisfactory level of performance throughout the year were

exempted from writing final examinations, and many of the students of this study were in that category. Accordingly, the latest examinations written by all students, that is, those in April, were used.

In order to represent the marks for all students on a common scale, all marks were converted to Z-scores. This made it possible to reduce a list of the subject marks for a given student to a single representative score.

Standard scores.-- Percentage marks were converted to Z-scores on the assumption that Z-scores may be compared with one another and thus may be averaged, while marks should not be so treated.

Basically, marks are not comparable because they lack any common element, other than their maximum and minimum levels. Standard scores, on the other hand, do have a common element; each score represents a distance from a common mean, such distances being in standard deviation units, which are constant.

The Z-score is a convenient and widely-used type of standard score. A raw score may be converted to a Z-score by means of the formula:<sup>1</sup>

$$Z = \frac{10(X - M)}{\sigma} \div 50$$

---

<sup>1</sup>E.F. Lindquist, A First Course in Statistics (Cambridge, Mass: Houghton Mifflin Company, 1942), p. 149.

where  $X$  = the raw score,  $M$  = the mean, and  $\sigma$  = the standard deviation of the sample from which  $X$  is drawn.

The position of a raw score in a distribution cannot be determined from that score alone. Thus, a mark of 60 may be either the highest or the lowest in the group to which it belongs. Any standard score, on the other hand, is self-explanatory to the extent that the score indicates its own position in the distribution. Since Z-scores belong in a distribution with a mean of 50 and a standard deviation of 10, a Z-score of 60 is one standard deviation above the mean, or at approximately the 84th percentile.

The data of this experiment provide a striking illustration of the usefulness of standard scores. An examination of Table XXXII in Appendix A reveals that Food Study and Management 202 has a mean of 76.9 and a standard deviation of 6.9, while the corresponding figures for Physics 206 are 49.3 and 19.6. On the basis of raw scores, a mark of 77 in Food Study would carry more weight than 64 in Physics; yet, in terms of group performance, the 64 is well above the mean, while the 77 is just above it. The corresponding Z-scores are: Food Study 52, Physics 58.

All examination marks used in this study were converted to Z-scores, using the formula shown above.

The criterion of group performance.-- The average

Z-score was found for each student, and these, in turn, were averaged for each group. Thus, for each of the Augmented, Enriched, and Control Groups, there was a number representing average group performance on the April examinations of Grade Ten.

Z-score data tables.-- All raw scores and Z-scores, along with data and statistics required for the conversion, may be found in the tables of Appendix A. Tables XI - XVII inclusive indicate this information for Grade Ten.

#### The Treatments

Augmented Group.-- These students took all subjects of the regular program, and, in addition, either biology or Latin. Seven chose the former, twenty-four the latter. Time for the extra subject was found by reducing the number of periods allowed for each subject of the regular program.

Enriched Group.-- This class followed the regular program, but with added depth to each subject. Staff members who taught this group held several meetings during the course of the year at which many aspects of enrichment of the regular program were discussed. Efforts were made to find activities which would be challenging but attainable, and useful in future educational endeavors. However, in the

final analysis, the nature of enrichment varied from teacher to teacher, and the effects were somewhat uneven. Details of enrichment activities and the opinions of students may be found in Appendix B, pages 120 - 135.

Control Group.-- In addition to the lack of special treatment, this group differed from the others in two important respects. Whereas the Augmented and Enriched Groups were intact classes, students in the Control Group belonged to various classes. In addition, the general level of performance in classes to which Control Group students belonged was not nearly as high as in the special classes. It is reasonable to suppose also that there were differences in such things as nature of class discussion, diligence in completing class assignments, and general class attitude toward intellectual activities.

Effects of non-experimental variables.--- Two points emerge from the foregoing discussion. First, teacher differences may introduce bias into subsequent comparison of groups. However, it must be remembered that, with a few exceptions, different subjects were taught by different teachers. Each group, on the average, received instruction from six teachers. Thus, any systematic effects due to teacher differences would tend to be nullified.

Secondly, differences in treatment involved more than

simply the absence of enrichment, insofar as the Control Group was concerned. This must be borne in mind in suggesting reasons for differences in group performance.

Status immediately after treatment.-- The criterion of performance in Grade Eleven was the average of school marks in each subject in the December and April examinations; this average was known as a composite mark. Top students again did not write final examinations; teachers determined their standing for the year from these composite marks, which were thus the best measure of achievement available for all students.

Tables XVIII - XXIV indicate appropriate data and statistics for all groups in Grade Eleven.

#### Status Beyond Grade Eleven

Chronology.-- The current study picked up the students at this point, that is, in 1958, at the end of Grade Eleven, and followed them through to the end of Second Year University in 1960.

Data for this study were gathered in the summer of 1960, after the Second Year results became available.

Locating students.-- As a preliminary to the undertaking of this study, an estimate was needed of the number

of these students proceeding to higher education in order to determine whether such a study were justified. There were several sources of information:

1. The writer knew several of the students personally.
2. School records were available showing address, father's occupation, and educational intention for the following year.
3. The writer's niece, Joan M. of the Enriched Group, knew most of the students and had friends who knew the others.

This survey indicated that well over half of the original hundred students had enrolled in Second Year at the University of Manitoba, proving the feasibility of the project.

For reasons to be shown later, only students in Grade Twelve and those attending the University of Manitoba and its affiliated colleges were included in the statistical study. Records in the registrar's office at the University provided a further method of locating students, and a sure means of determining whether they were enrolled in this University.

Criteria of achievement.-- Percentage marks obtained in final examinations on subjects offered in Grade Twelve in

high school and in First and Second Year at the University of Manitoba and its affiliated colleges were used as the measure of achievement.

Details of the courses in Grade Twelve are to be found in the Programme of Studies for 1958-59,<sup>2</sup> and in First and Second Year, in the University calendar for 1958-59, and 1959-60, respectively.<sup>3</sup>

Grade Twelve and First Year were equivalent in terms of qualification; standing in either was the prerequisite for entry to Second Year. About one-quarter of the students of the study chose Grade Twelve.

All Grade Twelve students in Manitoba in 1959 wrote standard final examinations, set and marked under central authority. Mean and standard deviation for each examination were obtained from the Director of Research of the provincial Department of Education.

The situation at the University and affiliated colleges was very similar. Both in 1959 and in 1960, all students taking a particular subject wrote the same examination. Mean and standard deviation for each subject were

---

<sup>2</sup>Programme of Studies for the Schools of Manitoba. Senior High Schools 1958-59. (Department of Education. The Queen's Printer for Manitoba, 1958).

<sup>3</sup>University of Manitoba, General Calendar, 1958-59, and 1959-60; Winnipeg, Man.

available at the Registrar's office. (The University awards scholarships on the basis of Z-scores rather than marks).

Conversion of marks to Z-scores.--- The mean and standard deviation for each examination obtained from the Department of Education and the University were based on the marks of all students in the province who wrote that examination.

By use of the formula described on page 32, each mark was converted to the appropriate Z-score. Each student's achievement, then, was expressed in terms of the average achievement of all students in the province writing the same examination.

The use of Z-scores rather than marks would tend to nullify any bias that might have been introduced through different students taking different subjects.

Tables XXV - XXXVIII indicate, for each group, raw scores, normative data, and Z-scores at all levels beyond Grade Eleven.

Students outside Manitoba.--- Consideration was given to including in the statistical portion of the study, grades given to students attending educational institutions outside of this province. Accordingly, a letter was sent to the registrar of each of the seven universities concerned, requesting a record of grades earned by the student and

normative data. Four replies were received; grades were, for the most part, indicated alphabetically. In no case was any normative data supplied. As a consequence, results for these students were not used in the study.

### Statistical Techniques

Sampling.-- The groups under study in this experiment were not so chosen as to be considered random samples. However, the possibility existed that they did, in fact, belong to the same original population. This possibility was tested.

Probability.-- The differences in mean Z-scores were examined with a view to determining which were sufficiently large to be considered real, rather than merely the result of fluctuations in sampling. Since any difference, no matter how large, could conceivably be attributed to chance, the method of expressing the probability of such a difference being due to chance has been used.

If a difference is so large that it would be obtained by chance only once in one hundred similar samplings, then the probability of the difference being due to chance is .01. Stated in another way, it may be said that, at the 1 per cent level of significance, the difference is real.

The 5 per cent level, used frequently, expressing a slightly lower degree of significance, may also be accepted.

The null hypothesis.-- The most convenient way of testing the significance of the difference between two statistics, (means, for example), is to state the hypothesis that the means are equal, and then to accept this hypothesis or reject it at a specified level of significance. This hypothesis of equality or of no significant difference is known as the null hypothesis.

The F-test.-- The test of the significance of the difference of means of two samples is a t-test. However, before the appropriate t-test can be applied, it is necessary to know whether or not the variances of the groups are sufficiently homogeneous. The F-test is used to compare two variances.

The variance is a statistic used to express the variability of a sample. It is the square of the standard deviation, and is found by means of the formula:<sup>4</sup>

$$s^2 = \frac{\Sigma(X - M)^2}{N - 1}$$

where  $s^2$  is the variance,  $X$  is a raw score,  $M$  is the mean of the sample,  $\Sigma(X - M)^2$  is the sum of the squared deviations of raw scores from the mean,  $N$  is the number of cases, and

---

<sup>4</sup>James E. Wert, Charles O. Neidt and J. Stanley Ahmann, Statistical Methods in Educational and Psychological Research (New York: Appleton - Century - Crofts Inc., 1954), p. 59.



$N - 1$  is the number of degrees of freedom.

While  $\Sigma(X - M)^2$  may be calculated directly, its value is found more easily by use of the formula:<sup>5</sup>

$$\Sigma(X - M)^2 = \Sigma X^2 - \frac{(\Sigma X)^2}{N}$$

where  $N$  is the number of cases,  $\Sigma X^2$  is the sum of the squared scores in the group,  $(\Sigma X)^2$  is the square of the sum of the scores.

The comparison of variances is made by means of the variance ratio, also known as the F-ratio:<sup>6</sup>

$$F = \frac{s_1^2}{s_2^2}$$

where  $s_1^2$  and  $s_2^2$  are the variances of the samples,  $s_1^2$  always being the larger.

If the F-ratio for a pair of samples exceeds a critical value, then it can be stated, with a high degree of confidence, that the two samples do not possess sufficiently homogeneous variance to warrant use of the t-test employed in this thesis. Critical values for the F-ratio at the 1 and 5 per cent significance levels may be found by referring to

---

<sup>5</sup>Ibid., p. 57.

<sup>6</sup>Ibid., p. 134.

a table such as that in Wert, Neidt, and Ahmann's standard text.<sup>7</sup>

The t-test.--- The statistic, t, is designed to test the significance of the difference in means of a pair of samples, and may be found by means of the formula:<sup>8</sup>

$$t = \frac{M_1 - M_2}{\sqrt{\frac{\Sigma(X_1 - M_1)^2 / N_1 + \Sigma(X_2 - M_2)^2 / N_2}{N_1 + N_2 - 2}}}$$

where the number of degrees of freedom is given by:

$N_1 + N_2 - 2$ . The Wert, Neidt and Ahmann text contains a table of critical values of t.<sup>9</sup> If an obtained value of t exceeds the value shown in the table at the desired level of significance for the appropriate number of degrees of freedom, then the null hypothesis of equal means may be rejected at that level of significance.

---

<sup>7</sup>Ibid., p. 419.

<sup>8</sup>P. O. Johnson, Statistical Methods in Research (New York: Prentice-Hall, 1949), p. 74.

<sup>9</sup>Wert, et al., op. cit., p. 418.

### Tests of Significance

As a result of obtaining examination results, converting these to Z-scores, and averaging the results for each group at each level beyond Grade Eleven, nine mean Z-scores were obtained.

These hypotheses were tested:

1. The mean Z-scores of the Augmented and Enriched Groups in Grade Twelve were not significantly different.
2. The mean Z-scores of the Augmented and Control Groups in Grade Twelve were not significantly different.
3. The mean Z-scores of the Enriched and Control Groups in Grade Twelve were not significantly different.
4. The mean Z-scores of the Augmented and Enriched Groups in First Year were not significantly different.
5. The mean Z-scores of the Augmented and Control Groups in First Year were not significantly different.
6. The mean Z-scores of the Enriched and Control Groups in First Year were not significantly different.
7. The mean Z-scores of the Augmented and Enriched Groups in Second Year were not significantly different.
8. The mean Z-scores of the Augmented and Control Groups in Second Year were not significantly different.
9. The mean Z-scores of the Enriched and Control Groups in Second Year were not significantly different.

Limited groups.-- Prior to the start of the present experiment, it was known that the groups were not equal in mean achievement in Grade Ten; the Control Group was significantly below the others. As the data for this study were being gathered, it also became evident that the number of students of the Control Group continuing in higher education was much lower than for the other groups.

Assuming that the weakest students were dropping out, it was decided to repeat the tests of significance of differences in mean Z-scores among the groups, using scores of only those students who completed Second Year. It was hoped that this would result in the revised groups being equal in mean achievement before treatment.

To differentiate these tests of significance from those made on the unrevised groups, the term "limited groups" will be used to describe the original groups less all students who failed to complete Second Year. To assist in identifying the students of these limited groups, names of students not remaining at the end of Second Year are marked "#" in Tables XV - XVII, XXII - XXIV, and XXIX - XXXI.

The tests were carried out for means in Grade Ten, Grade Eleven, and First Year. Since the limited Control Group in Grade Twelve consisted of one student, tests were not made at this level. Tests of significance for Second Year were, of course, unchanged.

Hypotheses.--- For the limited groups as defined, these hypotheses were tested:

1. The mean Z-scores of the Augmented and Enriched Groups in Grade Ten were not significantly different.
2. The mean Z-scores of the Augmented and Control Groups in Grade Ten were not significantly different.
3. The mean Z-scores of the Enriched and Control Groups in Grade Ten were not significantly different.
4. The mean Z-scores of the Augmented and Enriched Groups in Grade Eleven were not significantly different.
5. The mean Z-scores of the Augmented and Control Groups in Grade Eleven were not significantly different.
6. The mean Z-scores of the Enriched and Control Groups in Grade Eleven were not significantly different.
7. The mean Z-scores of the Augmented and Enriched Groups in First Year were not significantly different.
8. The mean Z-scores of the Augmented and Control Groups in First Year were not significantly different.
9. The mean Z-scores of the Enriched and Control Groups in First Year were not significantly different.

## CHAPTER IV

### PRESENTATION AND ANALYSIS OF DATA

#### Status of Groups Immediately After Treatment

Tests of significance.-- Tables 2a and 3a, found on pages 155 and 158 of Appendix B, and reproduced here as Tables I and II, show the significance of the differences among the groups in Grade Ten and in Grade Eleven.

The pairing of the Augmented and Enriched Groups in Grade Ten resulted in a value for F of 2.10; the probability of equal variance exceeded .01, hence the hypothesis of equal variance was accepted. The obtained value of t was .382; since the probability of equal means exceeded .70, the hypothesis of equal means was accepted.

In the case of the Control and Enriched Groups in Grade Ten, the obtained value of F was sufficiently small that the probability of equal variance exceeded .05, hence the hypothesis of equal variance was accepted. The value of t was sufficiently large that the probability of equal means was less than .01, hence the hypothesis of equal means was rejected.

At the Grade Eleven level, all F-tests resulted in the acceptance of the null hypothesis of equality of variances. Only with the Control and Enriched Groups was the difference of means non significant.

TABLE I  
SIGNIFICANCE OF THE DIFFERENCES AMONG THE GROUPS  
IN GRADE TEN

Group	N	M	Variance	F	P <sub>F</sub>	Hyp.	t	P <sub>t</sub>	Hyp.
Augmented Enriched	31 38	59.7 60.0	14.5116 6.8964	2.10	>.01	Acc.	.382	>.70	Acc.
Control Enriched	31 38	58.1 60.0	6.1611 6.8964	1.12	>.05	Acc.	3.065	<.01	Rej.

TABLE II  
SIGNIFICANCE OF THE DIFFERENCES AMONG THE GROUPS  
IN GRADE ELEVEN

Group	N	M	Variance	F	P <sub>F</sub>	Hyp.	t	P <sub>t</sub>	Hyp.
Enriched Augmented	38 31	56.2 59.4	28.6462 19.6025	1.46	>.05	Acc.	2.667	<.01	Rej.
Control Augmented	31 31	56.5 59.4	25.5017 19.6025	1.30	>.05	Acc.	2.404	<.02	Rej.
Control Enriched	31 38	56.5 56.2	25.5017 28.6462	1.12	>.05	Acc.	0.238	>.80	Acc.

Interpretation.-- The conclusions drawn from these data, as indicated on page 160 of Appendix B, were:

1. The Augmented and Enriched Groups as originally selected were not significantly different from each other in mean achievement in Grade Ten. The Control Group was below them significantly.
2. After the experiment in Grade Eleven, the Augmented Group emerged significantly higher than the Enriched and Control Groups who were now equal in mean achievement.

#### Location and Achievement of Groups in the Follow-up Years

Disposition of students.-- For the academic year 1958-59, that is, the first year beyond Grade Eleven, all one hundred students of the original study were located. For the following year, all but one were located; although his whereabouts were and are unknown, he was definitely not enrolled at the University of Manitoba that year. Tables III and IV show the disposition of the students for these two years.

A study of these tables reveals some pertinent facts. In the first year beyond Grade Eleven, only one student went directly into employment, while ninety-nine proceeded to higher education of some description. Ninety-two per cent enrolled either in Grade Twelve or at the University of Manitoba or one of its affiliated colleges. The three groups

TABLE III  
DISPOSITION OF THE ONE HUNDRED STUDENTS  
OF THE STUDY, 1958 - 1959

Location	Augmented N=31	Enriched N=38	Control N=31	Total N=100
Grade XII				
Kelvin	7	9	7	23
United College		1	1	2
University of Manitoba and affiliated colleges				
University Arts I	1	5	5*	11
"    Science I	6	11	7	24
"    Home Ec I		1	1	2
United Arts I	7	1	1	9
"    Science I	6	3	1	10
St. John's Arts I		2	2	4
"    Science I	2	2	3	7
----- **				
Other universities				
College de St. Jean		1		1
McGill			1	1
Mount Allison			1	1
Portland State		1		1
Other				
United Grade XI		1		1
Nursing	1			1
Employed			1	1
Travelling	1			1

\*One of these did not write final examinations.

\*\*Only students above this line were included in the statistical study.

TABLE IV  
DISPOSITION OF THE ONE HUNDRED STUDENTS  
OF THE STUDY, 1959 - 1960

Location	Augmented N=31	Enriched N=38	Control N=31	Total N=100
<b>University of Manitoba</b>				
Arts II	4	8	5*	17
Science II	9	11	3	23
Home Ec II		1	1	2
Commerce I	3	3	1	7
Engineering I	1	5	2	8
<b>Affiliated Colleges</b>				
United Arts II	4		1	5
" Science II	2		1	3
St. John's Arts II	2	2	2	6
" Science II	1	2		3
St. Paul's Arts II	1			1
----- **				
<b>Other universities</b>				
Carleton			1	1
College de St. Jean		1		1
McGill			1	1
Mount Allison			1	1
Portland State		1		1
Queen's		1		1
Wisconsin State			1	1
<b>Other</b>				
University Arts I		1		1
" Science I	2			2
United Arts I			1	1
Nursing	1	1	3	5
Employed	1	1	4	6
Travelling			1	1
Deceased			1	1
Whereabouts unknown			1	1

\*One of these did not write final examinations.

\*\*Only students above this line were included in the statistical study.

were almost identical in the proportion of students taking higher education in Manitoba: Augmented, 93 per cent; Enriched, 92 per cent; Control, 90 per cent.

However, the picture had changed somewhat by the following year, especially for the Control Group. By this time, fourteen were engaged in activities other than education, ten of whom came from the Control Group. Four were repeating First Year. Seventy-five were enrolled in Second Year in Manitoba, including 87 per cent of the Augmented Group, 84 per cent of the Enriched, but only 52 per cent of the Control.

Differences of means after Grade Twelve, First Year, and Second Year.--- Tables V - VII show details of the tests of significance of the differences in means among the groups. In all cases, the hypothesis of equal variance was accepted.

The t-tests produced the following results:

1. There was no significant difference between the mean Z-scores of the Augmented and Enriched Groups in Grade Twelve.

2. The difference between the mean Z-scores of the Augmented and Control Groups in Grade Twelve was significant at the 1 per cent level, and favored the Augmented Group.

TABLE V  
SIGNIFICANCE OF THE DIFFERENCES AMONG THE GROUPS  
IN GRADE TWELVE

Group	N	M	Variance	F	P <sub>F</sub>	Hyp.	t	P <sub>t</sub>	Hyp.
Augmented Enriched	7 10	64.5 59.9	13.5014 32.5004	2.41	>.05	Acc.	1.871	>.10	Acc.
Augmented Control	7 8	64.5 56.4	13.5014 19.9050	1.47	>.05	Acc.	3.801	<.01	Rej.
Enriched Control	10 8	59.9 56.4	32.5004 19.9050	1.63	>.05	Acc.	1.420	>.10	Acc.

TABLE VI  
SIGNIFICANCE OF THE DIFFERENCES AMONG THE GROUPS  
IN FIRST YEAR

Group	N	M	Variance	F	P <sub>F</sub>	Hyp.	t	P <sub>t</sub>	Hyp.
Enriched Augmented	25 22	57.1 55.7	29.2666 51.2368	1.75	>.05	Acc.	.761	>.40	Acc.
Augmented Control	22 19	55.7 52.2	51.2368 34.5213	1.48	>.05	Acc.	1.691	>.10	Acc.
Enriched Control	25 19	57.1 52.2	29.2666 34.5213	1.18	>.05	Acc.	2.865	<.01	Rej.

TABLE VII  
SIGNIFICANCE OF THE DIFFERENCES AMONG THE GROUPS  
IN SECOND YEAR

Group	N	M	Variance	F	P <sub>F</sub>	Hyp.	t	P <sub>t</sub>	Hyp.
Enriched Augmented	32 27	56.1 55.6	59.8396 63.2183	1.06	>.05	Acc.	.244	>.80	Acc.
Augmented Control	27 15	55.6 53.7	63.2183 27.9274	2.26	>.05	Acc.	.827	>.40	Acc.
Enriched Control	32 15	56.1 53.7	59.8396 27.9274	2.14	>.05	Acc.	1.085	>.20	Acc.

3. There was no significant difference between the mean Z-scores of the Enriched and Control Groups in Grade Twelve.

4. There was no significant difference between the mean Z-scores of the Enriched and Augmented Groups in First Year.

5. There was no significant difference between the mean Z-scores of the Augmented and Control Groups in First Year.

6. The difference between the mean Z-scores of the Enriched and Control Groups in First Year was significant at the 1 per cent level, and favored the Enriched Group.

7. There was no significant difference between the mean Z-scores of the Enriched and Augmented Groups in Second Year.

8. There was no significant difference between the mean Z-scores of the Augmented and Control Groups in Second Year.

9. There was no significant difference between the mean Z-scores of the Enriched and Control Groups in Second Year.

Interpretation of difference of means.--

1. In Grade Twelve, Enriched Group students occupied

the middle position in level of achievement. They were inferior to students of the Augmented Group, and superior to those in the Control Group, but neither difference was significant, and so the groups had to be considered equal in mean achievement. However, the groups at the extremes, that is, the Augmented and Control, were significantly different.

2. In First Year, Augmented Group students occupied the middle position. They were inferior in mean achievement to students of the Enriched Group, and superior to those of the Control Group, but neither difference was significant, hence the groups had to be considered equal. However, the groups at the extremes again, this time the Enriched and Control, were significantly different.

3. In Second Year, the groups were equal in mean achievement.

#### Tests of Significance with Limited Groups

In an effort to eliminate a significant difference in mean Z-scores between the Enriched and Control Groups in Grade Ten, new groups were created by limiting the original groups to students who completed Second Year.

Size and mean achievement of limited groups.--- By the end of Second Year, the Augmented Group had lost only 4

of its original 31 members; the Enriched Group now numbered 32 of the original 38; the Control Group was down to 15, having lost 16.

As a result, the use of the limited groups instead of complete groups would be expected to cause little change in the mean Z-scores for the special classes, and, in fact, did not, as a comparison of the means in Tables V - VII and VIII - X will indicate. The Control Group mean, however, showed an increase of 1.4.

Hypotheses of equal mean Z-scores.-- Tables VIII - X show the results of the t-tests for the limited groups. In all cases, the hypothesis of equal variance was accepted.

1. There was no significant difference between the mean Z-scores of the Enriched and Augmented Groups in Grade Ten.

2. There was no significant difference between the mean Z-scores of the Augmented and Control Groups in Grade Ten.

3. There was no significant difference between the mean Z-scores of the Enriched and Control Groups in Grade Ten.

4. The difference between the mean Z-scores of the Augmented and Enriched Groups in Grade Eleven was significant at the 2 per cent level, and favored the Aug-

TABLE VIII

SIGNIFICANCE OF THE DIFFERENCES AMONG THE LIMITED GROUPS  
IN GRADE TEN

Group	N	M	Variance	F	P <sub>F</sub>	Hyp.	t	P <sub>t</sub>	Hyp.
Enriched	32	60.1	7.6083	1.91	>.01	Acc.	.466	>.60	Acc.
Augmented	27	59.7	14.5410						
Augmented	27	59.7	14.5410	2.21	>.05	Acc.	1.087	>.20	Acc.
Control	15	58.5	6.5921						
Enriched	32	60.1	7.6083	1.15	>.05	Acc.	1.874	>.05	Acc.
Control	15	58.5	6.5921						

TABLE IX

SIGNIFICANCE OF THE DIFFERENCES AMONG THE LIMITED GROUPS  
IN GRADE ELEVEN

Group	N	M	Variance	F	P <sub>F</sub>	Hyp.	t	P <sub>t</sub>	Hyp.
Augmented	27	59.7	19.7876	1.09	>.05	Acc.	2.437	<.02	Rej.
Enriched	32	56.8	21.5127						
Augmented	27	59.7	19.7876	1.07	>.05	Acc.	1.242	>.20	Acc.
Control	15	57.9	21.1252						
Control	15	57.9	21.1252	1.02	>.05	Acc.	.760	>.40	Acc.
Enriched	32	56.8	21.5127						

TABLE X  
SIGNIFICANCE OF THE DIFFERENCES AMONG THE LIMITED GROUPS  
IN FIRST YEAR

Group	N	M	Variance	F	P <sub>F</sub>	Hyp.	t	P <sub>t</sub>	Hyp.
Enriched Augmented	24 21	56.9 56.2	30.0936 47.3236	1.57	>.05	Acc.	.379	>.70	Acc.
Augmented Control	21 14	56.2 52.4	47.3236 33.0623	1.43	>.05	Acc.	1.706	>.05	Acc.
Enriched Control	24 14	56.9 52.4	30.0936 33.0623	1.10	>.05	Acc.	2.397	<.05	Rej.

mented Group.

5. There was no significant difference between the mean Z-scores of the Augmented and Control Groups in Grade Eleven.

6. There was no significant difference between the mean Z-scores of the Control and Enriched Groups in Grade Eleven.

7. There was no significant difference between the mean Z-scores of the Enriched and Augmented Groups in First Year.

8. There was no significant difference between the mean Z-scores of the Augmented and Control Groups in First Year.

9. The difference between the mean Z-scores of the Enriched and Control Groups in First Year was significant at the 5 per cent level, and favored the Enriched Group.

Interpretation of difference of means.--

1. In Grade Ten, the groups were equal in mean achievement.

2. In Grade Eleven, the Control Group fell between the others in order of mean achievement. It was below the Augmented Group and above the Enriched, but neither difference was significant, so these groups were considered to be

equal. However, the highest and lowest, that is the Augmented and Enriched, were significantly different.

3. In First Year, students of the Augmented Group were lower in mean achievement than those of the Enriched Group, and higher than those of the Control, but neither difference was significant, so these groups were considered to be equal. However, the Enriched Group was significantly superior to the Control, these groups being at the extremes.

4. These results are very similar to those for the complete groups, changes being limited to the loss of a significant difference in Grade Ten and in Grade Eleven. The loss in Grade Ten was, of course, desired, as this meant that the limited groups could be considered to be equal in mean achievement before treatment.

## CHAPTER V

### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

#### Summary

This study was concerned with the effect of enrichment in high school on the achievement of bright students at higher levels of education. The subjects were one hundred students who were in Grade Eleven in Kelvin High School, Winnipeg, in 1957-58, who had all attended the same school the previous year, and most of whom went on to the University of Manitoba.

These were divided about equally into three groups which received different treatments in Grade Eleven. The Augmented Group, consisting of thirty-one students, took an extra subject; the Enriched Group, containing thirty-eight students, probed more deeply into the subjects of the regular program; the Control Group, composed of thirty-one bright students in various ordinary classes, simply followed the regular program.

During the academic year 1958-59, about one-quarter of each group, twenty-five students in all, took Grade Twelve, mainly at Kelvin. Sixty-six students, approximately two-thirds of each group, enrolled in First Year.

By the end of Second Year in 1960, about eighty-five per cent of each of the special groups remained, but the Control Group was down to half of its original size.

Achievement was measured by means of final examination results. The Department of Education and the University made available normative data consisting of mean and standard deviation for each examination, which permitted the conversion of marks to Z-scores. These Z-scores were averaged, both for each student and for each group, in Grade Twelve, in First Year, and in Second Year. Similar data had been found for Grade Ten in order to establish pre-treatment status, and for Grade Eleven, in a previous study on which this experiment was based.

Three groups at each of three levels provided nine mean Z-scores representing average achievement. Taking the groups in pairs at each level, the null hypothesis of the equality of these means was tested. The F-test, followed by a t-test, was used to determine the significance of the differences in the mean Z-scores.

In order to eliminate a difference in mean achievement of groups before treatment, the t-tests were repeated on limited groups, which were composed only of students who had completed Second Year.

The investigation of similar studies revealed that enrichment in high school produced superior results in high school, but not at college.

## Conclusions

Limited groups vs. complete groups.-- The elimination of some weak students of the Control Group did result in the limited groups, (Augmented, Enriched, and Control) being equal in mean achievement in Grade Ten. The use of the limited groups caused only one other change in the results for the unrevised groups; a significant difference in Grade Eleven favoring the Augmented over the Control Group was lost.

In view of their greater validity for comparison of groups after treatment, results for the limited groups have been used as the basis for the following conclusions whenever possible. For Grade Twelve, comparisons had to be made using complete groups.

General conclusions.-- All groups were equal in mean achievement in Grade Ten, before treatment. The groups were again equal in mean achievement three years later, in Second Year. During the intervening two years, each of the special groups exhibited some superiority; the Augmented in Grades Eleven and Twelve, the Enriched in First Year. A more detailed analysis of the variation of the group follows.

The Augmented Group.-- These "extra subject" students showed marked superiority in Grade Eleven, being significantly

superior to the Enriched Group. The portion of the group taking Grade Twelve also performed well, being significantly superior to students of the Control Group. However, Augmented Group students in First Year showed no superiority.

The Enriched Group.--- The "added depth" group made a comparatively poor showing in Grade Eleven, being significantly below the Augmented Group. Students of the Enriched Group taking Grade Twelve were equal to those of the other groups, while their former class-mates who elected First Year obtained the highest mean score at that level, being significantly superior to the Control Group.

The Control Group.--- These "regular class" students fared rather badly in comparison with the special groups. At no level did they exhibit any significant superiority; they were either inferior or equal.

Summary of conclusions.---

1. The limited groups produced approximately the same results as the complete groups, but with the advantage of initial equality of achievement for all groups.

2. No consistent pattern of superiority for enrichment in general nor for either form of enrichment tested in this experiment is evident.

3. The findings of several other studies have been

verified; enrichment for bright students can produce superior results in high school, but has not, in the long run, at university.

4. The immediate benefits in high school of enrichment by an extra subject did not carry over to university.

5. The Control Group did not compare well with the other two. At no time did it exhibit any significant superiority in achievement: it was either inferior or equal. Its drop-out rate at university was much higher than that of the other groups.

6. Enrichment by added depth to the regular program, which appeared to be not very successful in high school, did produce superior results in the first year at university.

#### Speculation and Recommendations

The initial superiority of the Enriched Group and the comparatively poor showing of the Augmented Group at university might be accounted for by the fact that the learning-teaching atmosphere is basically different at university than in high school.

The extra subject and shorter time allotment for all subjects which characterized the Augmented Group program in Grade Eleven merely sharpened the ability of these students to deal with the high school curriculum. The Enriched Group,

on the other hand, was exposed to teaching which was designed, in part, to give greater insight into the basic nature of the various subjects. The teachers, who themselves had made the transition from high school to university and who knew that most of these students were about to make the same change, could have attempted, with the extra time available, either consciously or unconsciously, to acquaint the students with the kind of thinking which would be required of them at university.

Whatever their cause, these differences in group performance in higher education give rise to the following recommendations:

1. Enrichment by added depth to the regular program merits at least equal status with enrichment by an extra subject as a means of catering to the needs of bright high school students in the district served by Kelvin High School.

2. In view of the high drop-out rate and complete lack of academic superiority at any level for the Control Group, bright Grade Ten students in Kelvin should be encouraged to enrol in special classes such as the Augmented and Enriched Groups.

3. Having shown some evidence of producing superior results at the University of Manitoba, enrichment by added depth to the regular program in Kelvin School merits further study and experimentation. An investigation of the gains in

individual subjects, coupled with a detailed examination of the enrichment techniques employed by different teachers, might lead to evidence as to which enrichment activities are most beneficial.

BIBLIOGRAPHY

BIBLIOGRAPHY

- Abramson, David A. "The Effect of Ability Grouping in the High School Upon Achievement in College," Dissertation Abstracts, 20:221, July, 1959.
- Alpren, Morton. "Trends in Special Classes for Gifted Adolescents," The National Association of Secondary Schools Principals Bulletin, 44:136-137, October, 1960.
- Applbaum, Morris J. "A Survey of Special Provisions for the Education of Academically Superior Students," The National Association of Secondary Schools Principals Bulletin, 43:26-43, October, 1959.
- Barbe, Walter B. "Evaluation of Special Classes for Gifted Children," Exceptional Children, 22:60-62, November, 1955.
- Barr, Arvil S., Robert A. Davis, and Palmer O. Johnson. Educational Research and Appraisal. New York: J.B. Lippincott Company, 1953.
- Bauldauf, Robert J. "A Comparison of the Extent of Educational Growth of Mentally Advanced Pupils in the Cedar Rapids Experiment," Journal of Educational Research, 52:181-183, January, 1959.
- Bish, Charles E. "Can We Provide a Better Program for the Able Student?" The National Association of Secondary Schools Principals Bulletin, 42:13-21.
- Campbell, William G. Form and Style in Thesis Writing. Boston: Houghton Mifflin Company, 1954.
- Caraway, Sarah H. "A Study of the Program for Gifted Students in Needham B. Broughton High School, Raleigh, North Carolina," Dissertation Abstracts, 20:2708, January, 1960.
- Carter, Harold D. "Gifted Children," Encyclopedia of Educational Research (3rd ed.), p. 589.
- Doolin, Ruie B. "An Experiment with Moderately Gifted Children in the Public High Schools of Cedar Rapids, Iowa," Dissertation Abstracts, 16:1384, August, 1956.
- Goldberg, Miriam L. "Recent Research on the Talented," Teachers College Record, 60:150-163, December, 1958.

- Harley, John K. "The Writing of a Thesis," Research Bulletin No. 24 (March, 1961), Faculty of Education, The University of Manitoba, pp. 23-30.
- Hays, Donald G. "Educational Decision-Making by Superior Secondary-School Students and Their Parents," Dissertation Abstracts, 21:547, September, 1960.
- Hoyt, Daniel B. "A Follow-Up Study of Intellectually Superior Graduates of University High School, State University of Iowa, From 1940 Through 1954, With Emphasis Upon the Social Studies," Dissertation Abstracts, 19:1672, January, 1959.
- Ivins, Wilson. "How Can the Senior High School Best Provide for the Academically Talented Student?" The National Association of Secondary Schools Principals Bulletin, 43:27-28, April, 1959.
- Johnson, Palmer O. Statistical Methods in Research. New York: Prentice-Hall Inc., 1949.
- Lindquist, E.F. A First Course in Statistics. Boston: Houghton Mifflin Company, 1942.
- \_\_\_\_\_. "Statistical Analysis in Educational Research," Cambridge, Mass: Houghton Mifflin Company, 1940.
- A Manual of Style. Chicago: The University of Chicago Press, 1949.
- Passow, A. Harry. "Enrichment of Education for the Gifted," Fifty-seventh Yearbook of the National Society for the Study of Education, Part II. Chicago: 1957, pp. 193-221.
- \_\_\_\_\_. "Planning for Talented Youth: A Research Project," Educational Leadership, 13:249-254, January, 1956.
- Programme of Studies for the Schools of Manitoba. Senior High Schools 1957-58. Department of Education. The Queen's Printer for Manitoba, 1957.
- Rummel, J. Francis. An Introduction to Research Procedures in Education. New York: Harper and Brothers, 1958.
- Shreve, John W. "A Study of the Effectiveness of Two Types of High School Programs in Preparing Youth for Academic Success in College," Dissertation Abstracts, 18:967, March, 1958.

- Smith, Gjertrud H. "Professional and Lay Attitudes Toward the Education of the Intellectually Gifted High School Student," Dissertation Abstracts, 20:939, September, 1959.
- Terman, Lewis M., and Melita H. Oden. The Gifted Child Grows Up. Vol. IV of Genetic Studies of Genius. Edited by Lewis M. Terman. 4 vols. Stanford: Stanford University Press, 1947.
- University of Manitoba. General Calendar, 1958-59 and 1959-60. Winnipeg, Man.
- Wert, James E., Charles O. Neidt, and J. Stanley Ahmann. Statistical Methods in Educational and Psychological Research. New York: Appleton - Century - Crofts Inc., 1954.
- Williams, Clifford W. "Characteristics and Objectives of a Program for the Gifted," Fifty-seventh Yearbook of the National Society for the Study of Education, Part II. Chicago: 1957, pp. 147-165.

APPENDIX A

TABLES OF MARKS, NORMATIVE DATA, AND Z SCORES

TABLE XI  
 SCHOOL MARKS FOR THE AUGMENTED GROUP  
 IN GRADE TEN, KELVIN SCHOOL  
 APRIL, 1957

Name	Lit.*	Comp.	Geog.	Math.	Sc.	Fr.	Lat.
1. Leslie A.	71	75	76	93	77	71	80
2. Charles A.	70	69	76	94	89	83	70
3. James A.	66	69	86	96	89	76	68
4. Michael B.	76	77	91	96	89	90	92
5. May B.	57	78	74	93	78	72	80
6. Judy B.	78	85	73	95	88	89	83
7. Rita B.	86	79	75	91	78	84	88
8. Susan B.	84	84	89	98	92	95	95
9. Carol C.	90	85	91	82	85	69	--
10. Neil C.	77	80	78	80	78	87	84
11. Bonnie D.	71	76	74	80	--	64	81
12. Bruce H.	74	62	78	76	87	85	82
13. Carol J.	76	79	69	87	91	68	78
14. David K.	70	72	87	100	92	90	91
15. Robin M.	86	90	87	84	88	91	94
16. Helen M.	93	91	97	97	94	98	100
17. Keith M.	84	81	82	97	96	84	87
18. Donald M.	76	88	81	84	82	73	88
19. Bruce N.	72	84	95	90	93	88	90
20. James N.	67	81	75	80	81	58	76
21. Reva R.	93	85	91	98	87	97	100
22. Marshall R.	67	81	79	89	85	84	86
23. Janet R.	87	86	97	82	93	87	92
24. Brent S.	86	78	88	79	91	78	82
25. Gerald S.	78	84	90	81	92	63	86
26. Arthur S.	79	87	90	97	95	88	96
27. Allan S.	74	85	90	74	72	67	89
28. Susan S.	82	82	94	79	88	85	76
29. Judith T.	88	87	94	98	96	92	100
30. Bonnie W.	74	83	82	67	74	79	--
31. Faye W.	91	90	93	89	97	86	--

\*Abbreviations are explained in Table XIV.

TABLE XII

SCHOOL MARKS FOR THE ENRICHED GROUP  
IN GRADE TEN, KELVIN SCHOOL  
APRIL, 1957

Name	Lit.	Comp.	Geog.	Math.	Sc.	Fr.	Lat.
1. Sheldon B.	70	87	83	87	85	78	86
2. Howard B.	80	75	83	82	90	87	84
3. Ronald B.	80	78	95	77	94	77	
4. Oscar B.	63	73	88	78	87	80	
5. Michael B.	63	77	79	86	77	80	84
6. William D.	80	78	78	62	88	77	
7. Fred D.	70	76	98	72	96	86	
8. Patricia D.	86	84	76	72	70	86	
9. Leonard E.	82	70	95	88	91	95	89
10. John F.	70	86	87	94	92	85	91
11. Ken F.	67	78	91	92	91	86	
12. Jim G.	72	67	90	76	94	82	
13. Earl G.	87	80	90	83	90	86	92
14. Elaine H.	81	82	89	95	88	91	83
15. John H.	89	91	97	98	95	98	
16. Morley H.	91	78	90	93	95	93	91
17. Valdine I.	74	84	86	74	75	80	
18. Baillie K.	86	86	90	96	95	89	92
19. William K.	65	62	92	97	86	91	
20. Dorothea K.	90	90	87	89	84	90	
21. Joan M.	72	81	77	91	80	83	
22. Robert M.	94	89	92	77	95	82	
23. Dennis M.	61	71	88	92	90	77	
24. Jim M.	62	80	80	93	88	81	
25. Murray P.	73	77	77	83	77	78	
26. Burnett R.	62	72	93	79	90	85	
27. John R.	82	88	87	80	90	69	
28. Heather R.	85	91	91	95	89	86	90
29. John R.	78	80	90	86	88	85	88
30. Perry S.	68	61	92	84	83	80	
31. Charles S.	62	78	81	86	89	61	70
32. David S.	78	75	84	95	90	78	84
33. Ray T.	66	74	90	79	89	84	
34. Henry U.	73	83	93	94	95	85	90
35. Mary-Jane V.	85	94	83	87	83	80	91
36. Jim W.	66	74	94	97	92	88	
37. Merle W.	85	87	86	80	86	84	
38. Mark Y.	69	72	93	87	95	83	

TABLE XIII

SCHOOL MARKS FOR THE CONTROL GROUP  
IN GRADE TEN, KELVIN SCHOOL  
APRIL, 1957

Name	Lit.	Comp.	Geog.	Math.	Sc.	Fr.	Lat.
1. Ray B.	62	60	87	89	85	88	
2. Sharon B.	81	66	84	90	87	85	
3. Joy B.	75	63	66	79	89	83	
4. Gordon B.	68	62	89	73	91	75	
5. Bryan C.	63	68	93	86	91	69	
6. Joan C.	79	79	86	82	93	90	
7. Marilyn C.	82	75	85	85	81	94	
8. Jocelyn D.	74	85	87	73	64	78	
9. John E.	83	84	94	94	88	90	
10. James F.	81	72	86	84	87	72	
11. Peter F.	61	69	82	73	92		996
12. David G.	66	71	75	88	89	79	
13. Simmie G.	66	69	83	71	81	84	
14. Avon H.	91	91	88	79	65	83	
15. Carolyn H.	65	77	85	64	65	80	
16. Joan H.	81	76	86	83	85	80	
17. Hillaine J.	81	80	69	88	83	63	
18. Garry L.	90	86	82	85	83		92
19. Bruce L.	50	66	88	81	82	67	
20. Catherine M.	83	80	90	81	91	86	
21. Judith M.	82	78	91	79	87	79	
22. David M.	68	75	72	95	88	78	
23. Wendy P.	76	72	89	72	77	77	
24. Janet R.	90	83	82	93	85	83	
25. Dorothy R.	78	73	76	87	61	84	
26. Frances R.	81	75	93	50	90	81	
27. Roger S.	69	60	91	91	93	92	
28. Walter S.	67	53	91	86	83	84	
29. Carolyn W.	73	68	86	80	83	85	
30. Edward W.	60	64	87	84	84	68	
31. Giles V.	75	74	86	70	83		76

TABLE XIV  
MEASURES OF CENTRAL TENDENCY FOR KELVIN SCHOOL  
AS A WHOLE FOR GRADE TEN  
IN APRIL, 1957

Subject	Abbreviation*	Number writing(N)	Mean	Standard deviation( $\sigma$ )
Literature	Lit.	384	60.4	16.5
Composition	Comp.	384	65.5	13.9
Geography	Geog.	379	71.8	14.4
Mathematics	Math.	375	61.5	21.5
Science	Sc.	378	71.2	16.0
French	Fr.	355	62.4	19.4
Latin	Lat.	97	81.0	11.4

\*These abbreviations were used to identify the subjects in Tables XI, XII, and XIII.

TABLE XV  
Z-SCORES FOR THE AUGMENTED GROUP IN GRADE TEN  
KELVIN SCHOOL, APRIL, 1957

Name	Lit.	Comp.	Geog.	Math.	Sc.	Fr.	Lat.	Average
1. Leslie A.	56	57	53	64	53	55	49	55.3
2. Charles A.	56	53	53	65	61	61	40	55.8
3. James A.	53	53	60	66	61	57	39	55.6
4. Michael B.	59	58	63	66	61	65	60	61.7
#5. May B.	48	59	52	64	54	55	49	54.4
6. Judy B.	60	64	51	65	60	64	52	59.4
#7. Rita B.	65	60	52	63	54	61	56	58.7
8. Susan B.	64	63	62	67	63	67	62	64.0
9. Carol C.	68	64	63	59	58	54	--	61.0
10. Neil C.	60	60	54	58	54	63	53	57.4
11. Bonnie D.	56	58	52	58	--	51	50	54.2
12. Bruce H.	58	48	54	56	59	62	51	55.4
13. Carol J.	59	60	48	61	62	53	47	55.7
14. David K.	56	55	61	67	63	65	59	60.9
15. Robin M.	65	68	61	60	60	65	62	63.0
16. Helen M.	70	68	68	66	64	69	67	67.4
17. Keith M.	64	61	57	66	65	61	55	61.3
#18. Donald M.	59	66	56	60	56	56	56	58.4
19. Bruce N.	57	63	66	63	63	63	58	61.9
20. James N.	54	61	52	58	56	48	46	53.6
21. Reva R.	70	64	63	67	59	68	67	65.4
22. Marshall R.	54	61	55	62	58	61	55	58.0
23. Janet R.	66	65	68	59	63	63	60	63.4
24. Brent S.	65	59	61	58	62	58	51	59.1
25. Gerald S.	60	63	63	59	63	51	55	59.1
26. Arthur S.	61	66	63	66	64	63	63	63.7
27. Allan S.	58	64	63	55	50	53	57	57.1
28. Susan S.	63	62	66	58	60	62	--	61.8
#29. Judith T.	66	66	66	67	65	66	67	66.1
30. Bonnie W.	58	63	57	52	51	59	--	56.7
31. Faye W.	68	68	65	62	66	62	--	65.2

Mean of average Z-scores: 59.7

#Students who did not complete Second Year University.

TABLE XVI

Z-SCORES FOR THE ENRICHED GROUP IN GRADE TEN  
KELVIN SCHOOL, APRIL, 1957

Name	Lit.	Comp.	Geog.	Math.	Sc.	Fr.	Lat.	Average
1. Sheldon B.	56	66	58	61	58	58	55	58.9
2. Howard B.	62	57	58	59	61	63	53	59.0
3. Ronald B.	62	59	66	57	64	58		61.0
#4. Oscar B.	51	55	61	57	59	59		57.0
5. Michael B.	51	58	55	61	53	59	53	55.7
6. William D.	62	59	54	50	60	58		57.2
7. Fred D.	56	58	68	54	65	62		60.5
8. Patricia D.	65	63	53	54	49	62		57.7
9. Leonard E.	63	53	66	62	62	67	57	61.4
10. John F.	56	65	61	65	63	62	59	61.6
11. Ken F.	54	59	63	64	62	62		60.7
#12. Jim G.	57	51	63	56	64	60		58.5
13. Earl G.	66	60	63	60	61	62	60	61.7
#14. Elaine H.	62	62	62	65	60	65	52	61.1
15. John H.	67	68	68	67	64	69		67.2
16. Morley H.	68	56	63	64	64	66	59	62.9
17. Valdine I.	58	63	60	55	52	59		57.8
18. Baillie K.	65	65	63	66	64	64	60	63.9
19. William K.	53	48	64	66	59	65		59.2
20. Dorothea K.	68	68	61	62	58	65		63.7
21. Joan M.	57	61	54	63	55	61		58.5
22. Robert M.	70	67	64	57	64	60		63.7
23. Dennis M.	50	54	61	64	61	58		58.0
#24. Jim M.	51	60	56	64	60	60		58.5
25. Murray P.	57	58	54	60	53	58		56.7
26. Burnett R.	51	55	65	58	61	62		58.7
27. John R.	63	66	61	58	61	54		60.5
28. Heather R.	65	68	63	65	61	62	58	63.1
29. John R.	60	60	63	61	60	62	56	60.3
30. Perry S.	54	47	64	60	57	59		56.8
31. Charles S.	51	59	56	61	61	50	40	54.0
32. David S.	60	57	59	65	61	58	53	59.0
#33. Ray T.	53	56	63	58	61	61		58.7
34. Henry U.	57	63	65	65	64	62	61	62.4
35. Mary-Jane V.	65	71	58	61	57	59	59	61.4
36. Jim W.	53	56	66	66	63	63		61.2
#37. Merle W.	65	66	60	58	59	61		61.5
38. Mark Y.	55	55	65	61	64	61		60.2

Mean of average Z-scores: 60.0

#Students who did not complete Second Year University.

TABLE XVII

Z-SCORES FOR THE CONTROL GROUP IN GRADE TEN  
KELVIN SCHOOL, APRIL, 1957

Name	Lit.	Comp.	Geog.	Math.	Sc.	Fr.	Lat.	Average
#1. Ray B.	51	46	61	63	59	63		57.2
2. Sharon B.	62	50	58	63	60	62		59.2
#3. Joy B.	59	48	46	58	61	61		55.5
4. Gordon B.	55	47	62	55	62	56		56.2
5. Bryan C.	52	52	65	61	62	53		57.5
#6. Joan C.	61	60	60	60	64	64		61.5
7. Marilyn C.	63	57	59	61	56	66		60.3
#8. Jocelyn D.	58	64	61	55	46	58		57.0
9. John E.	64	63	65	65	61	64		63.7
10. James F.	62	55	60	60	60	55		58.7
#11. Peter F.	50	53	57	55	63		63	56.8
#12. David G.	53	54	52	62	61	59		56.8
#13. Simmie G.	53	53	58	54	56	61		55.8
14. Avon H.	69	68	61	58	46	61		60.5
#15. Carolyn H.	53	58	59	51	46	59		54.3
#16. Joan H.	62	58	60	60	59	59		59.7
17. Hillaine J.	62	60	48	62	57	50		56.5
#18. Garry L.	68	65	57	61	57		58	61.0
19. Bruce L.	44	50	61	59	57	52		53.8
20. Catherine M.	64	60	63	59	62	62		61.7
21. Judith M.	63	59	63	58	60	59		60.3
22. David M.	55	57	50	66	61	58		57.8
#23. Wendy P.	59	55	62	55	54	58		57.2
#24. Janet R.	68	63	57	65	59	61		62.2
#25. Dorothy R.	61	55	53	62	44	61		56.0
26. Frances R.	62	57	65	45	62	60		58.5
#27. Roger S.	55	46	63	64	64	65		59.5
#28. Walter S.	54	41	63	61	57	61		56.2
29. Carolyn W.	58	52	60	59	57	62		58.0
30. Edward W.	50	49	61	60	58	53		55.2
#31. Giles V.	59	56	60	54	57		46	55.3

Mean of average Z-scores: 58.1

#Students who did not complete Second Year University.

TABLE XVIII

COMPOSITE SCHOOL MARKS FOR THE AUGMENTED GROUP  
IN GRADE ELEVEN, KELVIN SCHOOL  
APRIL, 1958

Name	Lit.	Comp.	Hist.	Math.	Biol.	Phys.	Chem.	Fr.	Lat.
1. Leslie A.	74	71	73	95		87	88	88	72
2. Charles A.	56	56	74	89		78	76	71	56
3. James A.	70	58	70	82		81	79	82	63
4. Michael B.	69	74	85	96		84	87	91	76
5. May B.	70	63	68	92	79	72	86	73	
6. Judy B.	75	80	73	83		84	85	85	62
7. Rita B.	77	68	69	88		66	86	69	70
8. Susan B.	77	82	84	95		85	94	93	83
9. Carol C.	79	76	75	74	86	80	83	69	
10. Neil C.	70	72	67	86		87	84	79	74
11. Bonnie D.	61	56	72	92		68	77	66	66
12. Bruce H.	74	66	75	67		79	77	76	70
13. Carol J.	82	78	59	85		85	83	84	70
14. David K.	67	57	80	98		95	95	91	83
15. Robin M.	71	75	77	100	84	89	89	87	
16. Helen M.	85	86	91	98		97	98	99	93
17. Keith M.	74	77	71	91		86	88	83	82
18. Donald M.	72	73	63	71		76	70	79	58
19. Bruce N.	77	75	83	89		83	78	86	82
20. James N.	69	65	54	67		77	69	73	51
21. Reva R.	83	83	90	96		96	93	96	92
22. Marshall	70	70	88	80		85	81	81	68
23. Janet R.	72	77	75	93		90	91	85	84
24. Brent S.	76	75	86	88		86	94	80	64
25. Gerald S.	67	60	80	87		83	90	78	65
26. Arthur S.	82	77	85	90		93	88	83	79
27. Allan S.	73	73	85	70		86	81	80	73
28. Susan S.	79	78	83	75	90	76	90	85	
29. Judith T.	76	79	85	95	85	89	90	90	
30. Bonnie W.	73	70	62	85	82	81	89	83	
31. Faye W.	79	82	71	93	92	96	93	88	

TABLE XIX

COMPOSITE SCHOOL MARKS FOR THE ENRICHED GROUP  
IN GRADE ELEVIN, KELVIN SCHOOL  
APRIL, 1958

Name	Lit.	Comp.	Hist.	Math.	Phys.	Chem.	Fr.
1. Sheldon B.	68	68	69	71	90	81	75
2. Howard B.	66	64	70	78	91	92	73
3. Ronald B.	63	59	83	80	84	89	58
4. Oscar B.	45	58	40	34	56	56	34
5. Michael B.	58	68	70	79	80	79	69
6. William D.	71	70	68	61	74	85	64
7. Fred D.	61	61	86	69	93	93	65
8. Patricia D.	70	71	72	64	72	79	76
9. Leonard E.	66	69	77	79	80	85	81
10. John F.	68	73	83	86	87	92	71
11. Ken F.	67	66	70	87	79	83	65
12. Jim G.	69	69	75	72	78	86	69
13. Earl G.	79	69	82	70	86	83	75
14. Elaine H.	71	70	80	78	85	77	78
15. John H.	78	83	85	91	98	96	94
16. Morley H.	78	77	78	86	90	90	80
17. Valdine I.	59	70	56	53	61	66	71
18. Baillie K.	91	85	90	86	94	92	91
19. William K.	53	65	82	68	78	91	69
20. Dorothea K.	80	73	76	76	78	79	86
21. Joan M.	66	57	59	59	72	73	68
22. Robert M.	66	61	66	52	81	85	74
23. Dennis M.	62	69	69	76	81	87	67
24. Jim M.	62	74	64	85	85	89	74
25. Murray P.	59	61	59	63	83	82	63
26. Burnett R.	70	69	70	73	83	90	70
27. John R.	65	67	86	83	83	80	63
28. Heather R.	82	83	85	86	85	92	82
29. John R.	67	74	74	65	89	82	64
30. Perry S.	48	54	63	63	69	68	53
31. Charles S.	66	61	82	81	85	88	57
32. David S.	74	66	84	65	90	88	68
33. Ray T.	65	63	73	79	78	89	66
34. Henry U.	74	71	87	87	92	89	74
35. Mary-Jane V.	69	83	78	66	82	82	89
36. Jim W.	65	71	72	84	87	96	71
37. Merle W.	63	62	71	55	68	77	66
38. Mark Y.	67	61	74	64	82	82	69

TABLE XX  
 COMPOSITE SCHOOL MARKS FOR THE CONTROL GROUP  
 IN GRADE ELEVEN, KELVIN SCHOOL  
 APRIL, 1958

Name	Lit.	Comp.	Hist.	Math.	Biol.	Phys.	Chem.	Fr.	Lat.
1. Ray B.	67	72	64	88			85	81	80
2. Sharon B.	73	73	80	83			90	97	78
3. Joy B.	57	66	65	49	79		72	81	59
4. Gordon B.	71	71	77	80			91	79	72
5. Bryan C.	61	56	73	95				80	69
6. Joan C.	67	78	87	75			75	81	87
7. Marilyn C.	73	65	80	85	83			80	88
8. Jocelyn D.	66	58	73	53	76			54	61
9. John E.	80	80	88	87			96	95	89
10. James F.	67	64	87	61			89	77	67
11. Peter F.	76	80	97	89			92	89	
12. David G.	69	62	77	72			78	68	84
13. Simmie G.	63	63	86	68			71	80	79
14. Avon H.	77	74	93	73				75	87
15. Carolyn H.	60	69	52	58	56				73
16. Joan H.	77	75	87	66	88			77	66
17. Hillaine J.	60	73	61	67			67	70	53
18. Garry L.	77	76	86	82			84	78	
19. Bruce L.	51	61	49	78			90	83	58
20. Catherine M.	66	69	88	80			87	93	87
21. Judith M.	77	74	91	79	93			86	72
22. David M.	64	68	85	88			86	90	69
23. Wendy P.	70	63	86	63	68			66	59
24. Janet R.	76	85	84	81				86	81
25. Dorothy R.	69	72	78	76	78			64	68
26. Frances R.	82	76	89	55	83			75	73
27. Roger S.	54	54	69	60			77	76	55
28. Walter S.	50	45	68	74			87	77	64
29. Carolyn W.	69	65	82	68	70			68	77
30. Edward W.	64	64	78	60			73	69	66
31. Giles V.	61	60	69	61				72	

TABLE XXI

MEASURES OF CENTRAL TENDENCY FOR COMPOSITE SCHOOL MARKS  
FOR KELVIN SCHOOL AS A WHOLE  
GRADE ELEVEN, APRIL, 1958

Subject	Number writing (N)	Mean (M)	Standard Deviation ( $\sigma$ )
Literature	299	59.8	12.8
Composition	300	61.8	10.1
History	300	66.2	14.0
Mathematics	297	61.8	19.0
Biology	78	66.3	14.5
Physics	193	74.4	13.5
Chemistry	282	68.0	17.2
French	265	63.0	16.4
Latin	43	69.1	14.7

TABLE XXII

Z-SCORES FOR THE AUGMENTED GROUP IN GRADE ELEVEN  
KELVIN SCHOOL, APRIL, 1958

Name	Lit.	Comp.	Hist.	Math.	Biol.	Phys.	Chem.	Fr.	Lat.	Av.
1. Leslie A.	61	59	55	67		59	62	65	52	60.0
2. Charles A.	47	44	55	65		53	55	55	41	51.9
3. James A.	58	47	53	60		55	56	61	46	54.5
4. Michael B.	58	62	63	68		57	61	67	54	61.3
#5. May B.	58	51	51	66	59	48	61	56		56.3
6. Judy B.	62	68	55	62		57	60	63	45	59.0
#7. Rita B.	64	56	52	64		44	61	66	51	57.3
8. Susan B.	64	69	63	67		58	65	69	60	64.4
9. Carol C.	65	64	56	56	64	54	59	54		59.0
10. Neil C.	58	60	51	63		59	60	60	53	58.0
11. Bonnie D.	51	44	54	66		45	55	52	48	51.9
12. Bruce H.	61	55	56	53		53	55	58	51	55.3
13. Carol J.	67	66	45	62		58	59	63	58	58.9
14. David K.	55	45	60	69		65	65	67	60	60.8
15. Robin M.	58	64	57	70	63	61	62	65		62.5
16. Helen M.	70	73	68	69		66	68	72	67	69.1
17. Keith M.	61	65	53	65		59	63	62	59	60.9
#18. Donald M.	60	61	48	55		51	51	60	43	53.6
19. Bruce N.	64	63	62	64		56	56	64	59	61.0
20. James N.	57	53	42	52		52	50	56	38	50.0
21. Reva R.	68	71	67	68		66	65	70	66	67.6
22. Marshall R.	58	58	66	60		58	58	61	50	58.6
23. Janet R.	60	65	56	67		62	63	64	60	62.1
24. Brent S.	63	63	65	64		58	65	60	47	60.6
25. Gerald S.	56	48	60	63		57	63	59	48	56.8
26. Arthur S.	67	66	63	65		64	62	62	57	63.3
27. Allan S.	61	61	63	54		59	58	60	52	58.5
28. Susan S.	65	67	62	57	67	51	63	64		62.0
#29. Judith T.	63	67	63	67	63	61	63	67		64.3
30. Bonnie W.	61	58	47	62	61	55	63	62		58.6
31. Faye W.	65	70	53	66	68	66	63	65		64.5

Mean of average Z-scores: 59.4

#Students who did not complete Second Year University.

TABLE XXIII

Z-SCORES FOR THE ENRICHED GROUP IN GRADE ELEVEN  
KELVIN SCHOOL, APRIL, 1958

Name	Lit.	Comp.	Hist.	Math.	Phys.	Chem.	Fr.	Average
1. Sheldon B.	57	56	52	55	63	55	57	56.4
2. Howard B.	55	52	53	59	63	63	56	57.3
3. Ronald B.	52	48	62	60	59	60	47	55.4
#4. Oscar B.	39	46	32	35	43	36	32	37.6
5. Michael B.	49	56	53	59	57	53	54	54.4
6. William D.	59	58	52	49	54	58	51	54.4
7. Fred D.	51	49	64	54	65	64	51	56.9
8. Patricia D.	58	59	54	51	52	53	58	55.0
9. Leonard E.	55	58	58	59	57	58	61	58.0
10. John F.	57	61	62	63	61	63	55	60.3
11. Ken F.	56	54	52	64	56	56	51	55.6
#12. Jim G.	58	57	56	55	56	58	54	56.3
13. Earl G.	65	57	62	54	60	56	57	58.7
#14. Elaine H.	59	59	60	59	60	52	59	58.3
15. John H.	65	71	63	65	68	66	69	66.7
16. Morley H.	65	65	58	62	63	62	60	62.1
17. Valdine I.	50	58	43	45	46	44	55	48.7
18. Baillie K.	75	73	67	63	65	63	67	67.6
19. William K.	45	53	61	53	56	62	54	54.9
20. Dorothea K.	66	61	57	57	56	53	64	59.1
21. Joan M.	55	45	45	48	52	49	53	49.6
22. Robert M.	55	50	50	45	57	58	57	53.1
23. Dennis M.	52	57	52	58	58	59	52	55.4
#24. Jim M.	52	62	49	62	60	61	57	57.6
25. Murray P.	49	50	45	51	59	56	50	51.4
26. Burnett R.	58	57	53	56	58	62	54	56.9
27. John R.	54	56	64	61	59	53	50	56.7
28. Heather R.	68	71	63	62	60	63	61	64.0
29. John R.	56	62	56	52	62	56	51	56.4
30. Perry S.	41	42	47	51	50	45	44	45.7
31. Charles S.	55	49	61	60	60	60	46	55.9
32. David S.	61	55	62	52	63	61	53	58.1
#33. Ray T.	54	51	55	59	56	61	52	55.4
34. Henry U.	61	59	65	63	64	61	57	61.4
35. Mary-Jane V.	57	71	58	52	58	56	66	59.7
36. Jim W.	54	59	54	62	61	66	55	58.7
#37. Merle W.	53	50	53	47	50	52	52	51.0
38. Mark Y.	56	49	56	51	58	56	54	54.3

Mean of average Z-scores: 56.2

#Students who did not complete Second Year University.

TABLE XXIV

Z-SCORES FOR THE CONTROL GROUP IN GRADE ELEVEN  
KELVIN SCHOOL, APRIL, 1958

Name	Lit.	Comp.	Hist.	Math.	Biol.	Phys.	Chem.	Fr.	Lat.	Av.
#1. Ray B.	56	60	48	64		58	58	60		57.7
2. Sharon B.	60	62	60	61		62	67	59		61.6
#3. Joy B.	48	54	50	43	59	48	58	48		51.0
4. Gordon B.	59	59	58	60		62	56	55		58.4
5. Bryan C.	51	44	55	67			57	53		54.5
#6. Joan C.	56	66	65	57		50	58	64		59.4
7. Marilyn C.	60	53	60	62	62		57	65		59.9
#8. Jocelyn D.	55	47	55	45	56		42	49		49.9
9. John E.	66	68	66	63		66	66	66		65.9
10. James F.	56	52	65	50		61	55	52		55.9
#11. Peter F.	63	68	72	65		63	62		60	64.7
#12. David G.	58	50	58	55		53	50	63		55.3
#13. Simmie G.	53	51	65	53		47	57	60		55.1
14. Avon H.	63	62	70	56			54	64	62	61.6
#15. Carolyn H.	51	57	40	48	43			56		49.2
#16. Joan H.	63	64	65	52	65		55	52		59.4
17. Hillaine J.	51	61	47	52		45	51	44		50.1
#18. Garry L.	63	65	64	61		57	56		63	61.3
19. Bruce L.	43	49	38	59		61	59	47		50.9
20. Catherine M.	55	57	66	59		60	64	65		60.9
21. Judith M.	64	62	68	59	69		60	56		62.6
22. David M.	53	57	63	64		59	63	53		58.9
#23. Wendy P.	58	51	64	50	51		49	48		53.0
#24. Janet R.	63	73	63	60			61	61		63.5
#25. Dorothy R.	58	60	58	57	58		48	53		56.0
26. Frances R.	67	65	66	46	62		54	56		59.4
#27. Roger S.	45	43	52	49		52	54	45		48.6
#28. Walter S.	42	34	51	57		59	55	51		49.9
29. Carolyn W.	58	53	61	53	53		50	59		55.3
30. Edward W.	54	52	58	49		49	51	52		52.1
#31. Giles V.	51	48	52	49			53			50.6
	Mean of average Z-scores:									56.5

#Students who did not complete Second Year University.

TABLE XXV

MEASURES OF CENTRAL TENDENCY FOR SUBJECTS OF GRADE TWELVE  
AND FIRST YEAR AT THE UNIVERSITY OF MANITOBA, JUNE, 1959

	Subject	Code* letter	Number (N)	Mean (M)	Standard Deviation ( $\sigma$ )
Grade XII	Drama and Poetry	A	2650	53.2	15.0
	Comp. and Novel	B	2814	53.7	13.0
	History	C	946	56.2	17.3
	Mathematics	D	2376	56.9	19.2
	Chemistry	E	2398	54.6	19.6
	Physics	F	1732	55.3	18.5
	Biology	G	362	58.1	16.1
	French	H	1592	57.3	15.5
	Latin	J	102	55.6	19.1
First Year	Chemistry 110	K	749	54.7	16.6
	English 110	L	916	51.7	11.0
	French 110	N	684	54.1	14.7
	Mathematics 110	P	891	55.5	17.9
	Physics 110	Q	553	60.4	16.5
	History 110	R	237	58.9	13.2
	Latin 112	S	122	58.1	18.0
	Zoology 110	T	100	63.3	18.1
	German 101	U	82	54.5	20.8
	Latin 102	V	42	61.4	22.7
	Art 110	W	71	61.5	8.5
	Art 111	X	72	72.4	6.2
	Physiology 101	Y	51	60.8	14.8
	English 201	Z	1086	55.3	11.8

\*Subjects are named by means of these code letters in  
Tables XXVI - XXXI

TABLE XXVI

MARKS IN GRADE TWELVE AND FIRST YEAR UNIVERSITY  
FOR THE AUGMENTED GROUP, JUNE, 1959

Name	Subjects and Marks*					
1. Leslie A.	A:92	B:60	D:90	E:74	F:70	H:72
2. Carol C.	A:82	B:69	D:83	E:70	F:71	H:60
3. Carol J.	A:72	B:59	D:87	E:72	F:91	H:82
4. Robin M.	A:89	B:64	D:92	E:85	F:97	H:83
5. Janet R.	A:84	B:57	D:87	E:71	H:80	J:76
6. Judith T.	A:87	B:68	D:91	E:82	F:80	H:83
7. Faye W.	A:96	B:80	D:90	E:92	F:96	H:80
8. Charles A.	K:59	L:57	N:51	P:65	Q:64	
9. James A.	K:57	L:45	N:37	P:58	Q:76	
10. Michael B.	K:85	L:63	N:79	P:82	Q:77	
11. Judy B.	L:71	N:59	P:58	Q:62	R:70	
12. Susan B.	K:70	L:54	N:72	P:61	R:68	
13. Neil C.	K:54	L:52	N:64	P:44	Q:64	
14. Bonnie D.	K:67	L:42	N:45	P:70	Q:63	
15. Bruce H.	L:58	N:45	P:57	Q:64	R:52	
16. David K.	K:83	L:61	N:75	P:91	Q:81	
17. Helen M.	K:95	L:84	N:93	P:93	U:87	
18. Keith M.	K:60	L:54	N:55	P:64	Q:66	
19. Donald M.	K:41	L:57	N:56	P:30	Q:42	
20. Bruce N.	K:73	L:59	N:57	P:78	Q:60	
21. James N.	K:53	L:50	N:37	P:44	Q:59	
22. Reva R.	K:81	L:82	N:82	P:72	Q:73	
23. Marshall R.	K:65	L:62	P:72	Q:74	S:59	
24. Brent S.	K:86	L:63	N:68	P:78	Q:87	
25. Gerald S.	L:66	N:59	P:72	R:68	T:78	
26. Arthur S.	L:62	N:64	P:57	Q:73	R:80	
27. Allan S.	L:60	N:59	P:50	Q:69	R:80	
28. Susan S.	K:55	L:59	N:72	P:54	Q:50	
29. Bonnie W.	K:54	L:57	N:59	P:50	Q:45	

\*Subjects may be identified by reference to Table XXV.

TABLE XXVII

MARKS IN GRADE TWELVE AND FIRST YEAR UNIVERSITY  
FOR THE ENRICHED GROUP, JUNE, 1959

Name	Subjects and Marks*					
1. Michael B.	A:81	B:57	D:96	E:79	F:73	H:69
2. Ken F.	A:59	B:64	D:89	E:69	F:74	H:60
3. Jim G.	A:66	B:52	D:92	E:73	F:59	H:65
4. Joan M.	A:73	B:58	D:78	E:74	F:54	H:66
5. John R.	A:83	B:66	D:92	E:73	F:84	H:70
6. David S.	A:72	B:57	D:86	E:92	F:92	H:67
7. Mary-Jane V.	A:82	B:70	C:94	D:75	F:76	H:88
8. Jim W.	A:80	B:65	D:95	E:92	F:94	H:89
9. Merle W.	A:80	B:51	D:86	E:66	F:64	H:68
10. Perry S.	A:43	B:37	D:69	E:55	F:58	H:55
11. Sheldon B.	K:65	L:51	N:59	P:56	Q:60	Z:62
12. Howard B.	L:59	N:64	P:83	Q:84		
13. Ronald B.	K:83	L:51	N:68	P:72	Q:84	
14. William D.	L:69	N:42	P:32	Q:61	R:53	
15. Fred D.	K:87	L:45	N:62	P:70	Q:82	
16. Patricia D.	K:52	L:75	N:65	P:56	R:68	
17. Leonard E.	K:61	L:57	N:76	P:65	Q:68	
18. John F.	K:74	L:44	N:66	P:67	Q:53	
19. Earl G.	L:71	N:66	P:57	T:91	V:93	
20. Elaine H.	L:67	N:66	P:64	R:72	T:89	
21. John H.	L:73	N:88	P:92	Q:94	R:68	
22. Morley H.	K:86	L:72	N:77	P:69	Q:82	
23. Baillie K.	L:78	N:79	P:69	R:69	T:85	
24. William K.	K:62	L:57	N:61	P:69	Q:71	
25. Dorothea K.	K:57	L:72	N:71	P:67	R:69	
26. Robert M.	K:50	L:43	N:52	P:51	Q:60	
27. Dennis M.	K:62	L:59	N:55	P:66	Q:69	
28. Murray P.	K:59	L:34	N:58	P:63	Q:62	
29. Burnett R.	K:67	L:61	N:64	P:62	Q:80	
30. John R.	K:59	L:64	N:54	P:57	Q:68	
31. Heather R.	L:77	N:71	P:76	Q:81	R:85	
32. Charles S.	K:70	L:57	N:52	P:79	Q:80	
33. Henry U.	K:74	L:60	N:69	P:64	Q:79	
34. Mark Y.	K:50	L:53	N:53	P:70	Q:76	
35. Valdine I.	K:39	N:61	W:64	X:74	Y:65	

\*Subjects may be identified by reference to Table XXV.

TABLE XXVIII

MARKS IN GRADE TWELVE AND FIRST YEAR UNIVERSITY  
FOR THE CONTROL GROUP, JUNE, 1959

Name	Subjects and Marks*						
1. Ray B.	A:73	B:41	D:88	E:72	F:77	H:67	
2. Joan H.	A:74	B:62	D:73	E:65	G:84	H:74	
3. Garry L.	A:74	B:64	D:84	E:75	F:75	J:62	
4. Catherine M.	A:78	B:60	D:89	E:73	F:79	H:84	
5. Wendy P.	A:68	B:61	C:83	D:52	E:53	H:62	
6. Walter S.	A:52	B:39	D:83	E:69	F:76	H:50	
7. Giles V.	A:65	B:39	D:64	E:63	F:77	J:23	
8. Roger S.	A:60	B:54	D:63	E:73	F:61	H:54	
9. Sharon B.	K:59	L:45	N:59	P:56	Q:44		
10. Joy B.	K:50	L:54	N:54	P:50	Q:45		
11. Gordon B.	K:69	L:36	N:50	P:55	Q:52		
12. Bryan C.	K:73	L:29	N:25	P:77	Q:83		
13. Joan C.	L:31	N:71	P:43	Q:44			
14. Marilyn C.	K:55	L:51	N:73	P:67	R:55		
15. John E.	L:72	N:80	P:79	Q:78	R:76		
16. James F.	K:64	L:55	N:54	P:50	Q:61		
17. Peter F.	K:76	L:68	P:63	Q:77	S:56		
18. Simmie G.	L:58	N:60	P:39	R:51	T:59		
19. Avon H.	K:29	L:66	N:56	P:50	R:67		
20. Hillaine J.	K:50	L:56	N:50	P:25	Q:37		
21. Bruce L.	K:86	L:44	N:58	P:79	Q:89		
22. Judith M.	K:62	L:64	N:59	P:65	R:58		
23. David M.	K:64	L:59	N:53	P:60	Q:73		
24. Frances R.	L:62	N:66	P:37	R:80	T:89		
25. Janet R.	L:62	N:69	P:68	R:67	T:91		
26. Edward W.	K:50	L:40	N:51	P:56	Q:54		
27. Carolyn W.	K:53	L:57	N:72	W:70	X:72	Y:71	

\*Subjects may be identified by reference to Table XXV.

TABLE XXIX

Z-SCORES IN GRADE TWELVE AND FIRST YEAR UNIVERSITY  
FOR THE AUGMENTED GROUP, JUNE, 1959

Name	Subjects and Z-scores*						Average
1. Leslie A.	A:76	B:55	D:67	E:60	F:58	H:60	62.7
2. Carol C.	A:69	B:62	D:64	E:58	F:58	H:52	60.5
3. Carol J.	A:63	B:54	D:66	E:59	F:59	H:66	61.2
4. Robin M.	A:74	B:58	D:68	E:66	F:73	H:67	67.7
5. Janet R.	A:71	B:53	D:66	E:58	H:65	J:61	62.3
6. Judith T.	A:73	B:61	D:68	E:64	F:63	H:67	66.0
7. Faye W.	A:79	B:70	D:67	E:69	F:72	H:65	70.3
Mean of average Z-scores, Grade Twelve:							64.5
8. Charles A.	K:53	L:55	N:48	F:55	Q:52		52.6
9. James A.	K:51	L:44	N:38	P:51	Q:59		48.6
10. Michael B.	K:68	L:60	N:67	P:65	Q:60		64.0
11. Judy B.	L:68	N:53	P:51	Q:51	R:58		56.2
12. Susan B.	K:59	L:52	N:62	P:54	R:57		56.8
13. Neil C.	K:50	L:50	N:57	P:44	Q:52		50.6
14. Bonnie D.	K:57	L:41	N:44	P:58	Q:52		50.4
15. Bruce H.	L:56	N:44	P:51	Q:52	R:45		49.6
16. David K.	K:67	L:59	N:64	P:70	Q:62		64.4
17. Helen M.	K:74	L:79	N:76	P:72	U:66		73.4
18. Keith M.	K:53	L:52	N:51	P:55	Q:53		52.8
#19. Donald M.	K:42	L:55	N:51	P:36	Q:39		44.6
20. Bruce N.	K:61	L:57	N:52	P:63	Q:50		56.6
21. James N.	K:49	L:48	N:38	P:44	Q:49		45.6
22. Reva R.	K:66	L:78	N:69	P:59	Q:58		66.0
23. Marshall R.	K:56	L:59	P:59	Q:58	S:51		56.6
24. Brent S.	K:69	L:60	N:59	P:63	Q:66		63.4
25. Gerald S.	L:63	N:53	P:59	R:57	T:58		58.0
26. Arthur S.	L:59	N:57	P:51	Q:58	R:66		58.2
27. Allan S.	L:58	N:53	P:47	Q:55	R:66		55.8
28. Susan S.	K:50	L:57	N:62	P:49	Q:44		52.4
29. Bonnie W.	K:50	L:55	N:53	P:47	Q:41		49.2
Mean of average Z-scores, First Year:							55.7

\*Subjects may be identified by reference to Table XXV.

#Students who did not complete Second Year University.

TABLE XXX

Z-SCORES IN GRADE TWELVE AND FIRST YEAR UNIVERSITY  
FOR THE ENRICHED GROUP, JUNE, 1959

Name	Subjects and Z-scores*						Average
1. Michael B.	A:69	B:53	D:70	E:62	F:60	H:58	62.0
2. Ken F.	A:54	B:58	D:67	E:57	F:60	H:52	58.0
3. Jim G.	A:59	B:49	D:68	E:59	F:52	H:55	57.0
4. Joan M.	A:63	B:53	D:61	E:60	F:49	H:56	57.0
5. John R.	A:70	B:59	D:68	E:59	F:65	H:58	63.2
6. David S.	A:63	B:53	D:65	E:69	F:70	H:56	62.7
7. Mary-Jane V.	A:69	B:63	C:72	D:59	F:62	H:70	65.8
8. Jim W.	A:68	B:59	D:70	E:69	F:71	H:70	67.8
9. Merle W.	A:68	B:48	D:65	E:56	F:55	H:57	58.2
10. Perry S.	A:43	B:37	D:56	E:50	F:51	H:49	47.7
Mean of average Z-scores, Grade Twelve:							59.9
11. Sheldon B.	K:56	L:49	N:53	P:50	Q:50	Z:56	52.3
12. Howard B.	L:57	N:57	P:65	Q:64			60.8
13. Ronald B.	K:67	L:49	N:59	P:59	Q:64		59.8
14. William D.	L:66	N:42	P:37	Q:50	R:46		48.2
15. Fred D.	K:69	L:44	N:55	P:58	Q:63		57.8
16. Patricia D.	K:48	L:71	N:57	P:50	R:57		56.6
17. Leonard E.	K:54	L:55	N:65	P:55	Q:55		56.8
18. John F.	K:62	L:43	N:58	P:56	Q:46		53.0
19. Earl G.	L:68	N:58	P:51	T:65	V:64		61.2
#20. Elaine H.	L:64	N:58	P:55	R:60	T:64		60.2
21. John H.	L:69	N:73	P:70	Q:70	R:57		67.8
22. Morley H.	K:69	L:68	N:66	P:58	Q:63		64.8
23. Baillie K.	L:74	N:67	P:58	R:58	T:62		63.8
24. William K.	K:54	L:55	N:55	P:58	Q:56		55.6
25. Dorothea K.	K:51	L:68	N:62	P:56	R:58		59.0
26. Robert M.	K:47	L:42	N:49	P:47	Q:50		47.3
27. Dennis M.	K:54	L:57	N:51	P:56	Q:55		54.6
28. Murray P.	K:53	L:34	N:53	P:54	Q:51		49.0
29. Burnett R.	K:57	L:59	N:57	P:54	Q:62		57.8
30. John R.	K:53	L:61	N:50	P:51	Q:55		54.0
31. Heather R.	L:73	N:62	P:61	Q:62	R:70		65.6
32. Charles S.	K:59	L:55	N:49	P:63	Q:62		57.6
33. Henry U.	K:62	L:58	N:60	P:55	Q:61		59.2
34. Mark Y.	K:47	L:51	N:49	P:58	Q:59		52.8
35. Valdine I.	K:41	N:55	W:53	X:53	Y:53		51.0
Mean of average Z-scores, First Year:							57.1

\*Subjects may be identified by reference to Table XXV.

#Students who did not complete Second Year University.

TABLE XXXI

Z-SCORES IN GRADE TWELVE AND FIRST YEAR UNIVERSITY  
FOR THE CONTROL GROUP, JUNE, 1959

Name	Subjects and Z-scores*							Average
1. Ray B.	A:63	B:40	D:66	E:59	F:62	H:56	57.7	
2. Joan H.	A:64	B:56	D:58	E:55	G:66	H:61	60.0	
3. Garry L.	A:64	B:58	D:64	E:60	F:61	J:53	60.0	
4. Catherine M.	A:67	B:55	D:67	E:59	F:63	H:67	63.0	
5. Wendy P.	A:60	B:56	C:65	D:47	E:49	H:53	55.0	
6. Walter S.	A:49	B:39	D:64	E:57	F:62	H:45	52.7	
7. Giles V.	A:58	B:39	D:54	E:54	F:62	J:33	50.0	
8. Roger S.	A:55	B:50	D:53	E:59	F:53	H:48	53.0	
Mean of average Z-scores, Grade Twelve:							56.4	
9. Sharon B.	K:53	L:44	N:53	P:50	Q:40		48.0	
#10. Joy B.	K:47	L:52	N:50	P:47	Q:41		47.4	
11. Gordon B.	K:59	L:36	N:47	P:50	Q:45		47.4	
12. Bryan C.	K:61	L:29	N:30	P:62	Q:64		49.2	
#13. Joan C.	L:31	N:62	P:43	Q:40			44.0	
14. Marilyn C.	K:50	L:49	N:63	P:56	R:47		53.0	
15. John E.	L:68	N:68	P:63	Q:61	R:63		64.6	
16. James F.	K:56	L:53	N:50	P:47	Q:50		51.2	
#17. Peter F.	K:63	L:65	P:60	Q:60	S:49		58.2	
#18. Simmie G.	L:56	N:54	P:41	R:44	T:48		48.6	
19. Avon H.	K:35	L:63	N:51	P:47	R:56		50.4	
20. Hillaine J.	K:47	L:54	N:47	P:30	Q:36		42.8	
21. Bruce L.	K:69	L:43	N:53	P:63	Q:67		59.0	
22. Judith M.	K:54	L:61	N:53	P:55	R:49		54.4	
#23. David M.	K:56	L:57	N:49	P:52	Q:58		54.4	
24. Frances R.	L:59	N:58	P:40	R:66	T:64		57.4	
#25. Janet R.	L:59	N:60	P:57	R:56	T:65		59.4	
26. Edward W.	K:47	L:39	N:48	P:50	Q:46		46.0	
27. Carolyn W.	K:49	L:55	N:62	W:60	X:51	Y:57	52.2	
Mean of average Z-scores, First Year:							52.2	

\*Subjects may be identified by reference to Table XXV.

#Students who did not complete Second Year University.

TABLE XXXIII

MEASURES OF CENTRAL TENDENCY FOR SUBJECTS OF SECOND YEAR  
AT THE UNIVERSITY OF MANITOBA, APRIL, 1960

Subject	Code*	Number (N)	Mean (M)	Stan. Dev. ( $\sigma$ )
Botany 205	a	105	58.1	14.7
Chemistry 201	b	634	56.8	15.2
Chemistry 207	c	47	59.3	16.0
Chemistry 301	d	343	55.4	21.0
Chemistry 110	e	730	60.3	16.6
Christian Origins 201	f	16	59.8	14.4
Economic Principles 203	g	345	60.2	13.1
English 201	h	1365	54.5	11.0
English 110	i	955	55.3	11.1
French 201	j	828	54.0	15.6
Geography 201	k	420	56.2	10.7
Geology 202	l	133	56.6	10.7
German 110	m	49	65.2	18.0
History 203	n	419	57.4	12.2
Logic 202	o	62	68.8	14.6
Arts and Science Mathematics 201	p	680	58.1	19.7
Mathematics 209	q	64	59.2	16.5
Mathematics 110	r	897	58.8	18.4
Philosophy 203	s	63	62.3	12.3
Philosophy 204	t	226	58.5	11.7
Physics 203	u	359	45.7	24.5
Physics 206	v	212	49.3	19.6
Physics 110	w	522	55.4	16.4
Political Science 201	x	274	61.5	6.8
Psychology 203	y	643	53.7	13.3
Russian 102	z	26	67.6	19.8
Sociology 202	A	196	58.2	10.9
Zoology 209	B	419	57.0	10.9
Zoology 110	C	198	62.6	17.6
Commerce Special English 202	D	45	68.1	16.1
Mathematics of Finance 201	E	46	66.1	14.5
General Mathematics 203	F	36	63.1	15.9
Basic Accounting 201	G	47	60.0	15.8
Engineering Chemistry 206	H	206	53.4	12.5
English 204	I	278	54.2	10.2
Physics 111	J	215	52.2	22.4
Algebra 112	K	201	55.7	18.9
Geometry & Calculus 113	L	273	57.6	23.7
Trigonometry 116	M	283	54.8	21.8
Drawing 110	N	181	77.3	5.8
Mechanics 114	P	215	60.4	20.0
Descriptive Geometry 117	Q	192	58.3	22.0
Survey Field Work 118	R	244	76.0	4.9
Surveying 120	S	192	61.4	18.3
Geography 111	T	210	63.0	10.5
Home Ec. Psychology 313	U	54	52.9	10.3
Sociology 201	V	53	58.5	9.1
Food Study & Management 201	W	48	68.8	9.2
Food Study & Management 202	X	48	76.9	6.9
Clothing & Textiles 201	Y	48	58.3	12.1
Clothing & Textiles 202	Z	48	63.1	9.5

\*Subjects are named by means of these code letters  
in Tables XXXIII - XXXVIII

TABLE XXXIII

MARKS IN SECOND YEAR UNIVERSITY FOR THE  
AUGMENTED GROUP, APRIL, 1960

Name	Subjects and Marks*						
1. Leslie A.	h:68	j:66	x:65	A:67	o:74	s:65	
2. James A.	b:53	j:50	p:57	u:54	B:45		
3. Michael B.	b:85	h:64	p:82	u:78	l:67		
4. Judy B.	h:62	j:73	A:63	g:62	k:31		
5. Susan B.	h:62	j:75	n:67	C:79	y:60		
6. Carol C.	h:71	j:50	A:57	t:60	y:53		
7. Neil C.	b:50	h:57	v:72	B:42	y:57		
8. Bonnie D.	b:66	h:37	p:39	B:64	y:42		
9. Bruce H.	h:45	j:53	p:51	y:57	g:58		
10. Carol J.	b:42	h:61	j:66	p:35	u:33		
11. David K.	b:90	h:60	p:88	u:88	y:83		
12. Robin M.	b:38	j:68	p:75	B:59	a:70		
13. Helen M.	h:77	j:94	A:80	y:96	m:93		
14. Keith M.	b:50	h:69	p:57	u:16	B:52		
15. Bruce N.	h:70	j:61	n:80	x:74	t:56		
16. James N.	h:40	v:34	B:37	d: 7	r:60		
17. Reva R.	b:67	h:86	j:77	v:42	y:86		
18. Brent S.	b:87	h:72	p:91	u:70	y:80		
19. Arthur S.	h:67	j:58	n:80	x:67	t:76		
20. Allan S.	h:85	j:63	n:80	x:62	t:64		
21. Susan S.	h:85	j:65	x:67	A:61	y:71		
22. Bonnie W.	b:43	h:70	B:59	t:56	q:64		
23. Faye W.	b:83	h:62	j:80	p:86	u:82	g:71	
24. Marshall R.	h:64	p:57	D:73	E:65	F:52	g:65	G:70
25. Janet R.	h:58	p:57	D:74	E:61	F:74	g:69	G:62
26. Gerald S.	h:67	x:61	D:78	E:75	F:68	g:73	G:66
27. Charles A.	H:53	I:58	J:65	K:72	L:76	M:82	N:77
			P:74	Q:59	R:77	S:76	T:67

\*Subjects may be identified by reference to Table XXXII.

TABLE XXXIV

MARKS IN SECOND YEAR UNIVERSITY FOR THE  
ENRICHED GROUP, APRIL, 1960

Name	Subjects and Marks*							
1. Sheldon B.	v:58	B:74	y:68	d:66	k:63			
2. Howard B.	b:75	h:65	p:83	u:93	y:81			
3. Ronald B.	b:70	h:55	p:67	v:83	B:71			
4. William D.	h:59	j:34	g:72	t:61	r:50			
5. Fred D.	b:85	h:58	p:64	u:67	y:65			
6. Patricia D.	h:58	j:62	n:61	x:61	y:58			
7. Leonard E.	j:72	g:70	v:52	B:66	d:43			
8. Earl G.	h:63	j:69	g:81	e:59	w:63			
9. John H.	h:66	j:88	p:94	u:94	n:59			
10. Morley H.	b:88	h:76	j:81	p:89	u:83			
11. Baillie K.	h:86	j:75	n:66	x:70	t:71			
12. William K.	h:57	j:60	p:57	B:62	y:67			
13. Dorothea K.	h:72	j:74	A:62	t:68	f:74			
14. Joan M.	h:60	j:44	p:62	B:45	y:45			
15. Robert M.	b:42	j:45	p:18	B:45				
16. Murray P.	b:53	j:57	p:45	u:54	l:50			
17. John R.	b:65	h:56	v:74	B:67	y:82			
18. Heather R.	h:87	j:81	n:76	t:85	y:68			
19. John R.	b:62	h:64	p:82	l:67	k:70			
20. Perry S.	v:26	x:53	B:45	i:57	d:45			
21. Charles S.	b:60	h:69	p:83	v:64	y:81			
22. Mary-Jane V.	h:81	j:83	n:81	A:81	y:73			
23. Mark Y.	b:56	h:63	p:50	v:21	B:57			
24. Michael B.	h:53	p:42	g:54	D:73	E:61	F:67	G:50	
25. John F.	h:63	p:69	g:67	D:70	E:71	F:62	G:59	
26. Ken F.	h:50	p:64	g:57	D:80	E:62	F:83	G:50	
27. Dennis M.	H:45	I:45	J:81	K:55	L:64	M:56	N:83	
			P:74	Q:67	R:81	S:60	T:56	
28. Burnett R.	H:55	I:58	J:43	K:76	L:57	M:55	N:80	
			P:71	Q:61	R:75	S:85	T:68	
29. David S.	H:69	I:70	J:82	K:64	L:84	M:98	N:79	
			P:78	Q:91	R:78	S:71	T:82	
30. Henry U.	H:64	I:62	J:76	K:62	L:91	M:68	N:81	
			P:77	Q:63	R:81	S:84	T:71	
31. Jim W.	H:73	I:70	J:97	K:84	L:91	M:90	N:80	
			P:98	R:84	S:92	T:83		
32. Valdine I.	h:61	e:56	U:56	V:56	W:64	X:77	Y:58	
			Z:59					

\*Subjects may be identified by reference to Table XXXII.

TABLE XXXV

MARKS IN SECOND YEAR UNIVERSITY FOR THE  
CONTROL GROUP, APRIL, 1960

Name	Subjects and Marks*								
1. Sharon B.	h:62	j:57	x:56	C:77	t:56				
2. Bryan C.	b:75	j:29	p:79	u:53	y:50				
3. Marilyn C.	h:51	j:78	n:57	C:67	y:68				
4. Avon H.	h:64	j:59	A:62	C:82	y:61				
5. Hillaine J.	h:54	j:40	x:56	C:70	t:54				
6. Bruce L.	b:79	j:56	p:86	u:96	t:70				
7. Judith M.	h:68	j:57	n:68	t:63	z:77				
8. Catherine M.	h:63	j:66	p:69	n:69	y:61				
9. David M.	b:60	h:43	p:62	g:70	B:60				
10. Frances R.	h:57	j:68	n:71	x:76	t:65				
11. Edward W.	h:45	j:45	g:56	v:54	B:55				
12. John E.	h:63	p:70	D:83	E:87	F:79	G:75	g:76		
13. Gordon B.	H:53	I:63	J:72	K:29	L:71	M:60	N:78		
			P:66	Q:71	R:71	S:70	T:71		
14. James F.	H:51	I:67	J:55	K:26	L:24	M:54	N:59		
			P:45	Q:52	R:74	S:51	T:68		
15. Carolyn W.	h:59	c:72	U:50	V:65	W:73	X:87	Y:63		
			Z:67						

\*Subjects may be identified by reference to Table XXXII.

TABLE XXXVI

Z-SCORES FOR THE AUGMENTED GROUP IN  
SECOND YEAR UNIVERSITY, APRIL, 1960

Name	Subjects and Z-scores*							Av.
1. Leslie A.	h:62	j:58	x:55	A:58	o:54	s:52		56.5
2. James A.		b:47	j:47	p:49	u:53	B:39		47.0
3. Michael B.		b:68	h:59	p:62	u:63	l:60		62.4
4. Judy B.		h:57	j:62	A:54	g:51	k:27		50.2
5. Susan B.		h:57	j:63	n:58	C:59	y:55		58.4
6. Carol C.		h:65	j:47	A:49	t:51	y:49		52.2
7. Neil C.		b:46	h:52	v:62	B:36	y:53		49.8
8. Bonnie D.		b:56	h:34	p:40	B:56	y:41		45.4
9. Bruce H.		h:41	j:49	p:46	y:53	g:48		47.4
10. Carol J.		b:40	h:56	j:58	p:38	u:45		47.4
11. David K.		b:72	h:55	p:65	u:67	y:72		66.2
12. Robin M.		b:38	j:59	p:59	B:52	a:58		53.2
13. Helen M.		h:70	j:76	A:70	y:82	m:65		72.6
14. Keith M.		b:46	h:63	p:49	u:38	B:45		48.2
15. Bruce N.		h:64	j:54	n:69	x:68	t:48		60.6
16. James N.		h:37	v:42	B:32	d:27	r:51		37.8
17. Reva R.		b:57	h:79	j:65	v:46	y:74		64.2
18. Brent S.		b:70	h:66	p:67	u:60	y:70		66.6
19. Arthur S.		h:61	j:53	n:69	x:58	t:65		61.2
20. Allan S.		h:78	j:56	n:69	x:51	t:55		61.8
21. Susan S.		h:78	j:57	x:58	A:53	y:63		61.8
22. Bonnie W.		b:41	h:64	B:52	t:48	q:53		51.6
23. Faye W.	b:67	h:57	j:67	p:64	u:65	g:58		63.0
24. Marshall R.	h:59	p:49	D:53	E:49	F:43	g:54	G:56	51.9
25. Janet R.	h:53	p:49	D:54	E:46	F:57	g:57	G:51	52.4
26. Gerald S.	h:61	x:49	D:56	E:56	F:53	g:60	G:54	55.6
27. Charles A.	H:50	I:54	J:56	K:59	L:58	M:63	N:49	
			P:57	Q:50	R:52	S:58	T:54	55.0
Mean of average Z-scores:								55.6

\*Subjects may be identified by reference to Table XXXII.

TABLE XXXVII

Z-SCORES FOR THE ENRICHED GROUP IN  
SECOND YEAR UNIVERSITY, APRIL, 1960

Name	Subjects and Z-scores*							Av.
1. Sheldon B.	v:54	B:66	y:61	d:55	k:56			58.4
2. Howard B.	b:62	h:60	p:63	u:69	y:71			65.0
3. Ronald B.	b:59	h:50	p:55	v:67	B:63			58.8
4. William D.	h:54	j:37	g:59	t:52	r:45			49.4
5. Fred D.	b:68	h:53	p:53	u:59	y:59			58.4
6. Patricia D.	h:53	j:55	n:53	x:49	y:53			52.6
7. Leonard E.	j:62	g:57	v:51	B:58	d:44			54.4
8. Earl G.	h:58	j:60	g:66	e:49	w:55			57.6
9. John H.	h:60	j:72	p:68	u:70	n:51			64.2
10. Morley H.	b:70	h:70	j:67	p:66	u:65			67.6
11. Baillie K.	h:79	j:63	n:57	x:63	t:61			64.6
12. William K.	h:52	j:54	p:49	B:55	y:60			54.0
13. Dorothea K.	h:66	j:63	A:53	t:58	f:60			60.0
14. Joan M.	h:55	j:44	p:52	B:39	y:43			46.6
15. Robert M.	b:40	j:44	p:30	B:39				38.3
16. Murray P.	b:47	j:52	p:43	u:53	l:44			47.8
17. John R.	b:55	h:51	v:63	B:59	y:71			59.8
18. Heather R.	h:80	j:67	n:65	t:73	y:61			69.2
19. John R.	b:53	h:59	p:62	l:60	k:63			59.4
20. Perry S.	v:38	x:38	B:39	i:52	d:45			42.4
21. Charles S.	b:52	h:63	p:63	v:58	y:71			61.4
22. Mary-Jane V.	h:74	j:69	n:70	A:64	y:65			68.4
23. Mark Y.	b:49	h:58	p:46	v:35	B:50			47.6
24. Michael B.	h:49	p:42	g:45	D:53	E:46	F:52	G:44	47.3
25. John F.	h:58	p:55	g:55	D:51	E:53	F:49	G:49	52.9
26. Ken F.	h:46	p:53	g:48	D:57	E:47	F:62	G:44	51.0
27. Dennis M.	H:43	I:41	J:63	K:50	L:53	M:51	N:60	
			P:57	Q:54	R:60	S:49	T:43	52.0
28. Burnett R.	H:51	I:54	J:46	K:61	L:50	M:50	N:55	
			P:55	Q:51	R:48	S:63	T:55	53.3
29. David S.	H:62	I:65	J:63	K:54	L:61	M:70	N:53	
			P:59	Q:65	R:54	S:55	T:68	60.8
30. Henry U.	H:59	I:58	J:61	K:53	L:64	M:56	N:58	
			P:58	Q:52	R:60	S:62	T:58	58.1
31. Jim W.	H:66	I:65	J:70	K:65	L:64	M:66	N:55	
			P:64	Q:68	R:66	S:67	T:69	65.4
32. Valdine I.	h:56	e:47	U:53	V:47	W:45	X:52	Y:50	
			Z:46					49.5
								Mean of average Z-scores:
								56.1

\*Subjects may be identified by reference to Table XXXII.

TABLE XXXVIII

Z-SCORES FOR THE CONTROL GROUP IN  
SECOND YEAR UNIVERSITY, APRIL, 1960

Name	Subjects and Z-scores*							Av.
1. Sharon B.	h:57	j:52	x:42	C:58	t:48			51.4
2. Bryan C.	b:62	j:34	p:61	u:53	y:47			51.4
3. Marilyn C.	h:47	j:65	n:50	C:52	y:61			55.0
4. Avon H.	h:59	j:53	A:53	C:61	y:56			56.4
5. Hillaine J.	h:50	j:41	x:42	C:54	t:46			46.6
6. Bruce L.	b:65	j:51	p:64	u:71	t:60			62.2
7. Judith M.	h:62	j:52	n:59	t:54	z:55			56.4
8. Catherine M.	h:58	j:58	p:55	n:60	y:56			57.4
9. David M.	b:52	h:40	p:52	g:57	B:53			50.8
10. Frances R.	h:52	j:59	n:61	x:71	t:56			59.8
11. Edward W.	h:41	j:44	g:47	v:52	B:48			46.4
12. John E.	h:58	p:56	g:62	D:59	E:64	F:60	G:60	59.9
13. Gordon B.	H:50	I:59	J:59	K:36	L:56	M:52	N:51	
			P:53	Q:56	R:40	S:55	T:58	52.1
14. James F.	H:48	I:63	J:51	K:34	L:36	M:50	N:18	
			P:42	Q:47	R:46	S:44	T:55	44.5
15. Carolyn W.	h:54	c:58	U:47	V:57	W:55	X:65	Y:54	
			Z:54					55.5
								Mean of average Z-scores: 53.7

\*Subjects may be identified by reference to Table XXXII.

APPENDIX B  
THE PREVIOUS STUDY

KELVIN HIGH SCHOOL  
WINNIPEG

A  
REPORT  
ON  
AN EXPERIMENT WITH VERY BRIGHT STUDENTS

DECEMBER, 1958

SCHOOL DISTRICT OF WINNIPEG NO. 1  
Superintendent's Department

FOREWORD

The attached report was not prepared initially for publication or wide circulation. It was substantially the attempt of a school staff to prepare for its own satisfaction a record and an assessment of an experiment in which many members had been involved. Because of its quality, however, and its timeliness, it seems proper, with the consent of the staff, to make it available for wider scrutiny.

It would be unwise to draw final conclusions from this single experience as to methods of educating very bright students in their high school years. But it is from carefully planned, carefully executed and carefully appraised projects of this kind that progress will come. The opinions and conclusions of all concerned will be of immediate value in making city-wide plans for 1959-60. Thanks are due to Mr. R. J. Cochrane and his staff and to Dr. W. H. Lucow of the Faculty of Education, University of Manitoba for a valuable contribution to the educational program in Winnipeg.

G. T. MacDonell,  
Assistant Superintendent.

TABLE OF CONTENTS

Section		Page
I	- The Principal's Report	106
II	- Staff Assessment	120
III	- Student Assessment	133
IV	- Counsellor's Report	138
V	- Suggested Texts and Materials for Enriched Courses	143
VI	- Statistical Report	146

SECTION I

The Principal's Report

In recent times education has been taking a closer look at the school's responsibility for the education of the bright or gifted child. The general public and those engaged in education have questioned whether or not the bright child gets full value for the years spent in school. In some quarters it has been suggested that the school even harms the gifted child rather than develops or benefits him; that he is held back, bored and even frustrated while waiting for his slower classmates. It is claimed that the course of studies offers little challenge to his superior ability; that he has little opportunity to exhibit or develop initiative, original thinking and creative effort when he takes his schooling with a heterogeneous or rank and file class. This type of thinking maintains that society is wasting, possibly partially destroying much talent and ability that could develop into leadership in the community and nation.

No doubt there is a kernel of truth in the statement that a number of brighter students do not get as much from their schooling as they should. However, it is an extravagant and unfair criticism to make a sweeping condemnation of the school's handling of bright children.

Leadership, whether it be in research or management of

people requires many qualities besides intellectual superiority (if defined by a high I.Q.). No transient or temporary environment, no inclement educational climate will do permanent damage to the development of potential leaders, nor will it retard intellectual growth for more than a short season. As great or even greater damage can result from a "hot house" environment for too long a season of early development. Modern thought in education inclines to the theory that more and more should be done for the children with the resultant lessening of emphasis on what the child can and should do for himself. Leadership and achievement are rooted in the conquest of self and the surmounting of obstacles of environment and situation.

An old and familiar story from the animal world illustrates the point. In an ill advised attempt to make entrance into life easier for the chicken a farmer cracked an egg shell at the psychological moment thus relieving the chicken of solving the problem of his environment and of putting forth the energy required to reach the next stage of his development. This chicken became the weakling of the flock and never achieved normal maturity. History is full of names of men and women who battled seemingly insurmountable obstacles to become leaders in letters, art and the sciences. But will anyone deny that the poorest school offers opportunity, even if it be but a minimum, for the

bright child to slake his thirst for knowledge and to make him aware of other fountains that are bubbling over with opportunities ready for his taking?

This argument is not to say that we should be satisfied with the poorest school situation or on the other hand with even the best. Nevertheless, it is an over-simplification to think that provision and arrangement of environment, curriculum and teaching will solve the problem of developing leaders. A host of variants and uncontrollable factors will also have to be taken into account. Emotional make-up, family background and home situation, the impact of outside influences, interest and motivation, to mention only a few, can be aids or deterrents in the growth and development of the individual, bright or dull.

The school and the general public must recognize the very real existence of the many influences brought to bear upon the children outside of the school. There is a great deal of truth in one of the cliches of progressive education i.e., "that the whole child goes to school". Although the school may accept the dictum that its main purpose is to promote and encourage the mental development of its students it is also aware that Johnny's ideas about right and wrong, his sense of values, his social concepts are being molded too, not only by the school but by family, church and social companions. If there is an overall consonance of development

we can hopefully expect maximal achievement and if Johnny happens to be a gifted child, then he should make an outstanding contribution to society.

But is there something more that the school can do to help the gifted student to approach full development of his potentialities? Many schools are seeking the answer to this question through experiment and observation of the results.

Several years ago, the Winnipeg School system organized a number of classes for gifted children in the elementary schools. A careful process of selection was used to choose the pupils for these classes. Every effort was put forth to be sure that members of the special classes were well adjusted emotionally, socially, had a good home environment and possessed above average innate ability. The teachers assigned to these classes took courses in handling gifted children. The school board provided the necessary additional materials and facilities for the schooling of these children. As yet no formal report has been made on the results of the experiment.

Some of these pupils are presently completing Jr. High school. Shortly they will be knocking on the doors of High School, looking for new worlds to conquer. Looking ahead to that time, we at Kelvin have been doing some experimenting with the brighter high school students. In

the school years 1955-1956 - 1956-1957 a Grade XI class each year was formed of students who undertook four optional subjects instead of the usual three. French, Chemistry, and Physics were taken by all students with an additional option of Latin or Biology. Latin proved the more popular by about two to one (for Biology). Membership in the class was by application and selection was on the basis of academic performance in Grade X. The school sent out a letter advising the home of the plan, and the parent's signature on the student's application form gave family consent.

All thirty students of the first class gained accredited standing (1955-1956). A member of this group won an Isbister Scholarship.

The 1956-1957 class had thirty-nine members. Three failed to obtain exempted standing; two of the four Isbister Scholarships won by Kelvin went to members of the special class. It is noteworthy that both classes had a high participation rate in student program activities with little apparent effect on their studies. There can be no claim to scientific experiment. The results based on observation were interesting and gratifying. By cutting time corners, a little here and there, sixty-six (in the two classes) young people handled quite comfortably the regular course and a year's work in an additional subject. No time cut was made for them in the four weekly periods allotted to study,

incidental art, glee club, opera, student council and other program activities. In only four cases during the two years was it necessary to suggest reduction in extra activities to students. Homework and home study time averaged two-and-a-half hours per day of a five-day week. We did not consider this excessive.

Encouraged by the success of the venture we decided to broaden the scope of the experiment. For two years bright students had undertaken an augmented program. For the 1957-1958 school year, Grade X students were permitted to apply for either an augmented course or an enriched course.

The augmented course, as in the two previous years consisted of the compulsory subjects, three optional subjects, French, Chemistry, Physics and a choice of Latin or Biology as the fourth option.

The enriched course consisted of the compulsory subjects and three optional subjects, French, Chemistry, and Physics.

Selection of students was based as before on academic achievement in the grade. Thirty-two students were chosen for the augmented course, thirty-eight for the enriched. The range of academic averages in the former was 75.5% to 94.7%, in the latter 78.2% to 94.4% general average for the year. These 1957-1958 classes had two different groups of teachers. The teachers of this class held several meet-

ings to discuss how enrichment was to be carried out. It was agreed that each teacher should provide enrichment in the subject when and as the teacher saw fit; no attempt would be made to hurry through course content but the class pace would determine to what extent the scope of the course could be extended. Teachers kept an account of the enrichment attempted. The Winnipeg School Board provided additional materials and books requested by the teachers.

As stated above the classes were formed on the basis of voluntary application for the course and academic achievement in Grade X. However, we decided that it would be interesting and instructive to obtain information about the students' family background, socio-economic status, job experience and participation in extra-curricular activities. To this end, the guidance counsellors interviewed all students. Much of the information gleaned from these interviews served to confirm our contention that influences and climate outside the school play a large part in success at school. The young men and women of the two special classes have received from their parents and homes an inheritance of good natural ability, attitudes and habits of industry and enthusiasm, respect for direction and guidance. The seventy families represented are all economically middle class, about 70% could see their children through university without any

great sacrifice by the parents, 20% might be said to be well off, and 10% would have to make considerable sacrifice to pay for university education of their children. Eighty per cent of the families include two or three children. In only 20% of the homes are both parents working and among them very few mothers are employed full time. Two sets of parents have legal separations. In two cases the mothers are widowed. Sixty-four per cent of the parents hold professional, managerial or administrative positions. Student information indicated that 43% of the parents have university degrees, and another 42% have at least high school education with additional training in nursing, commercial courses and partial university standing. It is no surprise therefore that the children of such homes should be ambitious for success in getting a good formal education; they have the home background and training to encourage them in their endeavour. These students engaged in a variety of extra-curricular activities both in school and out; in school they gave leadership and support through their zestful participation; outside of school we find them as leaders in church, synagogue and youth groups. Not more than 25% indicated job experience at any time, with only 18% doing part time work during Grade XI.

If one sought to define education in a short sentence possibly the most fitting definition is found in the New Testament statement concerning Jesus - that He,

"increased in wisdom and stature, and in favour with God and man".

It would be folly to attempt to measure in completely objective terms the growth and development of our students in those four-fold respects. Where measuring instruments exist e.g. school marks, we may examine the results. However, the estimate of success or failure of the undertaking must rest upon the preponderance of evidence, for either decision, through the subjective and personal judgments expressed by both students and teachers engaged in the experiment. The broad participation of these classes in the student program, literary, athletic, musical and social activities as well as their active interest in church and humanitarian organizations outside of school, indicate considerable growth in understanding of God and their fellow man and a healthy physical development. If student appraisal should be considered a more valid measurement of their gain or loss, the opportunity was given them to answer a questionnaire evaluation form. The class taking the enriched course wanted a chance to express themselves more fully in an open session with the principal. The students had been told that their evaluation could afford helpful guidance in making plans for future classes like theirs. I was impressed with the sincerity, frankness and intelligence of student contributions to the discussion which we had.

Rapport between students and staff members was excellent. Both classes refused the privilege of submitting

anonymous evaluation forms and their replies were by no means a stamp of approval of all aspects of the experiment. The staff had agreed that enrichment should not consist of forging ahead into the next year's work but additional study should be on a horizontal plane. The students in their appraisal were quick to note that certain subjects such as English and History lend themselves more readily to this form of extension, whereas Mathematics and the Sciences offer a more limited scope in this respect. Therefore, there was general agreement among the students that greater effort in planning should be made to extend enrichment in the latter subjects. Some students wanted enrichment to be on an individual basis entirely, with freedom to choose particular subjects for additional study. The boy scientists and mathematicians were particularly vocal on this topic. They argued at length against the philosophy of broader general education at the high school level and more specialized study at the university stage. A sound recommendation for instituting a science club came from these same people. This conference also suggested that students be permitted to plan and institute, with teacher approval, projects of their own choice. A great majority of the students placed as their most important benefit the stimulating experience of being with eager and alert classmates. Several pupils of the augmented course class quite rightly claimed that their

subjects were enriched too through penetrating questions by students and teachers which led to explorations and discussions beyond the ordinary limits of the course.

On the other hand a small number felt that the course was too heavy, or that they could not participate freely in extra-curricular activities without jeopardizing their scholastic standing. Of seventy boys and girls taking either of the courses, sixty-two stated without qualification that they enjoyed the year and would advise students like themselves to undertake the program. Of the remaining eight who did not enjoy the experience, or expressed partial enjoyment, five would advise students like themselves to take a standard course. A number of students were pleased to have an extra year in Latin feeling that it broadened their horizon, increased their English vocabulary and in one instance suggested that the Latin discipline would be helpful in his approach to the science discipline in university.

Other interesting comments appearing in the evaluation forms include the argument that the augmented course offered a better balance between the humanities and the sciences, that the additional subject offered a broader choice on entering the university and a wider scope in the selection of an occupation. People from the enriched course found that they had received a valuable training in doing reference and research work both in the school and other libraries.

Forced to work more on their own, they had broadened their knowledge, increased their maturity and understanding in many directions.

There is always the possibility in experiments of this kind, that we, on the teaching side, might get carried away with the willingness and ability of the students under our care; therefore, we must always be on guard against overloading. As we have noted above, slightly over ten per cent of the pupils found the course too difficult in some respects. During the year we took a spot check by asking students to keep a home study chart and found the average homework time to be 10-12 hours per week. This load did not seem excessive.

Details of enrichment provided in the various subjects are set forth in teacher comments appended to this report. The teachers of both the augmented and enriched courses found the experiment interesting and stimulating and in most cases have spoken for themselves in their submissions.

On the basis of student and teacher evaluation and my own observation we may say that the experiment with the brighter students has been most interesting and instructive.

The seventy students involved were asked about their plans for the future; sixty-eight were looking forward to university or Grade XII, one boy intended to go directly into banking and one girl to business college. The boy for banking won an Isbister Scholarship and is now enrolled in

university; the girl returned to her counsellor before school closing to say that she intended to register in Fine Arts. A complete follow-up study has not been possible as yet so we do not know if all the others carried out their plans.

This intention to go on to further study, exploring, seeking the Truth is to me the greatest measure of success. In the natural course of events a large number of these more able students would proceed to university, but if the school by its efforts, nurture and guidance has influenced any to go on, who otherwise would have stopped their formal education at the end of Grade XI, I believe we have fulfilled to some extent the major role of education, i.e., to create in our youth a strong desire for more knowledge and greater wisdom.

Who can say how many leaders in their chosen field will come from this group? Many already have demonstrated leadership potentiality. They are greatly blessed - all have good ability, their early years have given them the kind of home security and sound training so necessary to future success and the school has aided and encouraged their development and put them on the first rung of the ladder upward. Many have shown a sense of responsibility and now as young adults their ability to assume the increasing responsibilities of adult life will measure their ability to become true leaders.

Whether their destiny be mainly leader or follower we are confident in predicting that these young people will make a solid and worthwhile contribution to the community.

R. J. Cochrane.

Section II

Staff Assessment

The grade eleven enriched course seemed to me to be a worthwhile experiment which I should like to consider for another year. We did cover a good deal of extra material in English (as shown in my separate listing) from which I believe the class benefited.

However, I do know that this group needed a great deal more drill on basic writing fundamentals than I or previous teachers have given them, that only a handful were above average in English, and that in most cases mathematical and scientific abilities appeared to be considerably in advance of language skills.

M. J. Thomson.

GRADE ELEVEN ENGLISH "ENRICHMENT"

Room XI-27 1957-58

I. Written Work

- (a) Original limericks
- (b) Original dramatic monologues (prose and verse)
- (c) Education week essays (for Provincial contest)

II. Oral Work

- (a) Series of debates on topics of current interest.
- (b) Series of panel discussions on topics on current interest.

III. Good Reading

Use of pocket book Good Reading as a "jumping off place" into various types of reading, pocket books available, suggestions for research source material. Invaluable book lists are included herein. Teacher gave two "lectures" on use of the book.

IV. Additional Texts and Literature

- (a) Argosy to Adventure (Prescribed text)
  - 3 extra essays
  - 2 extra stories
  - 2 extra poems

- (b) Pocket Book of Short Stories 5 extra stories
- (c) Pocket Book of Verse 16 extra poems

V. Recordings

Poetry readings --- 2 periods: R. Frost, T. S. Eliot, Ogden Nash, W. H. Auden, Dylan Thomas, etc.

VI. Modern Plays

- (a) Journey's End --- Sherriff
- (b) Hay Fever --- Noel Coward

M. J. Thomson

CHEMISTRY RE: ENRICHED CLASS

This class was given a great deal of extra work, particularly in the realm of practical chemistry. They seemed to enjoy the extra work and a good many of the students spent additional time after school, finishing up extra work. I made a stipulation that this work was not to be considered compulsory, yet everyone in the class co-operated.

The additional theoretical work added interest to the class as well as stimulating the teacher. Class marks were exceptionally good, both during the year and in the June departmental examinations.

The great lack, in a class of this type, is time, practical periods were all too short.

I think the classes were well worth while, and were reasonably successful for a first attempt.

J. Dickison.

ASSESSMENT OF ROOM 27 IN PHYSICS RE: ENRICHMENT

Amount of Enrichment

The lines of Enrichment contemplated and attempted were:

1. Additional detailed information all along the course --- attempted additional problems in text since problems were graded.

2. Additional practical work --- only one extra one was done.

3. Student participation in teaching activities --- some half dozen periods were spent this way, e.g.

Fred Dampier --- The Upper Atmosphere in Relation to Air Pressure.

Bob Machacek --- The Upper Atmosphere in Relation to Aurora Borealis.

Jim Wells --- Gasoline Engines

Charles Smithen --- Refrigeration

4. Discussions in class --- most time-consuming as the students were keen and had much to ask and suggest.

#### Verbal Estimate

A worthwhile project.

The greatest benefit is in that like abilities are grouped together.

In the year's work the class did not move any faster than Room 32 in covering their work, but, whereas Room 32 was mute, Room 27 was inquisitive. Room 32 accepted, Room 27 questioned, were other ways of solving problems acceptable? There were deeper explanations, not just application of formulas.

#### Suggestions for Future

Besides above:

Class Projects

Small group and individual activities

Contests and exhibits

Science Club

Very interesting and stimulating class to teach.  
Pleasure to have them!

S. Shewchuk

REPORT ON ENRICHED PROGRAM: ROOM XI-27 MATHEMATICS

The Amount and Nature of the Enrichment

The amount of the enrichment depended on the needs, abilities and interests of the individual student. It was noted that the high average mark which permitted a student to take the enriched course did not necessarily indicate outstanding ability or special interest in mathematics. Considerable variation was noted early in the year. However, to compensate for this variation, all members of the class (with one exception) had the desire to do well, to maintain a respectable standing in mathematics even when the chief interest of the student lay in other subject fields.

Several students, all delightful persons to work with, had neither outstanding ability nor keen interest in mathematics in comparison with other members of the class. Nevertheless, they did creditable work during the year. Others delighted in exploring beyond the confines of the course. An outstanding example of this: One student turned in reports on his gleanings in the fields of trigonometry, calculus, vector analysis, factorial notation, binomial theorem, and the slide rule. Another delved into combinations and permutations and the laws of chance and probability, with their application to cards, dice and gambling, in addition to reporting on the use and operation of the slide rule.

Nineteen students submitted reports based on intensive study of topics directly on the course. These reports, from twelve to twenty pages in length, described fully the methods used to deal with stated aspects of the course. A list of topics from which the student could choose is appended. Most of these reports were complete as to detail, and several were exceptionally well planned. Following a brief group discussion, the student was on his own in the preparation of the report.

Thirteen students made a practical study of the slide rule and its uses. One or two had some previous knowledge of the rule, and these assisted others to interpret the instructions provided. This was a very popular study, limited by the fact that there were insufficient rules to supply each student, and that there were too few reference books for those who wished to proceed further than the limited instruction given in the pamphlet supplied with the rule. Excellent reports were presented, outlining methods used and types of problems that were solved during the study.

Enriched Program --- Mathematics (continued)

Three students presented interesting reports on a study of optical (geometric) illusions, complete with illustrations and comment. One report was outstanding.

One girl prepared a report on mathematical curiosities, in which she discussed several problems which had interested her, selected from a reference book.

In the regular class periods opportunity occurred from time to time to present interesting information or to solve unusual problems. The method used to calculate the date of Easter in any year was of interest prior to the Easter holidays. Some students checked the date of Easter 1958 by the methods just to be sure that there was no mistake in the calendar!

Many of the students found time to browse in Mathematics for the Million by Hogben, and Through the Mathescope by Ogilvy. More copies of these and other books could be used to advantage, although not all students enjoy reading of this type.

It might seem at first thought that a class such as XI-27 should be able to complete the prescribed course at a much faster pace that would be possible for an unselected group. This does not seem to be the case. The interests of the students lead them to discuss each aspect of the course more fully, to ask questions concerning alternative methods or proofs, and to pose related problems not on the course, and which would not occur to the minds of students in an ordinary class. Control must be exercised in order to prevent the discussion from wandering too far afield, which would result in a failure to reach the conclusion of the topic of the lesson.

Considerable latitude was permitted in the doing of assigned work from the texts. Where the ability of the student to cope with the easier parts of the assignment had been demonstrated, he was permitted to advance quickly to the more difficult exercises, omitting many of the easier ones.

Students who made enquiry about branches of mathematics not of general class interest were given individual assistance or guidance outside the regular class time.

Enriched Program --- Mathematics (continued)

General Evaluation of the Course: Subjective

Although the class was not organized on the basis of interest and ability in mathematics alone, all students gained much more insight into the meaning and value of the subject than is possible in a regular class. The association of students whose interests lie in other directions with those who are keenly interested in mathematics proved a challenge to do good work. The students in a selected group such as XI-27 are freed from the boring necessity of having to listen to a repetition of the instruction which they had received in an earlier grade, because all members of their class are reasonably familiar with the subject-matter of Grade X. If the establishment of classes taking an enriched course becomes a permanent feature of the High School it should be possible to acquire a suitable mathematical library, and equipment which would add greatly to the interest of the subject.

TOPICS FOR REPORTS

(Room 27 Enriched XI)

A - On the Material of the Course:

- 40 1. The solution of Equations found in the Text.  
Instructions and examples covering all types and methods. Individual or group.
- 40 2. The Study of Fractions.  
(a) Their simplification and combination.  
(b) The elimination of fractions from equations, including examples of each type found in the text.  
(c) Some examples of greater difficulty. (Individual or group).
- 20 3. A Study of Factoring - An Outline - with simpler and more difficult examples of each type (all types to be treated fully). Individual or group.
- 40 4. A Study of the Circle in Plane Geometry - Includ-

Topics for Reports --- Enriched XI-27 (continued)

- ing the solution of typical problems. (In the case of each problem list the authorities used in its solution); (avoid too frequent duplication of authorities used). Individual or group.
- 20 5. A Study of Similar Triangles - The authorities, and typical examples illustrating the use of the authorities. (Individual or group).
6. Any Other Problem - comparable with the foregoing - the choice to be approved by Mr. Gresham before starting the work. Individual or group.

B - Extra-Curricular Problems:

1. My Study of the Slide Rule and its Uses - a report. Individual or group.
2. A series of unusual problems and my solutions. Individual or group.
3. My Impressions upon examing various geometrical illusions. (Individual)
4. An interesting mathematical study. (From Hogben - or other stated source). Several minor studies may be reported. Individual or group.
5. A report on some mathematical studies I have made during this school year. (Extra-curricular) Individual.
6. An approved topic of the student's choice. Individual or Group.

RULES:

1. Topics should be turned in as completed.
2. Major topics may be prepared by groups of students - not exceeding FOUR students to a group. In cases of group studies - each student must prepare the report on one or more sections of the study. The parts of the report prepared by each student must be signed. In the case of reports on curricular topics each student must provide an example problem or an illustration for each part of the report.

Topics for Reports --- Enriched XI-27 (continued)

3. The final date for turning in completed reports will be May 30th.
4. Topics are to be selected before the completion of the course in Mathematics - and the groups or individuals to be named.

W. J. Gresham.

REPORT ON ENRICHED COURSE IN HISTORY 1957-58

Enrichment in this Canadian History course consisted of:

- (a) required reading from sources more advanced than the usual high school texts, by individual choice from a fairly extensive list, mostly in our Kelvin library. One or more advanced source was required for each of three essay assignments.
- (b) a major essay assignment, topics being chosen mainly from a suggested list including recent or current Canadian problems and standard topics on the course. Topics were chosen individually. Research was conducted independently, with suggested sources where necessary. This project was assigned in mid-January and collected at the end of March. Topics were inter-related in most cases and there were one or two sessions where groups of students compared their findings. A high standard of style and form was required, including, for example, bibliography and foot-note form.
- (c) a primary research project --- This was lighter, intended to draw attention to the difference between primary and secondary sources. Students went to original documents, museums, early cemeteries, etc. or interviewed witnesses or participants in events such as the Winnipeg Strike of 1919.
- (d) a critical thinking project --- One period was spent in presenting characteristics of good

Report on Enriched Course in History 1957-58 (continued)

thinking, and then a questionable generalization ("Wars never settle anything; the settlement is made at the conference that follows") was given, and an independent written comment was required.

Two other things might be considered enrichment. Each student was supplied with the three authorized texts in history for the year, and a classroom collection provided extra material. There was more than the usual amount of questioning by students and discussion on most topics all year.

My method was generally to indicate sources in the texts for routine reading for all topics, to have very little reading in class, to spend most of the time on what might be called lecturing and discussion. I gave relatively few period tests after finding that material was grasped reasonably well, and I did not check notebooks. When the class was burdened with reading for essays, I provided in class most of the material they were expected to know. Between essays they were expected to read more of it for themselves.

They were asked for a written evaluation at the end of the course, and their opinions are indicated below:

1. The purpose of studying history is to illuminate the present. Has this purpose been achieved, so far as you are concerned?

Yes --- 30                      Sometimes --- 2                      No --- 1

2. What aspect or section of the course has been most interesting to you?

Answers ranged from beginning to end of course, with emphasis on the major research assignment (10), recent and current events, especially politics and elections (12).

3. Which of the forms of enrichment do you think should be continued?

(a) Advanced reading? Yes --- 23

(b) Major assignment with self-directed research? Yes --- 31 One student suggested it be smaller and oftener. Three did not like the high degree of formality. One suggested the topics be more closely related to exam.

Report on Enriched Course in History 1957-58 (continued)

- (c) Primary Research Project? Yes --- 24  
Four doubted that its value was worth the work.  
Seven would have liked more of this kind of thing.
- (d) Critical Thinking Project? Yes --- 23  
Sixteen thought it should be emphasized more.

4. What other forms of enrichment would you have liked to see as well or instead?

Answers included debates (14), panels (5), talks by students (6), mock parliament (3), guest speakers (3), more discussion of Canadian government, current politics, and world affairs not limited to Canada (7), films (3), visits to other classes for special programs, tours to historic sites etc. e.g. Ross House, Seven Oaks, City Council meeting, legislature session, dramatic presentations if well done (3), more depth on some topics, more review before exams, more map work, more on Manitoba, more advanced reading, more interpretations of current news.

5. Have you read two or more texts for most of the topics studied during the year?

Yes --- 7                      Sometimes --- 13                      No --- 14

Several skimmed all and read only the best one. One read outside more advanced sources.

6. Do you feel that the history course has required an unfair proportion of your time?

Yes --- 3                      Sometimes --- 3                      No --- 23

Some comments: At extremes, too much or too little,  
Teachers should get together,  
Just the right weight (4),  
Could be increased, e.g. the why and wherefore (2),  
Took more time than any other, but others didn't seem to warrant equal time (20),  
Took about 75% of study time  
Took, with Literature, 75-80% (2) of study time.

Report on Enriched Course in History 1957-58(continued)

During 2½ month assignment I spent all Saturday almost every week at the Library. Didn't enjoy so much of it, but appreciated the extra knowledge. Two mentioned that it sometimes cut into extra-curricular time. One said other subjects suffered a little. The course in program of studies is too long, hence "cram and forget".

7. Comments at large:

The lecturing all period and only stopping for discussion was very good. Assignment would be better spread over a longer span. Too heavy at times. More should be done as a class e.g. lecturing, debates, panels. Rule against two assignments at once was not adhered to.

My own observation leads me to believe that students find a class such as this mutually stimulating. They did not have to be driven. They went to the public libraries and the provincial and newspaper libraries, and wrote away for documents and materials, and generally went about their special studies with an independence and zeal that was most commendable. It was necessary to put a maximum page limit of fifteen pages on their major assignments where they complained that ten pages would not be enough. I plan to have these bound.

The methods of enrichment tried here were not all original with this class. My history class of '56-'57 (XI-31) was of similar calibre, and they got some of it without asking for it. On the basis of these two years, I believe that the scheme is worthwhile, the methods tried seem to have worked out reasonably well, and some of the suggestions offered by students seem worth a try.

If the amount of enrichment in the other subjects were increased, it would likely be necessary to reduce the weight of history assignments somewhat.

The whole experience has been fascinating and stimulating to me, and I would be delighted to have another year with a similar class.

H. H. Guest.

REPORT ON ENRICHED FRENCH PROGRAMME

XI - 27

I. Considerable use was made of three publications:

- (a) Le Français à la Page.
- (b) Le Devoir
- (c) Readers' Digest (French edition)

LE FRANÇAIS A LA PAGE

This is a student publication offering relatively little difficulty. Copies were distributed as they arrived (every second month), one copy to two students. At first they were read in class. Later, however, students read them at home, then related in class what they had read - usually in French.

LE DEVOIR

The best students were given the entire paper, while others were given selected articles. These were read sometimes at home, sometimes in class, and an account was given usually in English. This was sometimes oral, sometimes written.

Articles of general interest were sometimes written on the blackboard, so that the entire class could read and discuss them.

READERS' DIGEST (French Edition)

This magazine was used in the same way as Le Devoir. I secured copies of past issues from a second-hand store. Jokes, as a rule called for considerable discussion and explanation.

II. Use was also made of several books for supplementary reading:

- (1) Renard et Ses Confrères ) Dent's Modern
- (2) Renard à la Cour du Roi ) Language
- (3) Les Lunettes du Lion ) Series
- \*(4) Histoire de la France
- \*(5) Notre Pays

\*These are history texts used in many schools in France.

III. Oral accounts in French were made of stories that the entire class had read - e.g. stories from the text.

XI - 27 REPORT ON ENRICHED FRENCH PROGRAMME (Continued)

- IV. Some dramatization was done. Sometimes a story from the text was read; occasionally students composed original material.
- V. Students were encouraged to speak only French in the classroom, to listen to French programmes on television and radio. This is done, of course, with every French class, and cannot therefore be considered part of a programme of enrichment.

EVALUATION

Because there was considerable range both in interest and ability, results would vary. A few students with average or low average ability in French tended to avoid anything not directly connected with the course laid down for all Grade XI classes. Other students however, showed considerable interest in attempting something new and certainly gained in proficiency. On the whole I should judge that the programme of enrichment in French resulted in an increased interest in the language and in the people who speak it. Some students, doing considerable extra work, increased greatly their ability to read French and to understand conversational French. Others, doing less, gained less. There was not so much progress in ability to speak French as I had hoped, because of the size of the class.

Elizabeth F. Redmond.

SECTION III

STUDENT ASSESSMENT

Enriched Room XI-27

Thirty-eight returned.

Thirty-one enjoyed it.

Seven did not or qualified their answer to partial enjoyment. Five of these would advise students like themselves to take a standard course. Two of these would advise students like themselves to take an enriched course.

Others --- "Would you make same decision again?"

Four - augmented

Five - standard

Challenge: Too great --- 4      Too little --- 13  
Just right or divided as to subjects  
--- 20

"Did you feel you could participate freely in extra-curricular program without jeopardizing your scholastic standing?"

Yes --- 25

No --- 13

Generally agreed that the most enjoyable and valuable enrichment was in English and History, the two subjects which lend themselves to it most readily.

Homework:      Range --- 5-18      Average --- 12-14

Benefits --- Training in reference and research work, working more on their own, acquaintance with reference dept. of libraries, challenge of being with a good class, broader knowledge of some subjects, particularly a deeper insight into poetry and literature, greater skill in writing essays, a greater maturity, learned to use sources other than prescribed texts.

Quite a number stated that they had a weak subject, had some trouble with it and, in some cases, found it difficult to maintain the class pace.

Augmented Room XI-23

Thirty-two returned.

Thirty-one enjoyed course and would advise other persons like themselves to take the Augmented Course.

One did not enjoy course and would advise others to choose the Enriched Course. Reason: "Would like to get into a good class without the extra subject".

Two said they felt they could not participate freely in extra-curricular activities without jeopardizing their scholastic standing.

Extra subject offered a wider selection on entering university, a wider scope in vocations, a better balance between the humanities (Latin, French and the Sciences).

Many were pleased to have an extra year in Latin; if they had chosen a regular course, French would have been their language selection. Several mentioned that the Latin discipline would be helpful in his approach to the Science discipline in university.

Many felt that the pace set by the class, in spite of the extra subject, afforded time and opportunity for enrichment as well.

Unanimous approval of the course. Liked it because of its challenge. It meant hard work and most felt that students who have reasonably high intelligence also have a responsibility to work hard.

Those who admitted to a subject weaker than their other subjects for the most part felt they maintained class pace in this subject overcoming the handicap in several cases with additional home study.

Most felt the challenge about right, difficult but not beyond their powers.

Homework and home study --- Range 5 - 17  
Average 10 - 12 hours per week.

Room XI-27 Discussion Period June 9, 1958

Appraising Enriched Course Ideas and Classes

Much more enrichment in History and English than in others.

Some subjects enrichment was only extra exercises, class could have moved faster e.g. Physics (R. J. C.: Enrichment was in fuller discussion throughout). Too much basic drill.

Enrichment should be individual, not so much in class block. (S. Bland). Could have been much more enrichment in Chemistry and Physics i.e. More in total.

Would like to try self-organized experiments in Science (R. J. C. --- Science Club?). Considerable interest in class. D. Swan.

Disappointed in quantity of enrichment in Chemistry and Physics. (R. J. C. --- can uneven enrichment be avoided in next year's course?) Why not? (H. Book)

Mathematics enrichment was specified. Chemistry enrichment was not identified. Prefers this. (M. Hollenberg)

Total load could be increased, so long as not two big assignments at same time. Seemed excessive this year just before exams --- Should ease up three weeks before examination.

Will extra quantity affect retention? (M. Hollenberg)

Selection more on X marks than ability; maybe some doubts. (B. Klein)

Why not from first of year have a minimum outline, with extra topics distinguished. (D. Swan)

Class associates were stimulating.

Should try to introduce university approach and methods to some extent.

ENRICHED AND AUGMENTED CLASSES

STUDENT APPRAISAL FORM

CLASS: \_\_\_\_\_

NAME: \_\_\_\_\_

It will be of great value to Kelvin School in future planning if you will answer the questions below. Please give each question careful thought and then answer frankly and fully. If the question is not applicable to your class, please omit the question.

A. GENERAL

1. Did you enjoy this special course? \_\_\_\_\_

2. What benefits do you think you received from it? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3. Looking back over the past year, would you make the same decision again? \_\_\_\_\_

4. On the basis of your experience, would you advise a person like yourself to take:

- (a) a standard course . . . . . ( \_\_\_\_\_ )
- (b) an augmented course . . . . . ( \_\_\_\_\_ )
- (c) an enriched course . . . . . ( \_\_\_\_\_ )

Give reasons for your opinion \_\_\_\_\_

\_\_\_\_\_

5. Was the challenge in this course too great, or too little? \_\_\_\_\_

6. Did you find the homework load excessive? \_\_\_\_\_

\_\_\_\_\_

7. Please estimate the average hours spent per week on homework \_\_\_\_\_

8. Do you consider that you have a weak subject? \_\_\_\_\_

- (a) If so, please name it . . . . . \_\_\_\_\_
- (b) Did it give you trouble? . . . . . \_\_\_\_\_

(continued)

ENRICHED AND AUGMENTED CLASSES  
STUDENT APPRAISAL FORM  
(2)

- (c) Could you maintain class pace in this subject? . . . . . \_\_\_\_\_
- (d) Did you feel that the class pace hindered your grasp of the subject? . . . . . \_\_\_\_\_

9. Did you feel that you could participate freely in extra-curricular programme without jeopardizing your scholastic standing? \_\_\_\_\_

B. ENRICHMENT

1. Do you feel that enrichment in the various subjects was worth the effort? \_\_\_\_\_

2. Did you prefer enrichment projects (check in order of choice 1, 2, 3)

- (a) for the class as a whole? ( \_\_\_\_\_ )
- (b) for small groups? ( \_\_\_\_\_ )
- (c) for individuals? ( \_\_\_\_\_ )

3. Do you think that the amount of enrichment was too much ( \_\_\_\_\_ ) or too little? ( \_\_\_\_\_ )

4. After each of the following subjects, suggest which area of enrichment you, personally, found most valuable.

- English . . . . . \_\_\_\_\_
- Social Studies . . . . . \_\_\_\_\_
- Mathematics . . . . . \_\_\_\_\_
- French . . . . . \_\_\_\_\_
- Physics . . . . . \_\_\_\_\_
- Chemistry . . . . . \_\_\_\_\_

5. In your specified "valuable enrichment" list, above, underline the particular piece of enrichment which was most enjoyable to you.

Double underline the enrichment which you think was probably most valuable to you personally (though not necessarily most enjoyable).

SECTION IV  
COUNSELLORS' REPORT

	<u>ENRICHED</u>	<u>AUGMENTED</u>	<u>TOTALS</u>
<u>Parents Working</u>			
Both	9 (24%)	5 (15%)	14 (20%)
One	29	27	56
<u>Size Families</u>			
One child	5	3	8
Two children	17	19	36 (51%)
Three children	13	7	20
Four children	1	3	4
More	2		2
<u>Estimated Financial Position</u>			
Well Off	10	5	15
Middle	26	23	49
Marginal	2	4	6
<u>Student Work Experience</u>			
Job during Grade XI	4	9	13 (18%)
Past Only	16	3	19
<u>Parents' Position</u>			
Professional	13	6	19 64% in
Managerial, Proprietor	14	10	24 Profess-
Skilled Labour	1	3	4 ional Mgr.
Admin. Supervisory	7	4	11 Admin. 23%
Salesman	1	2	3 in Pro-
Worker	1	2	3 fessional
Writer	1		1 28% in
Teacher	4	6	10 Mgr'l.
Office Worker	5	3	8 Proprie-
Housewife	29	18	47 torial
<u>Parents' Education</u>			
University	31	18	49 85% with
High School Grad.	30	18	48 H.S. or
High School	8	1	9 better
Less	6	1	7 43% Uni-
			versity
			42% H.S.
			& plus

Augmented Course XI - 23 Boys

Fifteen boys.

Fifteen plan university or Grade XII.

FATHER'S OCCUPATION:

Teacher, controller, lawyer, chartered accountant, real estate manager, manufacturer's agent, heating engineer, personnel manager, hydro, supervisor, manager, auto. accessory chain, president, paint company, aeronautical inspector.

MOTHER'S OCCUPATION:

Teacher

STUDENT EMPLOYMENT: Past Only Present

8

2

EXTRA-CURRICULAR ACTIVITIES:

Sports, opera, orchestra, yearbook, scouts, YMHA, cadets, photography, Etcetera, U.N. Club, stamp collecting, rifle league, model railway builder, chess, church youth clubs, building cars, model aircraft.

PARENTS WORKING: One Both

13

2

FINANCIAL POSITION: Well Off Middle Marginal

2

13

SIBLINGS: Only Child Two Three Four

2

10

3

Augmented Course XI - 23 Girls

Seventeen girls.

Sixteen planned to go to Grade XII or First Year University.  
One planned to go to Business College.

FATHER'S OCCUPATION:

Carpenter, high school teacher, retired, personnel manager, office manager, minister, mine worker, doctor, manufacturers' agent, fireman, radio repairman.

MOTHER'S OCCUPATION:

Teacher (widow), secretary, P. O. clerk.

EXTRA-CURRICULAR ACTIVITIES:

None, orchestra, pianist for opera, yearbook editor, tennis champ., committee work, stamp club, library club, S. S. teacher, Young Peoples' swimming, Red Cross, I.S.C.F., Guides, Man. Schools Orchestra, athletics and inter-high teams, dramatics.

PARENTS WORKING: One Both Retired

13      3              1

FINANCIAL POSITION: Well Off Middle Marginal

3              10              4

SIBLINGS: Only Child Two Three Four

1              9              4              3

STUDENT EMPLOYMENT: Past Only Present

1              1

One broken home.

Enriched Course Room XI-27 Girls

Nine girls.

Nine planned university or Grade XII.

FATHER'S OCCUPATION:

School principal, manager in business, accountant, doctor, sales manager, salesman, secretary-treasurer.

MOTHER'S OCCUPATION:

Clerking, secretary, teacher.

EXTRA-CURRICULAR ACTIVITIES:

Operas, majorettes, typist for school paper, newspaper, year book, inter-room sports, B'nai B'rith, Young Peoples, Job's Daughters, orchestra, art, library.

PARENTS WORKING: One Both

1 3

FINANCIAL POSITION: Well Off Middle Marginal

2 2

SIBLINGS: Only Child Two Three Four

2 5 1 1

STUDENT EMPLOYMENT: None except baby sitting.

Enriched Course XI-27 Boys

Twenty-nine boys.

Twenty-eight plan University, one - Military College, one - banking

FATHER'S OCCUPATION:

Bus. manager, doctor, writer, yard foreman, druggist, surgeon, pharmacist, lawyer, bank manager, proprietor of wholesale confectionery, rust research scientist, C.A., G.O.C. Prairie Command, manager, Eaton's Mail Order, pres. real estate co., placement officer, Indian Affairs, school principal, furrier, foreman, shipping dept., auditor with Dominion Government.

MOTHER'S OCCUPATION:

Stenographer, social worker, doctor, secretary, H.B.C. clerking part-time, worker in candy factory part-time, teacher.

STUDENT EMPLOYMENT: Past Only Present

16 4

EXTRA-CURRICULAR ACTIVITIES:

Youth clubs, synagogue, sports, photography, writing stories, curling, skiing, cadets, radio and electronics, year book,

U.N. club, Hebrew classes, orchestra, Manitoba Schools  
Orchestra, opera. Y.M.C.A., Scouts, church clubs, Y.M.H.A.

PARENTS WORKING: One    Both

23        6

FINANCIAL POSITION:    Well Off    Middle    Marginal

8            19            2

SIBLING:    Only Child    Two    Three    Four    Five

3            12            12                       2

SECTION V

SUGGESTED TEXTS & MATERIALS FOR  
SPECIAL ENRICHED COURSES

MATHEMATICS:

- (1) "The Mathematics Student Journal" (American Funds)  
20 copies at \$.20 ea. per copy per  
year (Issued Oct., Dec., Feb., & April) \$ 4.00  
Order from: National Council of Teachers of Maths.  
1201 Sixteenth St., N. W.  
Washington 6, D. C., U. S. A.
- (2) "How to Study Mathematics" - Henry Swain .50  
(to be ordered from same source as above)
- (3) "Geometry Growing" - W. R. Raresom .75
- (4) "Byroads of Algebra" - Margaret Joseph .40
- (5) "Slide Rule Data Guide" - Student Marketing  
Institute, 375 Fifth Ave., New York 16, N. Y.  
(order 6) at \$.69 ea. 4.14  
(a permanent plastic sheet punched to fit 3  
ring binder)
- (6) "Optical Illusions" - J. Weston Walsh Publisher  
(1 copy only) Box 1075 Portland 1,  
Maine, U. S. A. 1.00
- (7) "Famous Problems of Elementary Geometry"  
(2nd. edition) (1 copy only) - Felix Klein,  
New York, Dover Publications, 1957 1.00
- (8) "Through the Mathescope" - C. Stanley Ogilvy,  
New York, Oxford University Press, Cloth.  
Ed'n. (1 copy only) 4.00
- (9) "One Hundred Mathematical Curiosities" -  
W. R. Ransom, Portland, Maine, J. Weston  
Walsh Publisher, 1955 (1 copy only) 3.00
- (10) "The Slide Rule and How To Use It" -  
Calvin C. Bishop, Published by Barnes &  
Noble (1 copy only) (Library) 1.25
- (11) "Mathematical Recreations" - M. Kraitchik -  
Dover Press (1 copy only) 1.65

- |      |  |                |
|------|--|----------------|
| (12) | "Mathematician's Delight" - Penguin Books #A 121 (1 copy only)   | \$ .50         |
| (13) | "The Penguin Problems Book" - Penguin Books #260   | .50            |
| (14) | "Mathematics for the Million" - Lancelot Hogben - (New 3rd Ed'n) London, George Allen & Unwin. Approx. \$4.00 (2 copies required)  | 8.00           |
| (15) | "Accumulative Maths. Student Slide Rule #400" - Fraser's Art Supply, Wpg. Man. (10 rules at \$2.75 each less 10%) Less 10% for School Board Order in Lots of 1/2 doz. or more. | <u>24.75</u>   |
|      |  | <u>\$55.44</u> |

HISTORY (Library Ref. Dept.)

- |     |   |                |
|-----|---|----------------|
| (1) | "The Discovery of Canada" - Burpee (1 copy) | 3.50           |
| (2) | "Red River" - Alex. Ross (1 copy)           | <u>9.75</u>    |
|     |   | <u>\$13.25</u> |

ENGLISH

- |     |  |                |
|-----|--|----------------|
| (1) | "Good Reading" - Mentor Series - Guide in Reading \$.60 ea. (20 copies required) | 12.00          |
| (2) | "The Pocket Book of Verse" - Pocket Books Inc. at \$.35 ea. (40 copies required) | 14.00          |
| (3) | "The Pocket Book of Short Stories" - \$.35 ea. (40 required)                     | <u>14.00</u>   |
|     |  | <u>\$40.00</u> |

FRENCH

- |     |  |       |
|-----|--|-------|
| (1) | "Le Français à la Page" (\$.85 per subscription) (20 subscriptions required) | 17.00 |
| (2) | "Subscription to "Le Devoir" (through Library (?))                           | ?     |

SCIENCE

(1) "The Science Teacher" - November, 1955 \$6.00

MISCELLANEOUS

Sample books in all subjects at School Board Office which might be available.

Extra testing material (?)

Extra reference texts for Library (?)

<u>MATHEMATICS DEPT.</u>	(estimates only)	\$55.44(plus)
<u>HISTORY DEPT.</u>	(estimates only)	13.25
<u>ENGLISH DEPT.</u>	(estimates only)	40.00
<u>FRENCH DEPT.</u>	(estimates only)	17.00(plus)
<u>SCIENCE DEPT.</u>	(estimates only)	6.00
<u>MISCELLANEOUS</u>		<u>?</u>

GRAND TOTAL: \$131.69(plus)

SECTION VI

STATISTICAL REPORT OF  
SELECTION AND TREATMENT OF SPECIAL CLASSES  
IN GRADES TEN AND ELEVEN  
AT KELVIN SCHOOL DURING 1956 - 57 AND 1957 - 58

by  
WILLIAM H. LUCOW  
Associate Professor  
Faculty of Education  
University of Manitoba

in close cooperation with  
ROBERT J. COCHRANE  
Principal  
Kelvin High School  
Winnipeg

Winnipeg, Manitoba, Canada

December, 1958

STATISTICAL REPORT OF  
SELECTION AND TREATMENT OF SPECIAL CLASSES  
IN GRADES TEN AND ELEVEN  
AT KELVIN SCHOOL DURING 1956 - 57 AND 1957 - 58

William H. Lucow  
Associate Professor  
Faculty of Education  
University of Manitoba

### The Problem

Very bright children in the City of Winnipeg have been segregated in special rooms and referred to as major-work classes ever since they were in elementary grades. The first groups of these children are now about to enter senior high school, grades ten and eleven, and the problem of what type of program to offer them has arisen. In order to anticipate the treatment, Mr. R. J. Cochrane, principal of Kelvin high school, undertook to experiment with the Grade XI students of 1957 - 58 by setting up "Augmented" and "Enriched" classes composed of pupils who did best in grade ten. Performance on the regular school examinations as revealed in the Easter, 1957, marks was taken as a basis for selection of Grade X students to be included in the experiment. Composite marks in Grade XI at Easter, 1958, were taken as the criterion for judging the treatments.

### The Groups

There were 385 grade ten pupils in Kelvin school

during 1956 - 57. One hundred of these, not a random sample, but rather constituting the "top" of the student body, were taken for special scrutiny and treatment. No attempt was made to assign these 100 pupils to the special groups at random: the assignment was made through counselling, persuasion, and personal preference of the students.

The Augmented group numbered 31. The pupils in this group took one extra language or science in Grade XI.

The Enriched group numbered 38. The pupils in this group took the regular number of subjects, but dealt with enriched content and method within each subject.

The Control group consisted of 31 pupils of similar high rank as the foregoing two, but who elected to take the regular Grade XI course.

The total Grade XI student body at Kelvin during 1957 - 58 numbered 302.

### Statistical Analysis

In this statistical report no attempt is made to describe the two treatments; this part deals only with the numerical aspects and analysis of the results. Some phases of this effort included:

1. selection of pupils on the basis of grade ten marks at Easter, 1957
2. analysis of marks of entire grade ten population in 1957 and of entire grade eleven population in 1958

3. conversion of grade ten and eleven marks of the 100 top students in grade ten who constituted the special groups in grade eleven into standard scores
4. analysis of the standard scores in order to ascertain if the special groups were equal when they left grade ten, and to determine their status at the end of grade eleven
5. a comparison of the ways average school marks and average standard scores arranged the top fourteen students in grade ten and in grade eleven
6. analysis of the results of the Watson-Glaser Test of Critical Thinking given before and after the special treatment only to the Augmented and Enriched groups.

TABLE I

MEASURES OF CENTRAL TENDENCY AND SPREAD OF MARKS IN VARIOUS SUBJECTS FOR KELVIN SCHOOL AS A WHOLE FOR GRADE TEN IN APRIL, 1957, AND FOR THE SAME CLASSES IN GRADE ELEVEN IN APRIL, 1958

In order to establish the status of the individuals who constituted the Augmented, Enriched, and Control groups in grade eleven, it is necessary to look at the achievement of Kelvin school as a whole; that is, at the record of all the grade ten students when the special groups were part of them, and at all the grade eleven pupils when the special groups were in that grade.

Table I gives the mean mark in each subject for grades ten and eleven for the years in question. These are the marks compiled after the Easter examination in April. "N" in the table refers to the number of pupils enrolled in each subject. The mean is the arithmetic mean, or common average. The Greek letter sigma,  $\sigma$ , is the standard deviation of scores in each subject. The last column,  $M \pm \sigma$ , gives the spread of scores of the middle two-thirds (approximately) of the class, if the scores were arranged in order of magnitude in each subject. This measure of spread is much more stable and reliable than the full range from highest to lowest in the school.

In the list of subjects, AVERAGE refers to the school report average, and includes the options such as typewriting, shops, and household economics in addition to the subjects listed.

Tables 2 and 3 give the same statistics for the special groups alone.

TABLE I

MEASURES OF CENTRAL TENDENCY AND SPREAD OF MARKS IN VARIOUS SUBJECTS FOR KELVIN SCHOOL AS A WHOLE FOR GRADE X IN APRIL, 1957, AND FOR THE SAME CLASSES IN GRADE XI IN APRIL, 1958

SUBJECT	N	GRADE TEN - 1957		M $\pm$ $\sigma^*$	SUBJECT	N	GRADE ELEVEN - 1958		M $\pm$ $\sigma^*$
		MEAN	$\sigma$				MEAN	$\sigma$	
Literature	384	60.4	16.5	44 to 77	Literature	299	59.8	12.8	47 to 72
Composition	384	65.5	13.9	52 to 79	Composition	300	61.8	10.1	52 to 72
Geography	379	71.8	14.4	57 to 86	History	300	66.2	14.0	52 to 80
Mathematics	375	61.5	21.5	40 to 83	Mathematics	297	61.8	19.0	43 to 81
Science	378	71.2	16.0	55 to 87	Chemistry	282	68.0	17.2	51 to 85
French	355	62.4	19.4	43 to 82	French	265	63.0	16.4	47 to 79
Latin	97	81.0	11.4	70 to 92	Latin	43	69.1	14.7	54 to 84
AVERAGE	385	66.0	13.3	53 to 79	Physics	193	74.4	13.5	61 to 88
					Biology	78	66.3	14.5	52 to 81
					AVERAGE	302	64.2	13.0	51 to 77

\*M  $\pm$   $\sigma$  is the mean plus and minus the standard deviation. This gives the spread of scores of the middle two-thirds of the class.

TABLE 2

STATISTICS OF AUGMENTED, ENRICHED, AND CONTROL GROUPS WHEN THEY WERE IN GRADE TEN: MEAN AND SPREAD OF SCORES, APRIL, 1957

Table 2 shows that the students constituting the special groups were at the top of the student body when they were in grade ten. A comparison of the  $M \pm \sigma$  column in this table with the corresponding column for grade ten in Table I shows that, in general, the lowest of the middle two-thirds of the special classes starts where the highest of the middle two-thirds of the school as a whole leaves off. For instance, in school average of marks, the middle two-thirds of the school as a whole ranged from 53 to 79; while the Augmented, Enriched, and Control groups-to-be ranged respectively from 78 to 89, from 79 to 87, and from 75 to 83. It should be noted that the special groups were included in the calculations for the school as a whole. The data in Table 2 permit the conclusion that the students for the special classes were drawn from the top third of the student body.

Table 2 is also of interest in comparing the original status of the special groups. Note the means of the averages: a difference of only half a point between the Augmented and Enriched groups, with the Control group some four points below. When the standard scores were averaged and compared, the slight difference between the Enriched and Augmented groups was not statistically significant, while the differ-

ence between the Enriched and Control groups was significant at the 1% level. Table 2a gives the statistical argument for this conclusion.

The existing differences among the groups before the experimental treatments should be compared with the resulting differences after treatment. These differences are presented in Tables 3 and 3a.

TABLE 2

STATISTICS OF AUGMENTED, ENRICHED, AND CONTROL GROUPS WHEN THEY WERE IN GRADE TEN: MEAN AND SPREAD OF SCORES, APRIL 1957 MARKS

SUBJECT	GROUP	N	MEAN	$\sigma$	M $\pm$ $\sigma^*$
Literature	Augmented	31	78.2	8.8	69 to 87
	Enriched	38	75.4	9.5	66 to 85
	Control	31	74.2	9.7	64 to 85
Composition	Augmented	31	81.1	6.6	75 to 88
	Enriched	38	79.2	7.7	72 to 87
	Control	31	72.7	8.6	64 to 81
Geography	Augmented	31	84.6	8.0	77 to 93
	Enriched	38	87.8	5.8	82 to 95
	Control	31	84.8	6.7	78 to 91
Mathematics	Augmented	31	87.9	8.5	79 to 96
	Enriched	38	85.7	8.5	77 to 94
	Control	31	81.1	9.4	72 to 91
Science	Augmented	30	87.2	6.8	80 to 94
	Enriched	38	88.2	6.0	82 to 94
	Control	31	83.4	8.5	75 to 92
French	Augmented	31	81.3	10.4	71 to 92
	Enriched	38	83.3	6.7	77 to 90
	Control	28	80.6	7.5	73 to 88
Latin	Augmented	28	86.2	8.3	78 to 95
	Enriched	15	87.0	5.5	82 to 93
	Control	3	88.0	8.6	79 to 97
AVERAGE	Augmented	31	83.6	5.8	78 to 89
	Enriched	38	83.1	4.1	79 to 87
	Control	31	79.2	4.0	75 to 83

\*M  $\pm$   $\sigma$  is the mean plus and minus the standard deviation. This gives the spread of scores of the middle two-thirds of the class.

TABLE 2a

SIGNIFICANCE OF THE DIFFERENCES AMONG THE GROUPS IN GRADE TEN

GROUP	N	$\bar{Z}$	Variance	F	$P_F$	Hyp	t	$P_t$	$Hyp^t$
Augmented Enriched	31 38	59.7 60.0	14.5116 6.8964	2.10	>.01	Acc.	.382	>.70	Acc.
Control Enriched	31 38	58.1 60.0	6.1611 6.8964	1.12	>.05	Acc.	3.065	<.01	Rej.

The last entry in Table 2 referred to the school averages of the special groups. The Augmented and Enriched groups had mean averages of 83.6 and 83.1 respectively, a rather close match. The Control group had a mean average of 79.2, and it was of interest to discover whether this difference from the other two groups was significant. Rather than use the school marks, however, it was decided to convert all the marks of the special groups into standard scores and average these, omitting the non-academic courses such as typewriting, shops, and household economics. The formula used to convert school marks into standard scores made use of the mean and standard deviation in each subject for the school as a whole as given in Table I. The formula used was:

$$Z = \frac{10(X-M)}{\sigma} + 50$$

Each mark was individually converted to its standard score laboriously on a desk calculator at first: but later the

University of Manitoba Bendix G-15D Computer became available to the writer, and the calculations were greatly accelerated.

The standard scores were averaged and the results for the Augmented, Enriched, and Control groups were 59.7, 60.0, and 58.1, respectively. Analysis of variance showed that a significant difference existed among the groups, and so t-tests were run to locate the differences. On the basis of the results given in Table 2a, the hypothesis that the Augmented and Enriched groups had equal means was accepted, but the hypothesis of equal means for Control and Enriched was rejected. It is well to keep these conclusions in mind when you consider the results in Grade XI given in Table 3a.

TABLE 3

STATISTICS OF AUGMENTED, ENRICHED, AND CONTROL GROUPS IN  
GRADE XI MEAN AND SPREAD OF SCORES, APRIL, 1958 COMPOSITES

SUBJECT	GROUP	N	MEAN	$\sigma$	M $\pm$ $\sigma^*$
Literature	Augmented	31	73.8	6.1	68 to 80
	Enriched	38	67.5	8.7	59 to 76
	Control	31	67.7	8.2	60 to 76
Composition	Augmented	31	71.9	8.2	64 to 80
	Enriched	38	68.2	7.3	61 to 76
	Control	31	68.1	8.4	60 to 77
History	Augmented	31	75.9	9.1	67 to 85
	Enriched	38	73.9	10.0	64 to 84
	Control	31	78.4	11.5	67 to 90
Mathematics	Augmented	31	86.8	9.4	77 to 96
	Enriched	38	72.5	12.2	60 to 85
	Control	31	72.6	11.8	61 to 84
Biology	Augmented	7	85.7	4.3	81 to 90
	Control	10	77.4	10.2	67 to 88
Physics	Augmented	31	83.8	7.7	76 to 92
	Enriched	38	84.0	8.3	76 to 92
	Control	18	82.8	8.0	75 to 91
Chemistry	Augmented	31	85.5	7.0	79 to 93
	Enriched	38	81.8	8.6	73 to 90
	Control	30	78.3	9.2	69 to 88
French	Augmented	31	83.0	7.6	77 to 91
	Enriched	38	70.5	10.7	60 to 81
	Control	28	72.3	10.4	62 to 83
Latin	Augmented	24	72.4	10.8	62 to 83
	Enriched	0	-	-	-
	Control	3	86.7	1.9	85 to 89
AVERAGE	Augmented	31	79.5	6.2	73 to 86
	Enriched	38	74.0	7.7	66 to 82
	Control	31	74.1	7.1	67 to 81

\*M  $\pm$   $\sigma$  is the mean plus and minus the standard deviation.  
This gives the spread of scores of the middle two-thirds  
of the class.

The foregoing Table 3 shows the achievement of the special groups after treatment; and a comparison of the  $M \pm \sigma$  column with the corresponding column in the Grade XI portion of Table 1 discloses that the lower end of the middle two-thirds of the special groups has dipped below the general mean in most of the subjects. This is more true of the Enriched and Control groups than of the Augmented group. In general, however, the special groups remained ahead in the grade as a whole.

Table 3 shows that the Enriched group joined the Control group in average achievement, and the Augmented exceed them by more than five points. In order to test the statistical significance of the differences, all marks for the special groups were converted to standard scores, and t-tests were run between pairs of groups. Table 3a gives the results, accepting the hypothesis that the means of the Control and Enriched groups are alike, but rejecting the hypothesis that the Augmented group mean is the same as the others.

TABLE 3a  
SIGNIFICANCE OF THE DIFFERENCES AMONG THE GROUPS IN GRADE ELEVEN

GROUP	N	$\bar{Z}$	Variance	F	$P_F$	Hyp.	t	$P_t$	$t$ Hyp.
Enriched	38	56.2	28.6462	1.46	>.05	Acc.	2.667	<.01	Rej.
Augmented	31	59.4	19.6025						
Control	31	56.5	25.5017	1.30	>.05	Acc.	2.404	<.02	Rej.
Augmented	31	59.4	19.6025						
Control	31	56.5	25.5017	1.12	>.05	Acc.	0.238	>.80	Acc.
Enriched	38	56.2	28.6462						

RESULTS OF THE WATSON-GLASER TEST OF CRITICAL THINKING AS A  
PRE- AND POST-TEST ADMINISTERED TO THE AUGMENTED AND ENRICHED  
GROUPS

The Watson-Glaser test was administered only to the Augmented and Enriched groups in October, 1957, and again in June, 1958. There was very little difference in means in October, and no difference at all in June. Table 4 below shows these results and goes on to analysis of the variances. The F-test indicates that the differences in variances both in October and in June were not statistically significant.

An examination of the changes in variance reveals that the Augmented group spread out from October to June, while the Enriched group tended to become more homogeneous in the ability to do critical thinking.

The question of variability of abilities is linked with the development of individual differences within a group. Some psychologists hold that the release of expression of individual differences as manifested in greater variability in a group is in harmony with our democratic way of life.

TABLE 4

MEANS AND THE SIGNIFICANCE OF THE VARIANCES OF THE RESULTS OF  
THE WATSON-GLASER TEST OF CRITICAL THINKING FROM AUGMENTED  
AND ENRICHED

TIME	GROUP	N*	MEAN	VARIANCE	F	P	HYP.
Oct. 1957	Augmented	27	70.7	49.7378	1.071	>.05	Accept
	Enriched	37	69.1	46.4534			
June 1958	Augmented	27	74.7	60.4301	1.549	>.05	Accept
	Enriched	37	74.7	39.0030			

\*Only those who took the test at both times were included.

TABLE 5  
ORDER OF MERIT OF THE TOP FOURTEEN STUDENTS AS ARRANGED BY SCHOOL AVERAGE AND  
AS ARRANGED BY MEAN STANDARD SCORE

GRADE TEN				GRADE ELEVEN			
Average	Student	Mean Z-Score	Student	Average	Student	Mean Z-Score	Student
95.7	Helen M (A)	67.4	Helen M (A)	93.0	Helen M (A)	69.1	Helen M (A)
94.1	John H (E)	67.2	John H (E)	91.0	Reva R (A)	67.6	Reva R (A)
93.5	Judith T (A)	66.1	Judith T (A)	89.9	Baillie K (E)	67.6	Baillie K (E)
93.0	Reva R (A)	65.4	Reva R (A)	89.3	John H (E)	66.7	John H (E)
91.0	Susan B (A)	65.2	Faye W (A)	87.8	John E (C)	65.9	John E (C)
90.5	Baillie K (E)	64.0	Susan B (A)	87.0	Susan B (A)	64.7	Peter F (C)
90.2	Arthur S (A)	63.9	Baillie K (E)	87.0	Faye W (A)	64.5	Faye W (A)
90.1	Faye W (A)	63.7	Arthur S (A)	87.0	Peter F (C)	64.4	Susan B (A)
90.1	Morley H (E)	63.7	John E (C)	86.0	Judith T (A)	64.3	Judith T (A)
89.5	John E (C)	63.7	Dorthea K (E)	85.0	Heather R (E)	64.0	Heather R (E)
89.5	Heather R (E)	63.7	Robert M (E)	85.0	Arthur S (A)	63.5	Janet R (C)
89.1	Janet R (A)	63.4	Janet R (A)	84.0	Robin M (A)	63.3	Arthur S (A)
88.5	Hobin M (A)	63.1	Heather R (E)	83.1	Janet R (A)	62.6	Judith M (C)
88.3	Dorthea K (E)	63.0	Robin M (A)	83.0	David K (A)	62.5	Robin M (A)

NOTES: 1. The (A), (E), and (C) after the names refer to Augmented, Enriched and Control.  
2. Janet R (C) in the last column id different from Janet R (A) in the other columns.

### SUMMARY OF CONCLUSIONS

1. The Augmented and Enriched groups as originally selected were not significantly different from each other in mean achievement in grade ten. The Control group was below them significantly.
2. After the experiment in grade eleven, the Augmented group emerged significantly higher than the Enriched and Control groups who were now equal in mean achievement.
3. The Watson-Glaser Test of Critical Thinking showed no statistical differences in mean and variance for the two groups. However, the Augmented group increased in variance, while the Enriched group decreased in variance.

### PHILOSOPHICAL OBSERVATIONS AND RECOMMENDATIONS BY THE STATISTICIAN

1. The statistical analysis points to the better achievement of the Augmented group on regular school examinations. It may be argued that the regular school examination did not measure the expected outcome of the Enriched course. Such an argument could go on interminably. Indeterminate objectives are the bane of educational research. It appears to me that the Augmented group sharpened its ability to master essentials, and this manifested itself in their superiority on the regular school examinations.
2. The taking of an extra academic course, as was done by the Augmented group, left the door open for extra choice when these students entered University. This is to be desired.
3. It is my conviction that an extra subject enriches other subjects more than additional work within a subject. Physics enriches the study of chemistry more than does additional chemistry; Latin enriches English more than additional English.
4. While the Augmented course appeals to the writer as the preferred treatment for very bright students, he would not wish to see this the only course offered. The fact that the Control group made such inroads in the top

fourteen says much for self-determination. Students should be allowed their free choice after the advantages of the Augmented course are made clear to them.

5. Decisions on merit awards should be made on the basis of standard scores. The Z-score levels the inequalities of number of subjects and scoring habits of different teachers. They have the virtue of cardinal numbers in being amenable to mathematical treatment.
  6. All school marks should be converted into standard scores for any educational research.
-