THE UNIVERSITY OF MANITOBA

TEACHER QUALIFICATIONS AND EXPERIENCE AND PUPIL ACHIEVEMENT

BEING A THESIS SUBMITTED TO THE COMMITTEE ON POSTGRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS

BY

HARRY L. STEIN

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CHAPTER I

INTRODUCTION

This study has been inspired by the investigator's interest aroused by ten years experience as a teacher in small high schools in the Province of Manitoba, and therefore from first hand knowledge of some of the problems which confront the small rural high school. This interest was deepened by three years of graduate study in the field of education, in which contact was made, through a number of eminent educationists, and through more or less detailed study of a number of scientific investigations with an increasing array of problems in education.

The need of scientific research into the problems of small high schools is accentuated by the fact that there is a growing tendency to make secondary education more and more available to the rural population. This tendency has meant, at least in Manitoba, a steady growth in the number of very small secondary schools, the vast majority of which are of the one-room high school type, in which one teacher, who acts also as principal of the elementary department, has charge of the high school and teaches all the subjects

prescribed for or elected by the pupils of his school. Furthermore - and here again the reference is to Manitoba - recent occurrences such as the decision to retain the local district form of organization, indicate the possibility of a continuance of this type of secondary school. The implication is that research into the conditions of the small high school, its efficiency, its possibilities for improvement, is a dire necessity, if this ever widening sphere of availability of secondary education is to involve the creation of more small high schools.

Studies of small high schools.- Educational research in Canada has been up to the present, very limited in its scope. To find out what investigations have been made into the problems of small high schools, we must therefore delve into American literature. Here we find that a number of specialists in rural education have made extensive surveys of small high schools. Among the most outstanding of these are the "Rural School Survey of New York State," made in 1922, and the "National Survey of Secondary Education," made in 1932. These surveys, together with the writings of E. N. Ferris,[1] John

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[1] E. N. Ferris. "Secondary Education in Country and Village." New York: D. Appleton and Co., 1927.

Rufi,[2] W. H. Gaumnitz[3] and Francis D. Spaulding[4], present a mass of evidence on conditions in small high schools in the United States. It is not the intention of this study to summarize any of these works, or to present an extended discussion of their findings, but brief references will be made from time to time to conclusions drawn from American data, by way of comparison with the Manitoba situation.

The Saskatchewan Survey by Foght in 1918, and the British Columbia survey of 1925 make some reference to the small high school situation, and their findings will also be given brief consideration when the final analysis is made.

Problems of small high schools.- What are some of the problems confronting small high schools in Manitoba and elsewhere? To list them all would defeat the purpose of this study, but reference to a few will suffice to show their range. The following are of major interest:

1. Is the small high school an efficient administrative organization for bringing secondary education within the reach of the rural population?

2. How can conditions in rural high schools be improved

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2 John Rufi, The Small High School. Bureau of Publications, Teacher's College, Columbia University, 1926.

3 W. H. Gaumnitz, The Smallness of America's Rural High Schools. Office of Education. Bulletin, 1930, No.13, Washington, D. C.

4 Francis D. Spaulding, The Small Junior High School. Cambridge, Mass.: Harvard University Press, 1927.

as regards staffing, supervision, curriculum, buildings and equipment?

3. Does the small high school give full value for the money expended on its upkeep?

4. If the present form of organization is not producing satisfactory results what form of organization is likely to be more successful?

5. Are the methods of teaching in large high schools applicable in small high schools?

6. What are present tendencies in the organization of rural secondary education in other provinces of the Dominion, in the United States, and in other Countries?

This is a random sample of a multitude of problems both large and small, dealing with administration, methods, curriculum, buildings, equipment, staffing, transportation, and financing of small high schools, all of which await scientific study for their solution. It is not the purpose of this investigation to consider all or even one of these problems in its entirety. The best that can be hoped for as the field of scientific research in the problems within the field will be delimited to proportions which can be handled with comparative ease, and which involve a minimum of complexity, is that their solution may be reasonably forecast. In the next chapter the scope of the present study will be defined, the problem stated, and the hypothesis, with its possible implications, set up.

CHAPTER II

THE PROBLEM STATED

In general terms, it is the aim of this study to make an analysis of the academic training and the total experience of the teachers in one-, two-, and three-room high schools of Manitoba, and to see what relationship, if any, exists between these factors and pupil achievement, as measured by the departmental examinations. At the same time, an attempt will be made to determine what relationship, if any, exists between the size of the school and the average achievement of the pupils in these schools. For the sake of brevity, the term "small high schools" in this study will refer to one- two- and three-room high schools, unless otherwise stated.

In the province of Manitoba, all high schools outside of the city of Winnipeg would be considered "small", if they were staffed by fewer than ten teachers. According to American writers, then, Manitoba rural areas would have no large high schools, and this fact must be taken into consideration when comparisons are made with the American situation.

In more specific terms, the study will be treated in

two units. In unit I, a statistical analysis will be made of:

(a) the academic qualifications of the teachers in small high schools, taking into account (1) academic certification, (2) professional certification, and (3) academic training in English, History, Mathematics, Physics, Chemistry, French and Latin. The measure of this training will be discussed later.

(b) the total teaching experience of the teachers in small high schools.

(c) the tenure of teachers in small high schools.

In unit II, an analysis in statistical terms will be made of the relationship between:

(a) the academic training of the teachers and the achievement of their pupils.

(b) the total experience of the teachers and the achievement of their pupils.

(c) the academic training of the teachers and their total experience in teaching.

The relationship in each case will be expressed by the product moment correlation coefficient, and thus three r's will be obtained which will be treated by Spearman's "distortion" formula for the eliminating of disturbing factors.

The thesis will also consider in general terms, the possible effect of other factors affecting pupil

achievement, such as the pupils' intelligence quotients, teacher personality, conditions in and out of school, etc.

The measure of academic training.- In this study the "unit" is used as the primary measure of academic training. The unit is defined as

> "a body of work to which is assigned for instructional purposes one hour of lecture or other class room exercise per week or one continuous laboratory period of two or three hours per week, throughout an entire session, or the equivalent".[1]

The unit is therefore the equivalent of one lecture hour per week per year, and in most subjects, a student receives four units of credit for one year's work in either of the first two years. When specialization occurs in the third, fourth, and fifth years, a student may do work which is rewarded by credits of anywhere from four to sixteen units in any subject.

In considering the academic training of a student in any subject, no account was taken of the work the student did or did not do up to and including Grade XI. This matter will receive further consideration when the method of gathering the data is discussed in the next chapter.

The fundamental hypothesis.- The assumption upon which this study is based is that other things being equal, the teachers with more academic training should produce greater achievement on the part of their pupils than those

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[1] University of Manitoba, Winnipeg: Calendar of Arts and Science including pharmacy. Session 1934-35, p. 25.

with less academic training, and furthermore, if all other factors remain constant, the teachers with more experience should produce better results than those with less. It is readily admitted that it would be extremely difficult to find a situation in which all other factors affecting pupil achievement, excepting the academic training of the teachers and their experience, would be constant. Probably the largest single factor outside of the two mentioned would be the intelligence quotients of the pupils themselves. Other important factors are, the personality of the teacher, the size of the school, the equipment of the school, the amount and the quality of supervision, and probably the financial condition of the school district. All of these difficulties were foreseen at the outset, but it was hoped that by obtaining a sufficiently large distribution of data concerning teachers, schools, and pupils, that a great many of the disturbing factors would average themselves out.

It was hoped, for example, that if a sufficiently large number of pupils could be studied, the distribution of their intelligence quotients would follow pretty well the normal curve, and that on the average, the number with high and low intelligence quotients taught by teachers with little academic training and few years of experience would be as great as those taught by teachers with more academic training and experience. Had the study been begun before the children under consideration were examined, there

could possibly have been a correction made for this factor. Under the circumstances, however, no data on intelligence were available, and the assumption of mormality was therefore unavoidable.

Again, it was assumed that if a large enough distribution of teachers could be studied, the factor of the teacher's personality would not affect the results too much. It might reasonably be expected that in a large number of teachers, just as many teachers with a good personality and little academic training would be found as teachers with poor personality and more academic training. Furthermore, in a large group, it is quite likely that there would be just as many teachers with poor personality teaching pupils of high mental calibre as there would be teachers of good personality teaching pupils of low mental calibre.

The matter of school conditions is a rather difficult one to consider. So many factors enter here that a careful consideration of any or all of them is next to impossible. The effect of lighting, heating, ventilation, seating, etc., on pupil achievement may vary within wide limits. The difficulty of measuring such factors as these forces a further assumption of normality in a large distribution, with defective physical conditions having just as great an effect on good and poor pupils and teachers as ideal conditions have on them.

One factor, however, due to its simplicity, can be

given careful consideration, and that is, the number of teachers doing the high school work. In the first unit, the data will be so arranged as to show the effect of the size of the high school, in terms of the number of teachers, or at least to show what differences exist among schools of varying size, whether these differences are due to the size of the school or not.

The question of the size of the school in terms of the number of pupils enrolled, should also have been considered. Here again, a difficulty was encountered that was practically insurmountable. In measuring pupil achievement, only those pupils who wrote the Grade XI examinations were taken into account. In almost every school there was a number of pupils who were taught throughout the year but who did not write the departmental examinations. If enrolment were considered along with the examination results, it would be difficult to measure the true effects of the enrolment on pupil achievement.

Another very important factor in pupil achievement is the length of time spent in professional training by the teacher, of which, up to this point, no mention has been made. An examination of the data as presented in Chapter IV will show that this factor is practically constant through the whole distribution of teachers. The vast majority of teachers have had either eight, nine or ten months of Normal training. In other words, neglecting a few isolated cases

in which there was little or no professional training, the modal period of professional training was nine months, with a range of from eight to ten months. It is easily seen therefore that length of professional training is not a variable factor, and would have very little effect when thrown into a distribution involving such Variable factors as units of academic training and years of experience.

Another admission must be made at this point with reference to the teacher's professional training. In the last paragraph, only the length of time spent by the teacher in professional training was considered. It must be remembered that length of time spent in a course is not altogether an adequate measure of the value of the course. A great many of the teachers in the schools under consideration had taken third class, and second class normal training before setting out on their teaching careers. In the first few years of their teaching experience, large numbers increased their academic training, many to the extent of obtaining university degrees. On the other hand, equally large numbers have had first class normal training, and many the graduate normal training. The question of the difference in character of these different classes of normal training cannot be treated in this discussion. Suffice it to say that the variability in range of class of professional training, coupled with the more or less constant factor of length of professional training makes it

next to impossible to consider the factor of professional training in its relationship to pupil achievement. The assumption must therefore be made that, if the distribution is large enough, teachers with different types of professional training will appear in every situation in sufficient numbers to consider normality of the effects of this factor.

In determining the relationships stated in the outline of unit II, it was at first thought advisable to treat the respective size groups, one-, two-, and three-room high schools, separately. It was found, however, that in the two- and three-room schools, there was little variability in the number of units of academic training taken by the teachers in these groups. For example, the great majority of teachers of mathematics had either four or six units. To treat the two- and three-room groups separately then would have been rather awkward, so that it was found necessary to treat all three types of schools together, and to endeavor to determine the relationship between academic training and pupil achievement in small high schools generally. There is no doubt however, that differences would have arisen had each of the relationships for each group been determined separately, because there is no doubt, as the data will show subsequently, that size of school in terms of the number of teachers doing the work has a significant bearing on pupil achievement.

The results of the study depend almost entirely upon the extent of the data, and the reliability and accuracy of

the sources from which the information is obtained. The method of attack upon the problem, and a description of the sources of information, are the subject of the next chapter.

CHAPTER III

THE METHOD OF THE INVESTIGATION

The sources of the data.- With but few exceptions, the data for this thesis are drawn from the official records of the Department of Education of the Province of Manitoba and from the official records of the University of Manitoba. The data are divided into three main divisions: (1) those concerning schools, (2) those concerning teachers, and (3) those concerning pupil achievement. A full description of each division follows.

The schools.- The schools with which this investigation is concerned are the one-, two-, and three-room high schools of Manitoba. The primary list of these schools was obtained from the report of the Department of Education for the year ending June 30th 1933. From year to year, however, this list varies. Many schools which can one year qualify as a certain type of high school, cannot, the following year, be placed in the same category. In some cases, schools which are this year a two-room high school may next year be only a one-room high school, due to depletion in the enrollment. It is not uncommon for schools to oscillate between

the one-room and two-room classes, or between the two-room and three-room classes, from one year to the next. Furthermore, several schools may one year qualify as a high school and the next year may not be able to qualify at all.

In consequence of these variations, the list as recorded in the report for the year 1933 was not reliable and it was therefore necessary to revise it. This was accomplished by searching the records of the accountant's office of the Department. High school grants are made on the basis of the classification of the school. An examination of the "staff" reports of all the schools which received the high school grant revealed the changes which had to be made in the primary list. It might be argued that the "staff" reports should have been made the basis of the primary list, but these reports were not complete at the time the first list was prepared, and it was found also, that in some cases, it was not possible to determine from the report which of the staff were elementary teachers, and which were high school teachers. It was thought best therefore to use the official list for 1933, and correct it from the various other sources in the departmental records.

The teachers.- After the list of schools was completed, the names of the principals of one-room high schools, and of principals and assistants in two-, and three-room high schools, were listed beside the name of each school. The list of principals was obtained from the departmental report,

and the list of assistants together with revisions in the list of principals, from the "staff reports", and the staff cards in the "teachers" file in the general office of the Department was set up.

When the list of teachers was complete in every detail, each name was transferred to a 3 X 5 library filing card. The form of this card is shown in Figure I. The card was designed to form a basis for obtaining all the required information on the qualifications and experience of the teachers, including professional and academic training, professional certification, experience in elementary and high schools, and tenure. In the case of teachers in two- and three-room high schools, the back of the card was used to show the subjects taught by that teacher.

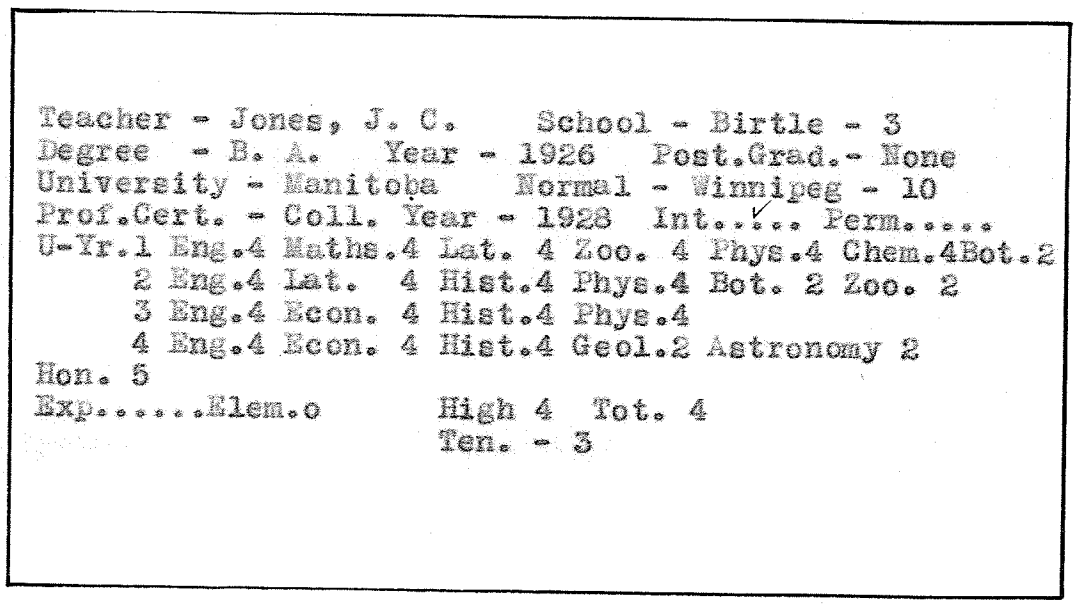

Fig. 1. - Teacher's Card

The next step in the gathering of the data on the teachers was to visit the office of the Registrar of the Department of Education and to examine the professional cards of the teachers under consideration. These cards contain an extensive record of the professional qualifications of all the teachers in Manitoba, including academic certification, together with deficiencies which must be supplied, length and place of normal training, University degrees, and where taken, professional certification and licensing, and all the comments necessary to a more or less complete knowledge of the teacher's standing in the province from the Registrar's standpoint. A very important part of the information required for the card in Figure I was obtained from this file. In a few cases, when teachers' records had not yet been transferred to this file, it was necessary to search through all record books of the department, but invariably the information was eventually available. The list contained the names of two hundred and seventy-two teachers, and considerable time was consumed in the search for this section of the data.

The question of experience and tenure was the next to be considered. Provision was made on the teacher's card for recording experience in elementary schools, high schools, total experience and the time spent in the present school. The only source from which this information was available with any degree of reliability was from the teachers'

retirement fund file in the office of the accountant. This file showed the total experience of the teacher and also the length of time spent in the present school, but there was no way of determining how much of the experience was in elementary schools, and how much in secondary schools. The only recourse for this information was a questionnaire, and as the unreliability of this form of data gathering is so well established, it was deemed advisable to avoid it wherever possible. It was decided, therefore that, while it would probably be best to correlate pupil achievement in high schools with experience in secondary schools, the measure of total experience might give a result that would not be in error to a large extent. After all, it might be argued that the type of teaching experience, is of little consequence, since a great many principles of teaching are common to both elementary and secondary education. On the other hand, the criticism will probably be offered that only secondary school experience should have been considered. Two factors affected the decision to use total experience. In the first place it was considered best to use official records as far as possible, and secondly, a study of a random sampling of the cards showed that a great many of the secondary school teachers had started their teaching careers after they had completed their degrees, and that with the large majority, total experience would correspond very closely, if not entirely with secondary school experience. In a very few cases, of teachers with

long experience, the earliest years were spent in elementary schools. These cases, however, were few, and it was therefore ascertained that a very small percentage of error would result from the use of total experience as a measure of experience in high school work. However, the general effect of this experience factor will receive further consideration when the conclusions are drawn from the data.

Subjects taught.- Strange as it may seem, one of the sections of the data it was found most difficult to obtain was the division of subjects among the teachers in two- and three-room schools. In one-room schools, of course, the teacher was responsible for teaching all the subjects, and it was necessary to determine only the schools which were or were not teaching languages. This was easily accomplished from a study of the examination records, and reference will be made later to a slight error which may possibly have occurred in this regard.

The division of subjects in three-room schools, which were seventeen in number, was obtained from three sources. The file containing the inspector's reports was examined, and a complete record of schools in the northern half of the province was found. On the reports of the teachers in this section, the high school inspector gave a complete record showing not only the subjects taught by the teacher, but also the experience in secondary schools, and the academic and professional training of the teachers. For the schools in

the southern half of the province, it was necessary to consult the high school inspector who kindly consented to seek out the information from his personal records. The information was thus completed for all three-room schools with the exception of two, and for these it was found necessary to write to the principals of the schools to obtain the data.

For the division of subjects in two-room schools, it was found necessary to use an indirect source. For a few schools, the inspector's reports for 1933 supplied the information. For the remainder, the information was obtained by the co-operation of the office of the Deputy Minister of Education. The application forms for the position of sub-examiner were revised to supply the required information, and when the forms were returned, it was found that all the two-roomed schools were represented with the exception of five. For these five schools, the Deputy Minister kindly consented to obtain the division of subjects.

When the data on subjects taught were complete, they were transferred to the backs of the cards illustrated in Figure I.

Academic records.- In surveying the possibilities for this thesis, it was thought that a comparison would be made between the results achieved by graduate teachers and those achieved by non-graduates. As soon, however, as the recording of the data on academical training was begun, it was found that a large proportion of those without degrees had

done advanced work towards a degree, and that some had even completed the degree work, but had not yet been graduated. It was seen, therefore, that no real line of demarkation could be drawn between graduates and non graduates, as regards academic training. The original intent of the study was to set up a curve showing the marks of pupils taught by graduates, and another curve showing the marks of pupils taught by non-graduates, and by a measure of skewness to determine whether or not there was any significant difference in the two curves that might be attributed to the academic training of the teachers. The fact that so many teachers were approaching degrees was sufficient to throw into the discard the method of correlation by the measure of skewness, and to indicate that a better measure of correlation between academic training and pupil achievement would be the product-moment coefficient.

The sources of the data on the academic training of the teachers in the schools under consideration were three in number. Two of these were official records, and the third was a questionnaire to thirty teachers, to which there was a complete response. Each of these sources will be discussed in detail.

The office of the Registrar of the University of Manitoba furnished the bulk of the data on the academic training of the teachers in the schools under consideration. It will be remembered that the teachers' professional cards

at the Department of Education furnished the information as to whether or not the teacher was a graduate, and if a graduate, at what University, and when the degree was taken. This information being on the card shown in Figure I, it was a simple matter to search out the teacher's academic card from the graduate file and transfer to the cards of this study the number of units taken in each year in each subject. Figure I. shows how this was done for an imaginary graduate. The system of assigning units of credit for courses taken was instituted in 1925. All students cards from that year to the present show the number of units of credit given for each course. For both graduates and under graduates who had taken courses previous to 1925 it was necessary to compute the number of units for each course on the basis of the number of lecture or laboratory hours taken in each subject. This was a comparatively easy matter, as the courses had changed very little, even though the system of recording the credits had changed.

As has been said, the great majority of the teachers with whom this study is concerned have taken some work at the University. Consequently, all their academic training is recorded in the University files. The cards, whether those of under graduates or graduates were taken in alphabetical order, and the data transferred to them. Where no record could be found in the University files, and the card showed that the student had taken his training in Manitoba, the card was taken out, to be filled in from the academic records

of the Department of Education.

The second source of the data on the training of the teachers was the examination records of the Department of Education. All the cards of teachers who had Grade XII A or Grade XII B standing and who had not taken any work at the University were taken to the Department to be completed. A great deal of labor was entailed in searching out the records of these teachers. Many of them had taken their Grade XII work in a piecemeal fashion, and it was necessary to use the cross indexed file and several books of examination records, some dating as far back as 1893. In every case where the work had been done in Manitoba, however, the records were available. Eight teachers had been granted Grade XII standing on English certificates. These were recorded as having the same number of units of credit as the regular Grade XII graduates of Manitoba schools. A slight error may have entered the data in this regard, but it was felt that on the average, the number of units awarded would not vary a great deal from the actual credit they obtained.

The third source of data on academic training was a questionnaire sent to thirty teachers who were graduates of universities other than Manitoba University. The questionnaire was accompanied by a letter from the Deputy Minister of Education, and a complete response was obtained. Of the thirty teachers, eight were graduates of McMaster University and had taken their work at Brandon College. Eight were

graduates of Queen's, and of the remaining fourteen, three had graduated from American Universities, and the rest were graduates of either universities in Eastern Canada or in the British Isles.

A difficulty of assigning units of credit for the courses taken by these teachers was encountered here. This difficulty was met in the following manner. The Calendars of the Universities at which these teachers studied were examined, and the approximate number of hours per week in each course was ascertained. While there was a good deal of variation from the practice in Manitoba in the case of some subjects, a great many similarities were found. It was decided, therefore, to award four units of credit for each year's work in English, History, Mathematics, Physics, Chemistry, French and Latin. For example, if a teacher had pursued the subject of History through four years, sixteen units of credit were awarded. When comparisons were made between the total number of units taken in any one year, and in all subjects, at other universities, and at Manitoba University, no great difference was found. The greatest differences were found as between Canadian and American Universities. The least difference was found between Manitoba University and Queen's or McMaster. On the average, it was determined that the percentage of error would not greatly affect the results of correlation.

The form of the questionnaire sent to the teachers

who were graduates of other Universities will be found in Appendix I. The teachers were asked to supply information on all the subjects they had taken, notwithstanding that some of these subjects are not considered in this study. The object was to compare the general training of other Universities with that of the Manitoba institution. Several of these teachers were found to have pursued studies which do not appear on the Manitoba curriculum.

The master sheets.- In order to facilitate the handling of the data on schools and teachers, it was found necessary to devise a form of master sheet, to which the data from the cards illustrated in Figure I could be transferred. These master sheets were designed to carry in columnar form all the information concerning the teachers from both the front and back of the card. The cards themselves were arranged in alphabetical order by teachers. The master sheets were arranged in three groups, one for each of the types of school with which the investigation is concerned. Within each group, the data on the sheets were arranged in alphabetical order by schools. The need for this will be seen when the recording of the data on pupil achievement is discussed.

In Figure II the form of the master sheet is shown together with the recording of a few typical cases from the data. For obvious reasons the names of the schools and teachers are omitted. The footings of the sheet are not

shown but they are used only for the purpose of totaling. When blanks appear in the columns for the number of academic units in each subject, it means that the University records showed that the student had not pursued the subject at all in the university. As has already been said, it was practically impossible, without resorting to the questionnaire, to determine whether or not the teachers had pursued the various subjects in high school, so that it must not be taken for granted that the teacher has had absolutely no training in the subject where blanks occur. Furthermore, there is always the possibility that the teacher may have taken considerable training in the subject outside of either high school or university. This phase of the situation will also receive further consideration in the concluding chapter.

It will be observed that in filling in the "subjects taught" section of the master sheet for one-room high schools the only columns filled in are the language columns since it is assumed that all the other subjects are being taught by the teacher. In two- and three-room schools, the entire division of subjects is indicated. In the second column from the extreme right, a check mark indicates that the teacher is teaching at least one subject in his major field.

The master sheet proved a most useful device for analysing and summarizing all the data into the tables shown in Chapters IV and V and for the further transfer of data to the pupil achievement sheets which will be discussed later,

SCHOOL	STAFF	DEPARTMENTAL RECORDS													UNITS OF ACADEMIC TRAINING							GRADE XI SUBJECTS TAUGHT								
		B.A.	B.Sc.	B.S.A.	M.A.OR MSC	XIIA	XIIB	COLL.CERT.	IA.OR IB.	NORMAL	INTERIM	SEC.EXP.	TOT.EXP.	TENURE	ENGLISH	HISTORY	MATHS.	PHYSICS	CHEMISTRY	FRENCH	LATIN	LITER.	COMP.	HISTORY	ALGEBRA	GEOMETRY	PHYSICS	CHEMISTRY	FRENCH	LATIN
ONE-ROOM HIGH SCHOOLS																														
1.	A					✓			✓	9			17	12	12		6	4	4										✓	
2.	B	✓						✓		9			12	2	24	8	4			4									✓	
3.	C	✓						✓		9			6	2	16	4	6	8	8										✓	
4.	D				M.A.			✓		10			10	3	8	4	14	4	16											
5.	E			✓				✓		4			13	5	16		8	8	8										✓	
6.	F		✓					✓		9		8	8	2	8		8	12	16	8									✓	
7.	G						✓		B	9	✓	3	3	3	4	4	4		4	4									✓	
TWO-ROOM HIGH SCHOOLS																														
1.	A					✓			✓	5			28	13	4	4	6		4					✓	✓	✓	✓	✓		
	B	✓						✓		10		4	4	4	16	16	4			12	4	✓	✓						✓	✓
2.	C	✓						✓		9			18	1	16	16	8	4	8						✓	✓	✓	✓		
	D	✓						✓		8	✓		1	1	16	4	6	12	4	16	4	✓	✓	✓					✓	✓
THREE-ROOM HIGH SCHOOLS																														
1.	A		✓					✓		10		8	8	3	8	8	4	16	28						✓	✓	✓	✓		
	B	✓						✓		10		5	5	3	16	16	4		4		8	✓	✓	✓						
	C					✓			✓	9		8	10	4	12	8	4	4	4	8	8								✓	✓

FIGURE II--THE MASTER SHEET

and which are used for the purpose of setting up the correlations tables described in Chapter VI.

Pupil achievement.- The measures of pupil achievement used in this study are the results of the Departmental examinations given in June 1934. The validity of these examinations as a measure of pupil achievement will not be discussed at this point. The purpose here is to show how the data on pupil achievement were recorded and put into statistical form for the purpose of analysis and correlation in the succeeding chapters.

The records of the departmental examinations are kept in a large loose-leaf book for each year. The results are arranged in alphabetical order by schools, with the pupils names in alphabetical order under each school.

In order to record the results quickly and accurately, the form shown in Figure III was used. One form was used for each school for each subject, and as there were nine subjects to be tabulated, this necessitated the use of about eighteen hundred forms.

This useful device is a slight variation of a classifier which first came to the writer's attention in his study of Holzinger's "Statistical Methods in Education". The left hand column of figures are tens, while the row of figures across the top are units. Accordingly there is a cell for every mark from zero to ninety-nine. All marks of one hundred were recorded in the "ninety-nine" cell.

SCHOOL - A- 3 SUBJECT - ALGEBRA AV- 56.3

	0	1	2	3	4	5	6	7	8	9		
9						/					90-100	1
8				/							80-89	1
7		/				/					70-79	2
6			//				/		/	/	60-69	5
5	//				/		//		/		50-59	6
4		/		/							40-49	2
3				/			/			/	30-39	3
2						/					20-29	1
1											10-19	0
0											0-9	0

UNITS - 6 EXPERIENCE - 11 21

TENURE - 3

Fig. 3. - Pupil Achievement Tabulation Sheet.

The extreme right hand column is a frequency distribution of the marks for the school, the class intervals being shown in the second column from the right. The distributions for each school were transferred to summary sheets, one for each of the three types of schools. In this way, a distribution was obtained of the marks for each type of school for each subject. For each distribution, the mean, median, and standard deviation were computed by the short method applicable to frequency distributions. These distributions and measures, together with an analysis of the results will be found in Chapter VII.

The method of correlation.- Unit II. of this investigation is a study of the relationship of three factors, namely pupil achievement, teacher training, and teaching experience.

All the data for the correlations are found on the sheets illustrated in Figure III. In the upper right-hand corner, the average (mean) mark of the school refers to the type of school. Along the lower edge of the sheet, three figures are to be found, only two of which are used in the correlation process. The figure opposite the word "units" indicates that this subject was taught by a teacher who had six units of academic training in mathematics. The other two figures indicate that the teacher had had eleven years experience in teaching, and had been in the present school three years.

Three correlation coefficients were computed. The first, r_{at}, shows the relationship between pupil achievement and academic training of teachers. The second, r_{ae}, shows the relationship between pupil achievement and teaching experience. The third, r_{et}, shows the relationship between the academic training of teachers and their experience.

For each subject, three scatter-diagrams were set up in order to compute the three coefficients described in the previous paragraph. The three r's having been obtained they were substituted in Spearman's formula for the elimination of disturbing factors. A further elucidation of this procedure will be given in Chapter VI. when the correlation coefficients are discussed in a little more detail. In the succeeding chapters, statistical tables summarizing the data will be set up and analyzed for their bearing upon the verification or refutation of the hypotheses discussed in Chapter II.

CHAPTER IV

UNIT I - QUALIFICATIONS OF TEACHERS

The purpose of this chapter is to array in tabular form the academic and professional qualifications of the teachers of the small high schools of Manitoba, and to analyze the tables with regard to the significance of these qualifications in the problems of small high schools.

TABLE I

ACADEMIC QUALIFICATIONS OF TEACHERS
IN ONE- TWO- THREE-ROOM SCHOOLS

	One-room		Two-room		Three-Room		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
B. A.	55	37.16	42	57.53	35	68.63	132	48.52
B. Sc.	2	1.35	2	2.74	3	5.88	7	2.58
B.S.A.	2	1.35			1	1.97	3	1.10
M. A.	4	2.71			3	5.88	7	2.58
B.Paed.	1	.67					1	.37
M.D.	1	.67					1	.37
XII A	51	34.46	25	34.25	9	17.64	85	31.25
XII B	32	21.63	4	5.48			36	13.23
Totals	148	100.00	73	100.00	51	100.00	272	100.00

Table I shows the academic certification of the teachers of the schools considered in this study. In the one-room schools approximately 44 per cent of the teachers have degrees. In the two-room schools nearly 60 per cent have graduated while in the three-room schools, over 82 per cent have received degrees. It should be remembered here that the regulations of the Department of Education[1] provide certain standards for the principals and teachers of high schools. A short summary of these regulations follow:

1. One-room schools - "The teacher of the said Department shall hold a First-Class Professional Certificate ....."

2. Two-room schools - "The principal of such Department shall hold at least a First-Class Professional Grade "A" Certificate and the second teacher .... shall hold at least a First-Class Grade "B" Certificate.

3. Three-room schools - "Each teacher employed shall hold a University degree... and in addition , a Collegiate certificate.

Notwithstanding these regulations, however, it still remains a fact that practically the same curriculum is taught in two- and three-room high schools as in one-room high schools, and the question therefore arises as to

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[1] Department of Education. "Regulations for Secondary Schools". Effective July 1st 1932.

whether or not the difference in the academic certification between teachers in one- and two-room schools, or between those in two- and three-room schools is really significant when considered as a factor in pupil achievement.

A further study of Table I reveals a number of interesting facts. Very few teachers have science degrees, that is, B. Sc. or B.S.A. In one-room schools 2.7 per cent, in two-room schools 2.7 per cent, and in three-room schools approximately 7.85 per cent have graduated from faculties offering a large proportion of science training. It would seem therefore, that graduates in the field of science seek to put their training into practice in fields other than education. The percentage of science graduates in three-room schools is nearly twice that of two-room schools. This, of course, is to be expected, since the better graded schools might naturally be expected to select specialists to teach science subjects. The small percentage of science graduates in the whole field, however, is regretable, and does not speak well for the drawing power of small high schools in the matter of qualified teacher attraction.

A very small proportion of the teachers in small high schools in Manitoba have Master's degrees. Table I shows that only 2.58 per cent of the two hundred and seventy-two teachers have taken a post-graduate degree. An interesting comparison may be made here with an American

situation. Table II shows a comparison between this study, and the study by the National Survey Committee[2] of small high schools in the United States.

TABLE II

A COMPARISON OF ACADEMIC CERTIFICATION OF PRINCIPALS AND TEACHERS IN AMERICAN AND MANITOBA SMALL HIGH SCHOOLS

Certification	Manitoba	United States Principals	United States Teachers
No Degree	44.45%	4.2%	13.8%
Batchelors Degree	54.57%	72.0%	81.2%
Masters Degree	2.58%	23.1%	5.0%
No. of Teachers	272	454	1,874

A significantly higher percentage of the teachers and principals in the American small high schools, it will be seen, have higher academic qualifications, although the percentage of masters' degrees among the assistant teachers is still relatively small.

The situation in the three-room schools of Manitoba compares most favorably in the matter of academic certification, with the American situation.

Generally speaking, then, it is seen that while the regulations demand certain qualifications of the teachers of small high schools in Manitoba, the better graded schools

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[2] The National Survey of Secondary Education. "The Smaller Secondary Schools". E. N. Ferris, et al. Washington, D.C.: 1933.

seem to attract a much higher percentage of those better qualified academically. These data support the general contention that the larger schools have a distinct advantage in the selection of their teachers. Just what the advantage is, is not difficult to surmise. While no data are at hand to support the contention, it is probable that better salaries, smaller teaching load, and the possibility of teaching more within their own fields, attract the better trained teachers to the larger schools. Teachers who have had considerable academic training are usually ambitious for promotion. When opportunities arise, they will naturally seek the better positions, with the result that the smallest schools must either retain poorly qualified teachers, or renew their staffs from the newcomers into the field. Consequently the one-room high school, which is without doubt the most difficult position for an unqualified and inexperienced teacher continues to be staffed with inexperienced teachers.

Professional certification.- One of three classes of certificates is requisite for a teacher in the secondary schools of Manitoba. Probably the most important basis for the award of these certificates is the academic preparation of the teacher. The type of certificate therefore follows very closely the nature of the teachers academic training. Teachers with Grade XII B standing may be awarded a First Class Grade B professional certificate, upon completion of the required period of professional training. Teachers

who have raised their academic standing to the Grade XII A level, may be awarded a First Class Grade A professional certificate. University graduates who have completed the required professional training are awarded a Collegiate Certificate. Table III shows the profeessional certification of the teachers considered in this study.

TABLE III

PROFESSIONAL CERTIFICATION OF TEACHERS IN ONE, TWO AND THREE ROOM HIGH SCHOOLS OF MANITOBA IN THE YEAR ENDING JUNE 30,1934

Type of Certificate	One Room		Two Room		Three Room		Total	
	No.	%	No.	%	No.	%	No.	%
Collegiate	62	41.89	44	60.27	42	82.36	148	53.42
First Class A	53	35.81	25	34.25	9	17.64	87	31.98
First Class B	33	22.30	4	5.48			37	13.60
Total	148	100.00	73	100.00	51	100.00	272	100.00

It will be observed from Table III that 45.58 per cent of the teachers have only First Class Grade A or B certificates while Table I shows that 44.48 per cent have Grade XII A or B academic standing. This discrepancy is due to the fact that two teachers, while possessing University degrees, have not been awarded Collegiate Certificates, probably because there is some deficiency in their professional training.

While the regulations permit teachers with Grade B

certificates to teach in two-room high schools, it will be noticed that the number of this class of teacher in these schools is small. This is further evidence of the fact that the two-room schools tend to select better trained teachers. The regulations do not permit three-room schools to engage teachers with a lower professional certificate than First Class, Grade A. Table III shows however, that fewer than one teacher in five of these schools possess a standing lower than the Collegiate Certificate.

Interim licensees.- The Department of Education makes the teacher's license permanent after two years of successful teaching. Until evidence of success in teaching is presented, interim licensees are granted. Table IV shows the number of teachers with interim licenses in the Manitoba small high schools.

TABLE IV

NUMBER OF TEACHERS IN MANITOBA SMALL HIGH SCHOOLS HOLDING INTERIM LICENSES DURING THE YEAR 1933-34

Type of School	Number of Teachers	Number Having Int. Licenses	Percent of Teachers
One-room	148	13	8.8
Two-room	73	10	13.7
Three-room	51	9	17.6
Total	272	32	11.7

A remarkable feature of this Table is that the percentage of interim license increases with the size of the school. No apparent reason is discernible for the fact that the three-room schools have twice as many teachers with interim licenses in proportion to the total number of teachers as the one-room schools. It may be that these teachers in three-room schools may have shown outstanding ability in their first year of teaching, and were therefore selected for the three-room school positions. This, however, is only a guess. It is quite possible that if the study were made a year later, these differences might be entirely erased.

Of the total number of teachers in the small high schools, a little more than one in ten hold interim licenses. This would indicate that the great majority have proved their teaching ability, at least to the satisfaction of the authorities who grant them licenses. The practice of granting interim licenses is now practically universal in Canada and has much to commend it. The responsibility in Manitoba for recommending that the license be made permanent, rests with the inspector of schools. His recommendation is usually accepted as final.

Academic training in English.- Throughout this study, as has already been mentioned, the measure of academic training is the unit, which was defined in Chapter II. In nearly every case four units represent a full year's work in the subject. Table V shows the number of units taken in English

by teachers in small high schools who are teaching English.

TABLE V

ACADEMIC TRAINING IN ENGLISH OF TEACHERS IN SMALL HIGH SCHOOLS WHO ARE TEACHING ENGLISH

Number of Units	One Room		Two Room		Three Room		All Schools	
	No.	%	No.	%	No.	%	No.	%
4	45	30.40	4	10.26	3	14.28	52	25.00
8	41	27.70	5	12.82	1	4.77	47	22.58
12	20	13.51	2	5.13	2	9.53	24	11.53
16	30	20.27	25	64.10	10	47.62	65	31.25
20	4	2.71					4	1.93
24	8	5.41		7.69	5	23.80	16	7.71
Total	148	100.00	39	100.00	21	100.00	208	100.00
Mean No. of Units	10.1		14.2		15.3		11.4	

Table V reads as follows:

In one-room schools forty-five teachers or 30.4 percent have taken four units of English; in two-room schools four teachers or 10.26 percent have taken four units; in three-room schools three teachers, or 14.28 percent have taken four units; and in all schools fifty-two teachers or 25. percent have taken four units.

If we accept as the standard that pursuing a subject through four years of the university constitutes specialization

then each teacher with at least sixteen units in any subject may be considered a specialist in that subject. From Table V it will be observed that in one-room schools slightly over twenty-eight percent of the teachers are specialists in English. In two-room schools the percentage of specialists rises sharply to over seventy-one percent, while in three-room schools the percentage of specialists is about the same as in the two-room schools. This is a particularly significant fact, and will be considered again when pupil achievement in English is discussed.

The average number of units of training in English taken by the teachers in each type of school is a fair measure of the general training in English of the teachers in these schools. Taking four units as a year's work, the teachers in the two-room schools have had on the average one full year's more training in English than the one-room school teachers. The three-room school teachers of English are even better trained on the average. Just whether or not this difference of training in the various types of schools produces greater achievement on the part of the pupils, will be seen in a later chapter. At any rate, if the hypothesis of the thesis holds, this should be the case.

Considering all the small high schools together it may be fairly stated that the teachers are, on the whole, pretty well trained in English. With the average number of units at 11.4, it means that nearly three years of university

English is the modal period of training. Furthermore, the table shows that seventy-five percent of the teachers have had two or more years of English. It is generally accepted that a good foundation in English is a necessary basis for success in nearly all other subjects. If such is the case, then the teachers of the small high schools should be fairly well trained academically to lay that foundation for their pupils.

Academic training in History.- The academic training in History of teachers of small high schools who are teaching History is shown in Table VI. The picture presented here varies but slightly from that presented in Table V, with the exception that a considerable number of teachers in one-room schools have apparently had no training in History beyond the high school level.

TABLE VI

ACADEMIC TRAINING IN HISTORY OF TEACHERS IN SMALL HIGH SCHOOLS WHO ARE TEACHING HISTORY

Number of Units	One Room		Two Room		Three Room		All Schools	
	No.	%	No.	%	No.	%	No.	%
0	20	13.51	1	2.86			21	10.50
4	71	47.97	13	37.16	2	11.77	86	43.00
8	21	14.17	7	20.00	3	17.64	31	15.50
12	10	6.76	3	8.57	5	29.41	18	9.00
16	18	12.18	9	25.70	2	11.77	29	14.50
20	2	1.35			1	5.88	3	1.50
24	6	4.06	2	5.71	4	23.53	12	6.00
Total	148	100.00	35	100.00	17	100.00	200	100.00
Mean No. of Units	7.0		9.6		14.1		7.3	

Table VI shows that in one-room schools, 13.5 percent of the teachers of History have had no academic training in History. This means that these teachers are giving instruction in Grade XI History with a level of training no higher than that at which they are teaching. Furthermore, in the smallest type of high school, over sixty-one percent of those teaching History have had one year or less of University training, over seventy-five percent have had two years or less, while only 17.5 percent can be considered to be specialists.

The situation is somewhat better in the two-room schools. Only one teacher had no training in History beyond the high school level. About sixty percent had two years or less of University training, while over thirty-one percent were specialists. In three-room schools, there were no teachers of History without University training in History, and less than thirty percent had fewer than eight units. In this type of school, just over forty-one percent were specialists.

When all schools are considered together, about one teacher of History in ten has had no University training in History. Over fifty-three percent have had one year or less, seventy-eight percent three years or less, and twenty-two percent were specialists. A comparison with Table V shows that the number of specialists in the field of English is nearly twice as large as the number of specialists in the

field of History.

The average number of units taken by History teachers in one-room schools is seven, which is nearly the average for all schools combined. The average number of units taken by History teachers in the three-room schools is just over fourteen, or about twice as many as the one-room school teachers.

Another interesting detail drawn from Table VI is that of the seventeen teachers of History, four, or over 23.5 per cent have taken the equivalent of honors History. This would seem to support the contention that the best trained teachers eventually find their way into the larger schools, leaving the smaller schools with the teachers of lesser academic training.

Academic training in Mathematics.- Contrary to what is true of most other subjects, it is not quite possible to determine from the number of units taken, how many different branches are involved in the study of Mathematics, each of which is usually the basis of two units of credit. For example, a student taking first year Mathematics may elect advanced Algebra and Geometry, and he would accordingly receive four units of credit. Should he elect to take Trigonometry along with the Algebra and Geometry, he would receive six units of credit. As a matter of fact, a student may elect one, two or all three of these subjects and receive the proportionate amount of credit. The usual

combination is either Algebra and Geometry, or these with Trigonometry added. Either of these combinations may constitute the first year's work in Mathematics. A great many students take the Algebra and Geometry in the first year, and take the Trigonometry in one of the succeeding years. Table VII presents the data on the academic training of Mathematics teachers in the small high schools.

TABLE VII

ACADEMIC TRAINING IN MATHEMATICS OF TEACHERS IN SMALL HIGH SCHOOLS WHO ARE TEACHING MATHEMATICS

Number of Units	One Room		Two Room		Three Room		All Schools	
	No.	%	No.	%	No.	%	No.	%
0	3	2.04					3	1.47
2	2	1.35					2	.98
4	66	44.55	12	33.33	5	25.00	83	40.68
6	42	28.35	13	36.11	6	30.00	61	29.90
8	13	8.80	4	11.11	2	10.00	19	9.32
10	10	6.75	1	2.78	2	10.00	13	6.38
12	3	2.04	4	11.11			7	3.43
14	3	2.04			1	5.00	4	1.96
16-22	3	2.04			4	20.00	7	3.43
24-34	3	2.04	2	5.56			5	2.45
Total	148	100.00	36	100.00	20	100.00	204	100.00
Mean No. of Units	6.3		7.6		8.9		6.9	

From Table VII it is evident that only a very few of the teachers in the small high schools have had no University training in Mathematics. Only 3.39 per cent have received less than four units of credit. The table also shows that the great majority of the teachers have taken little more than first year Mathematics. Approximately seventy-three per cent of the teachers in one-room schools, sixty-nine per cent of those in two-room schools, fifty-five per cent of those in three-room schools, and seventy per cent of those in all schools combined, have had either four or six units. Of those who have four units, it is quite likely that their choice was advanced Algebra and Analytical Geometry, since this course is designated as Mathematics I and I A, the I A course being Trigonometry. The table shows that nearly thirty per cent of all the teachers of Mathematics have taken Trigonometry.

Further examination of Table VII shows that about twenty-three per cent of the teachers in one-room schools, thirty per cent of those in two-room schools, and forty-five per cent of those in three-room schools have taken Mathematics beyond the first year. Here again, the largest type of those schools being considered seems to be staffed with the teachers having the best qualifications. It is perfectly natural, of course, that in the larger schools, there will be a tendency to fill the positions requiring specialization, with teachers who have done advanced work

in that particular field.

The number of specialists in the field of Mathematics teaching Mathematics in small high schools is comparatively small. In the one-room high schools, only four per cent, and in the two-room schools only 5.5 per cent of the teachers could qualify as specialists. In the three-room schools, the percentage of specialists in Mathematics is much larger, twenty per cent of those teaching Mathematics having credit for sixteen or more units.

The average number of units of credit taken by the teachers in the three types of schools does not vary greatly. The spread in length of training, from the one to the three-room type of school is from approximately one year to a little over two years. The mean of 6.9 units for all schools combined shows that on the average, a little more than one full year's training is possessed by the teachers of Mathematics.

The data show that the teachers of the small high schools of Manitoba have had much more training in English and History than in Mathematics. It is quite apparent that of those who pursue Mathematics through the four years of the University, very few enter the teaching profession. A question arises here, of course, as to whether or not, for the teaching of high school Mathematics, more training than that given in the first year of the University is really necessary. Further reference to this question will be made

when an analysis of pupil achievement is made in a later chapter. In the three-room schools, Grade XII is usually taught, and therefore the Mathematics teachers are required to teach the equivalent of first year university Mathematics. This would account, in part, for the fact that in the three-room schools, a larger proportion of the teachers have taken six or more units of credit.

Academic training in Physics.- For one year's study in Physics four units of credit are awarded. Table VIII shows the academic training in Physics of the teachers in the small high schools who are teaching Physics.

TABLE VIII

ACADEMIC TRAINING IN PHYSICS OF TEACHERS IN SMALL HIGH SCHOOLS WHO ARE TEACHING PHYSICS

Number of Units	One Room		Two Room		Three Room		All Schools	
	No.	%	No.	%	No.	%	No.	%
0	28	18.92	3	8.57	1	5.89	32	16.00
4	103	69.58	28	80.00	7	41.16	138	69.00
8	12	8.12	1	2.86	2	11.78	15	7.50
12	3	2.03	2	5.71	3	17.64	8	4.00
16	2	1.35	1	2.86	3	17.64	6	3.00
20					1	5.89	1	.50
Total	148	100.00	35	100.00	17	100.00	200	100.00
Mean No. in Units	3.9		4.6		8.7		4.4	

An analysis of Table VIII reveals the fact that about nineteen per cent of the teachers of Physics in one-room schools, or nearly one teacher in five, had had no academic training in Physics. This is easily understood when it is remembered that in Manitoba a high school student can enter the University with two languages, and without either Physics or Chemistry, and since Grade XI Physics is prerequisite for first year Physics, many do not pursue the Sciences in the University at all. When these students become teachers in small high schools, where they have no choice but to teach the Sciences, we have the situation shown in the table.

Just as in the case of Mathematics, the great majority of the teachers in each of the one- and two-room types of school have had no more than one year of University Physics. In the one-room schools, nearly seventy per cent, and in the two-room schools, eighty per cent of the teachers have four units of academic training in Physics. An improvement is seen in the case of the three-room schools where nearly fifty-three per cent of those teaching Physics have had two or more years of Physics. When the schools are considered as a whole, only fifteen per cent of the teachers of Physics have had more than one year of academic training in Physics.

The number of specialists in Physics throughout the whole field of small high schools is surprisingly small. Only two teachers in the one-room group, one teacher in the two-room group, and four teachers in the three-room group

could qualify as specialists. The percentage of specialists is by far the greatest in the three-room schools, nearly twenty-three per cent of the group having had at least four years of Physics.

When the average number of units for each type of school is considered there is a comparatively small difference between the one- and two-room Physics teachers. The largest type of school shows by far the best average training in the subject. The opportunity for specialization would no doubt account for the concentration of the best qualified Physics teachers in the largest type of school.

Academic training in Chemistry.- A still more serious situation exists in the qualifications of Chemistry teachers in the small high schools. An even larger proportion of the teachers than in the case of Physics, have had no academic training in Chemistry. It was not possible to determine just how many of these had had high school Chemistry but it is almost safe to say that some had not the requisite Grade XI Chemistry, and could not therefore proceed with University Chemistry. Table IX presents the date on academic training in Chemistry.

Of the teachers in one-room schools, nearly twenty-four per cent, or close to one teacher in four, have had no academic training in Chemistry. This means that, assuming that these teachers have had high school Chemistry, they are giving instruction at a level beyond which they them-

TABLE IX

ACADEMIC TRAINING IN CHEMISTRY OF TEACHERS IN SMALL HIGH SCHOOLS WHO ARE TEACHING CHEMISTRY

Number of Units	One Room		Two Room		Three Room		All Schools	
	No.	%	No.	%	No.	%	No.	%
0	35	23.65	4	11.45			39	19.50
4	98	66.21	24	68.56	7	41.16	129	64.50
8	9	6.12	5	14.28	3	17.64	17	8.50
12	1	.67			2	11.78	3	1.50
16	5	3.35	2	5.71	3	17.64	10	5.00
28					2	11.78	2	1.00
Total	148	100.00	35	100.00	17	100.00	200	100.00
Mean No. in Units	3.7		4.8		10.6		4.0	

selves have had no training. Of course, there is the fact that the teacher has matured and his advanced training in the University puts him on a higher intellectual plane than the pupils he is teaching. But it must also be remembered that in the one-room schools over fifty-six of the teachers have only Grade XII standing, and if they have not done any work towards a degree, they are not advanced very far beyond the level of the pupils they are teaching.

In the one-room schools about sixty-six per cent, in the two-room schools about sixty-eight per cent, and in the three-room schools about forty-one per cent of the teachers of Chemistry have had one year of academic training in the subject. In the one-room schools nearly ninety per cent of

the teachers have four credits or less, in the two-room schools the percentage of those with one year or less of training in Chemistry drops to about eighty per cent, while in the three-room schools, the percentage drops to about forty-one per cent. As in the case of Physics, the number of specialists in the one- and two-room schools is very small, while in the three-room schools, nearly one third of the Chemistry teachers have taken sixteen or more units. Two of the seventeen teachers in the largest type of school have taken honors Chemistry.

The average training in Chemistry of the teachers of Chemistry in the three-room schools is nearly three times that of the one-room school teachers. Whether or not this difference in training produces greater achievement on the part of their pupils will be seen in Chapter VII when this question is discussed more fully.

Academic training in Foreign Languages.- In order to determine the number of schools teaching French and Latin, it was necessary to make a study of the examination records. Accordingly, only those schools in which students wrote the Grade XI examinations in June 1934, were assumed to be teaching French or Latin in Grade XI. A slight error may have crept into the data here, since in 1934, a number of schools may have recommended their Grade XI students without examination, a temporary regulation of the Department permitting this. The error, however, would not be large

enough to affect the data materially.

TABLE X

NUMBER OF SMALL HIGH SCHOOLS IN MANITOBA TEACHING FOREIGN LANGUAGES

Schools	One Room		Two Room		Three Room		All Schools	
Teaching	No.	%	No.	%	No.	%	No.	%
French	90	60.81	30	85.71	16	94.12	136	68.00
Latin	18	12.16	17	48.57	13	76.47	48	24.00
French & Latin	10	6.75	15	42.85	13	76.47	38	19.00
No Language	40*	27.00					40	20.00
Number of Schools	148		35		17		200	

* A very few of these schools are teaching German.

Table X shows the distribution of French and Latin teaching in the small high schools of Manitoba. Nearly sixty per cent of the one-room schools are teaching French, and seventy-three per cent are teaching either French or Latin, or both. A very few schools are teaching German, and these are to be found mainly in the Mennonite settlements. All of the two-and three-room schools are teaching one or two languages, and all but one of the three-room schools are teaching French. Considering all the schools together, it is seen that twenty per cent are teaching no foreign language at all, but if the number teaching German could

have been determined, this percentage would have been slightly smaller.

TABLE XI

ACADEMIC TRAINING IN FRENCH OF TEACHERS OF FRENCH AND OF TEACHERS WHO ARE NOT TEACHING FRENCH IN ONE ROOM HIGH SCHOOLS

Number of Units	Teaching French		Not Teaching Fr.		Total	
	Number	Percent	Number	Percent	Number	Percent
0	28	31.11	22	37.93	50	33.75
4	21	23.33	16	27.58	37	25.00
8	27	30.00	10	17.26	37	25.00
12	7	7.78	2	3.44	9	6.10
16	7	7.78	7	12.07	14	9.47
20						
24			1	1.72	1	.68
Total	90	100.00	58	100.00	148	100.00
Mean No. of Units	5.5		5.2		5.3	

From Table XI it will be seen that over thirty-one per cent of those teaching French in one-room schools have had no academic training in French beyond Grade XI, and it is safe to say that at least some of these have not had high school French. Over fifty-four per cent of those teaching French have had less than two years of University French. The table also shows that of the group that are not teaching French nearly fourteen per cent are specialists while of the group that are teaching French, less than eight per cent are specialists. Just about ten per cent of all the

teachers in one-room schools have pursued French through four years of the University.

The average number of units of French taken by the teachers in one-room high schools is a fair indication of the general extent to which this group has been trained for the teaching of French. Something over one year seems to be the length of time spent in the study of French by these teachers, there being no significant difference, on the average, between those who are and those who are not teaching French.

For the sake of comparison, the first column in the body of Table XI is repeated in Table XII.

TABLE XII

ACADEMIC TRAINING IN FRENCH OF TEACHERS IN SMALL HIGH SCHOOLS WHO ARE TEACHING FRENCH

Number of Units	One Room		Two Room		Three Room		All Schools	
	No.	%	No.	%	No.	%	No.	%
0	28	31.11			1	6.25	29	21.32
4	21	23.33			1	6.25	22	16.18
8	27	30.00	11	36.66	4	25.00	42	30.89
12	7	7.78	4	13.34	1	6.25	12	8.82
16	7	7.78	14	46.66	8	50.00	29	21.32
20								
24			1	3.34	1	6.25	2	1.47
Total	90	100.00	30		16		136	100.00
Mean No. of Units	5.5		12.8		12.5		7.9	

From Table XII it is evident that the two-and three-room schools have teachers of French who are much better qualified on the average than the teachers of French in the one-room schools. Over fifty-six per cent of the French teachers in three room schools, and fifty per cent in two-room schools could qualify as specialists. It will be noticed that one teacher in the three-room schools apparently had no academic training in French. It is quite possible, of course, that this teacher may have taken special training outside the University, and therefore be quite qualified to teach French. The same argument might be applied to all who are teaching French in the small high schools and who have apparently no academic training in the subject. The likelihood of this being true in the majority of these cases is, however, small. Further reference will be made to this possibility when pupil achievement in French is considered in Chapter VI.

The lack of academically qualified teachers of Latin in one-room high schools is even more serious than in the case of French. Table XIII presents the data on the academic training in Latin of all one-room school teachers. This table shows that nearly three out of four teachers of Latin have apparently had no academic training in Latin beyond the high school level. On the average, those who are not teaching Latin have had much more training than those who are teaching the subject. Of the one hundred and

TABLE XIII

ACADEMIC TRAINING IN LATIN OF TEACHERS OF LATIN AND OF TEACHERS WHO ARE NOT TEACHING LATIN IN ONE ROOM HIGH SCHOOLS

Number of Units	Teaching Latin		Not Teaching Latin		Total	
	No.	%	No.	%	No.	%
0	13	72.22	83	63.84	96	64.86
4	2	11.11	20	15.38	23	15.53
8	3	16.67	14	10.77	16	10.80
12			2	1.54	2	1.35
16			9	6.93	9	6.10
20			1	.77	1	.68
24			1	.77	1	.68
Total	18	100.00	130	100.00	148	100.00
Mean No. of Units	1.8		3.1		2.9	

thirty teachers not teaching Latin, eleven or over eight per cent could qualify as specialists from the number of units they have taken. Not one of the eighteen teachers who are teaching Latin could qualify as a specialist.

From Table XIV it is evident that the three-room schools have the best qualified teachers of Latin, in the small high schools. Not one of the thirteen teachers has less than four units, and nearly seventy-seven per cent have had two years or more of University Latin. Two teachers had taken Honors Latin, and one of these has an M.A. in Latin.

TABLE XIV

ACADEMIC TRAINING IN LATIN OF TEACHERS IN SMALL HIGH SCHOOLS WHO ARE TEACHING LATIN

Number of Units	One Room		Two Room		Three Room		All Schools	
	No.	%	No.	%	No.	%	No.	%
0	13	72.22	4	23.53			17	35.42
4	2	11.11	9	52.95	3	23.08	14	29.17
8	3	13.67	2	11.76	6	46.16	11	22.91
12								
16			2	11.76	2	15.38	4	8.33
20								
24-36					2	15.38	2	4.17
Total	18	100.00	17	100.00	13	100.00	48	100.00
Mean No. of Units	1.8		4.9		11.7		5.6	

In Table X, it was shown that ten teachers in one-room schools were teaching both French and Latin. The data on the academic training of these teachers are not presented in tabular form, but a study of their cards shows that two had no academic training in either language, three had four units of French and none of Latin, two had four units of French and eight of Latin, two had four units of each language, and two had eight units of Latin and none of French. Not one of these teachers could be called a specialist in either language.

A possible explanation of the poor results in languages

in one-room schools may be found in the fact that since there are a great many changes of teachers yearly in one-room schools, a school may one year have a teacher qualified to teach French and Latin, and the next year, a teacher who is wholly unqualified in this respect. The result may be that pupils who have started a language in grade nine with a well trained teacher may finish their course under a teacher who has had no training at all in languages.

Summary.- In this chapter, there were presented in detail, the academic qualifications of the teachers in the small high schools of Manitoba during the year ending June 30th 1934. There is no doubt that the teachers as a group are best qualified in English and in History. As a group they are much more poorly qualified, from an academic standpoint, in Mathematics, Science and Foreign Languages. The teachers in the one-room schools are the least qualified in all subjects, while the teachers in the three-room schools are the best qualified. The number of specialists in all subjects other than English and History is relatively small.

No attempt will be made to generalize from the data as a whole until the question of pupil achievement is discussed. The object of this chapter was merely to present the facts, and conclusions based upon them will be drawn in the final chapter.

In this chapter, no distinction was made between principals and assistants in the two-and three-room schools.

While the evidence is not presented in tabular form, a study of the original data shows that in four out of the thirty-five two-room schools, or in 37.14 per cent, the assistant was better qualified generally than the principal. In four of the seventeen three-room schools, or in 23.5 per cent, the assistants were better qualified than the principals. It may be that the principals in these schools make up in experience for what they lack in academic training. In the next chapter, the matter of experience and tenure will be dealt with fully.

CHAPTER V

UNIT I CONTINUED - EXPERIENCE AND TENURE OF TEACHERS

The purpose of this chapter is to present in tabular form the data concerning the experience and tenure of teachers in the small high schools of Manitoba, and to analyze the tables with respect to significant differences which appear in them.

As has already been stated in Chapter III the measure of experience used in this discussion is the total number of years the teacher has taught regardless of whether the experience was in elementary or secondary schools. The reason for using this measure was also explained in Chapter III, and repetition will therefore be avoided here.

The importance of experience of the teacher as a factor in pupil achievement cannot be overestimated. As the data on pupil achievement will subsequently show, there is a distinct possibility that both too little and too much experience may react unfavorably on pupil achievement. This may sound paradoxical, but evidence is at hand, and will be

presented in Chapter VII, to show that, whether or not lowered pupil achievement is due to very long experience the facts show a general decline in the results obtained when the experience of the teacher increases beyond the fifteenth or sixteenth year. Several possible explanations of this feature of the data will be offered in a later chapter.

TABLE XV

TOTAL EXPERIENCE OF TEACHERS
IN 148 ONE-ROOM HIGH SCHOOLS

Total exper. in years	Number	Percent	Cumulative Percent Up	Cumulative Percent Down
1 - 3	18	12.16	100.00	12.16
4 - 6	29	19.59	87.84	31.75
7 - 9	26	17.57	68.25	49.32
10 - 12	27	18.25	50.68	67.57
13 - 15	12	8.10	32.43	75.67
16 - 18	9	6.08	24.33	81.75
19 - 21	6	4.05	18.25	85.80
22 - 24	8	5.41	14.20	91.20
25 - 27	6	4.05	8.79	95.25
28 - 30	5	3.38	4.74	98.64
31 - 33	1	.68	1.36	99.32
34 - 36	1	.68	.68	100.00
Totals	148	100.00		

Mean 11.3 years

From Table XV it is seen that only about twelve per cent of the teachers in one-room schools have had three years experience or less. The original data show that of the eighteen teachers in this group, four have had one year, five have had two years, and nine have had three years experience. Nearly eighty-eight per cent of the one-room school teachers have had four years or more experience, and over fifty per cent have had ten years or more, and nearly one fourth of the group have taught for sixteen years or more. It cannot, therefore, be denied that the teachers in this type of small high school have had considerable experience. A comparison with an American situation should be illuminating. E. N. Ferris[1] in the "Rural School Survey of New York" states:

> "In New York, in 1920-21, the median amount of experience of teachers in the small high schools was slightly over three years. The percentage of teachers who had taught two years or less in the community in which they were at the time of the report was seventy-five while over forty-nine per cent were teaching in their first year in the community."

A later survey,[2] "The National Survey of Secondary Education", sampling small high schools over the whole country, shows that in the smallest type of secondary school (those enrolling forty, or fewer, pupils) 52.4

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[1] E. N. Ferris. "Secondary Education in Country and Village". New York: D. Appleton & Co., 1927, p. 20.

[2] National Survey of Secondary Education. U. S. Department of the Interior, Bulletin No. 17, 1932, p. 74.

of the teachers had taught for two years or less.

The situation, then, seems to be much better in Manitoba than in the United States, as far as the experience of the teachers is concerned. The mean experience of the teachers in the one-room schools, in the year 1933-34, was 1.13 years.

TABLE XVI

TOTAL EXPERIENCE OF TEACHERS
IN 35 TWO-ROOM HIGH SCHOOLS

Experience in Years	Number	Percent	Cumulative Percent Up	Cumulative Percent Down
1 - 3	16	21.92	100.00	21.92
4 - 6	12	16.44	78.08	38.36
7 - 9	10	13.70	61.64	52.06
10 - 12	8	10.96	47.94	63.02
13 - 15	11	15.06	36.98	78.08
16 - 18	5	6.85	21.92	84.93
19 - 21	4	5.48	15.07	90.41
22 - 24	3	4.11	9.59	94.52
25 - 27	2	2.74	5.48	97.26
28 - 30	1	1.37	2.74	98.63
31 - 33	0			
34 - 36	1	1.37	1.37	100.00
Totals	73*	100.00		

Mean 10.3

* Three schools were operating on the Junior High School plan, the eighth-grade teacher doing some of the high school work.

Table XVI shows that in the two-room schools, nearly twenty-two per cent of the teachers had three years experience or less, as compared with about twelve per cent of the teachers in one-room schools. In the two-room group, however, seventy-eight per cent had six years experience or less, as compared with nearly eighty-eight per cent in the one-room group. Apparently, the two-room schools select more teachers with experience from one to three years than the one-room schools. A possible explanation of this lies in the fact that the two-room school teachers are better qualified academically than the one-room teachers, as has been pointed out in Chapter IV. From the 7-9 year and upwards class in both the one-and two-room type of school, there is not a great deal of difference in the percentage of teachers in each class. On the average, however, it is seen that the teachers in the two-room schools have had about one full year less of experience than the teachers in the one-room schools, the difference being due mainly to the larger proportion in the 1-3 year class.

Table XVII presents the data on the experience of the teachers in the three-room schools. The proportion of teachers with experience from one to three years is about the same as in the two-room schools. About three-fifths of the teachers in the largest type of school have had nine years experience or less, compared with about one-half of the teachers with this amount of experience in each of the smaller types.

TABLE XVII

TOTAL EXPERIENCE OF TEACHERS
IN 17 THREE-ROOM HIGH SCHOOLS

Experience In Years	Number	Percent	Cumulative Percent Up	Cumulative Percent Down
1 - 3	12	23.53	100.00	23.53
4 - 6	6	11.76	76.47	35.29
7 - 9	13	25.49	64.71	60.78
10 - 12	4	7.84	39.22	68.62
13 - 15	3	5.89	31.38	74.51
16 - 18	6	11.76	25.49	86.27
19 - 21	3	5.89	13.73	92.16
22 - 24	4	7.84	7.84	100.00
Totals	51	100.00		

Mean 9.7

The average experience in the three-room schools drops somewhat from the average in the two-room schools. The range of experience in the three-room schools is from one to twenty-four years, as compared to from one to thirty-six years in the two smaller types of school. There seems to be a tendency for the larger schools to engage teachers with better academic qualifications even though they tend to be slightly less experienced.

Another interesting comparison can be made here with the situation in the United States. "The National Survey of Secondary Education"[3] shows that, generally speaking,

[3] Op.cit., p. 74, Table 38.

as the size of the school increases, the average experience of the teacher increases. In Manitoba, the opposite seems to be the case, namely, that as the size of the school increases, (as far as small high schools are concerned) the average experience of the teacher decreases.

Tenure of teachers.- Commenting on teacher tenure in small high schools, E. N. Ferris[4] says:

"One of the serious problems in the small high schools of the country is the rapid turnover of the teaching staff. The large percentage of new teachers each year, either without teaching experience or new to the community, makes it difficult to develop a consistent policy of organization and instruction or to realize desirable returns from supervision."

TABLE XVIII

TENURE OF TEACHERS IN 148 ONE ROOM HIGH SCHOOLS

Tenure in Years	Number	Percent	Cumulative Percent Up	Cumulative Percent Down
1	43	29.06	100.00	29.06
2	23	15.54	70.94	44.60
3	35	23.65	55.40	68.25
4	19	12.83	31.75	81.08
5	8	5.41	18.92	86.49
6	5	3.37	13.51	89.86
7 - 9	5	3.37	10.14	93.23
10 - 12	6	4.05	6.77	97.28
13 - 16	4	2.72	2.72	100.00
Totals	148	100.00	Mean Tenure 3.40 Years	± .11

[4] E. N. Ferris. Op.cit., p. 21

Table XVIII shows the tenure of teachers in one-room high schools. Nearly forty-five per cent of the teachers have remained in the same position for two years or less, and nearly ninety per cent for six years or less. About three teachers in ten are spending their first year in the community in which they are teaching. About one teacher in ten has held his position for seven or more years. The desirability or undesirability of teachers remaining for long periods in small high schools will not be discussed at this time, but it is evident that long periods of tenure in these small communities are the exception rather than the rule. The range of tenure in one-room schools is from one to sixteen years and the mean tenure is 3.4 years. These figures show that the situation, in Manitoba at least, is not quite as black as it is sometimes painted.

The data given are for the year 1933-34, and while factual evidence is not at hand, there is reason to believe that in the past five or six years, the tenure of teachers in Manitoba has generally improved. This may be due to any number of causes, the most important of which may be that throughout the period of the economic depression, the scarcity of vacancies, and the possible over-supply of teachers, caused those holding positions not to seek changes as often as they did in previous years. It may also be that the public in general is beginning to realize the importance of teacher tenure to the welfare of their schools and

consequently not as desirous as formerly of making frequent changes in the teaching staff.

TABLE XIX

TENURE OF TEACHERS IN 35 TWO-ROOM HIGH SCHOOLS

Tenure in Years	Number	Percent	Cumulative Percent Up	Cumulative Percent Down
1	16	21.92	100.00	21.92
2	13	17.80	78.08	39.72
3	14	19.18	60.28	58.90
4	10	13.70	41.10	72.60
5	8	10.96	27.40	83.56
6	5	6.85	16.44	90.41
7 - 9	2	2.74	9.59	93.15
10 - 12	2	2.74	6.85	95.89
13 - 16	2	2.74	4.11	98.63
17 - 20	1	1.37	1.37	100.00
Totals	73	100.00		

Mean 3.77 $\pm$.17

Table XIX presents the data on tenure in the two-room schools. The percentage of teachers spending their first year in the school is a little less than in the case of the one-room schools. As a matter of fact, the percentages are slightly less for all tenure periods in two-room schools, up to the 7-9 period, when the percentages are approximately the same. It will be noticed also that the range of tenure

and the mean in two-room schools is somewhat larger than in the one-room schools. This difference in means has been found to be statistically significant.

TABLE XX

TENURE OF TEACHERS IN 17 THREE-ROOM HIGH SCHOOLS

Tenure in Years	Number	Percent	Cumulative Percent Up	Cumulative Percent Down
1	12	23.53	100.00	23.53
2	9	17.65	76.47	41.18
3	9	17.65	58.82	58.83
4	10	19.60	41.17	78.43
5	4	7.84	21.57	86.27
6	2	3.92	13.73	90.19
7 - 9	3	5.89	9.81	96.08
10 - 12	1	1.96	3.92	98.04
13 - 16	0			
17 - 20	1	1.96	1.96	100.00
Totals	51	100.00		
	Mean 3.57			

An examination of Table XX shows but very slight differences in the percentages of teachers in the respective tenure periods. While the range of tenure in three-room schools is the same as in two-room schools, there is a slight drop in average tenure.

It is interesting to note that the average tenure of teachers in American small high schools is much less than the average in Manitoba small high schools. The "National Survey"[5] previously referred to shows a median of 1.4 years for the teachers in all the small unselected schools studied. When this figure is compared with the average tenure in even the one-room schools of Manitoba, it is seen that the Manitoba teachers apparently hold their positions more than twice as long as their American counterparts. It should be noticed of course, that the measures are not quite comparable, since in this study, the mean is used as the measure of central tendency while in the American study, the median was used. It is believed, however, that since the distribution in the latter study was quite large, involving as it did 1,846 teachers, the mean would not vary significantly from the median for the purpose of comparison.

Summary.- In this chapter an attempt has been made to present a more or less detailed picture of the situation in Manitoba as regards the experience and tenure of the teachers in the small high schools. Two facts stand out as being of the utmost importance. The first is that as a group, the teachers of the schools under consideration have had considerable experience, nearly eleven years, on the average, and by

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[5] "National Survey of Secondary Education." Op.cit., p. 75. Table 39.

far the greatest portion of this experience is in secondary schools. The second is that the average teacher remains in his position for a little over three years.

From these facts it may reasonably be inferred that the teachers in the small high school have changed their positions about three and one-half times on the average. This means that a great many teachers must change their positions considerably more often than three and one-half times. The desirability of a situation of this kind, even for a very few teachers is questionable, since it means, especially in small high schools, that in many cases, the pupils may have three different teachers through the three years of their high school course, and it is quite conceivable that in a very few schools, the changes may have been even more frequent.

Had there been a greater distribution of tenure over the range, instead of a concentration of teachers in the lower quartile, it might have been possible to measure the correlation between pupil achievement and teacher tenure. There being no great variability in the tenure factor, it was thought unwise to attempt this correlation. In the next chapter, the facts regarding pupil achievement in the various types of schools will be considered.

CHAPTER VI

UNIT II - PUPIL ACHIEVEMENT

In this chapter, an analysis will be made of the achievement of pupils in Grade XI in the small high schools of Manitoba, in Literature, Composition, History, Algebra, Geometry, Chemistry, French and Latin, as measured by the Departmental Examinations held in June 1934. These examinations are held in nearly every small high school in the Province, so that the pupils are writing in the surroundings to which they are accustomed. It will be observed that no mention is made of the subject of Physics. The reason that this subject is omitted from this analysis is that the Department of Education found it necessary, after the papers had been marked, to make certain adjustments, due to discrepancies found in the examination itself. These adjustments were found to invalidate somewhat the results as a measure of achievement in Physics, and it was therefore thought unwise to include the subject in the analysis of pupil achievement.

At this point, it may be well to refer briefly to a criticism which may be offered and which will be discussed more fully when the conclusions are drawn in Chapter VIII.

Exception may be taken to the use of the Departmental Examination as a measure of pupil achievement when this achievement is considered in its relationship to the work of the teachers, their training, and their experience. It may be argued that the final examination in a course, whether it be of the objective or essay type, does not properly reflect either the work of the pupil or the efforts of the teacher on the pupils' behalf, and that it is therefore unfair to correlate either teacher training or teacher experience with so vague a measure of pupil achievement as the examination set by the Department of Education. The truth and the importance of this contention cannot be entirely denied. Nevertheless, it must be admitted that the Departmental Examination is a measure, whether it be a good one, or a fair one, or not. The fact remains that it is the only general measure of achievement available, and since it is the single measure used for the whole province, it carries with it the weight of a wide distribution. In each subject the number of pupils whose achievement is being considered is in the neighborhood of eleven hundred. It seems likely therefore, that if the measure of achievement is invalid, it will be so in nearly the same degree in all sections of the distribution. Furthermore, if the distribution is large enough, and the measure is unfair, there should be about the same degree of unfairness to good pupils as to poor pupils, and to small schools as to large schools.

In other words, if the Departmental Examination is a measure of achievement at all, and its purpose is to arrange the pupils in order of merit, and if it is applied to a sufficiently large number of pupils, then any deficencies in the examination itself should be compensated by the large numbers whose achievement is being measured by it. With this assumption, then, the achievement in the various types of schools will be analyzed and compared.

TABLE XXI

DISTRIBUTION OF MARKS IN LITERATURE OF GRADE XI PUPILS IN MANITOBA SMALL HIGH SCHOOLS

Marks	One Room		Two Room		Three Room		Consolidated Sch.	
	No.	%	No.	%	No.	%	No.	%
90-100	5	.76	6	2.13	7	3.55	7	1.77
80- 89	35	5.33	18	6.39	20	10.15	25	6.32
70- 79	108	16.49	61	21.63	33	16.76	69	17.47
60- 69	151	23.06	70	24.82	57	28.94	100	25.32
50- 59	187	28.55	81	28.72	47	23.86	108	27.34
40- 49	75	11.45	23	8.16	15	7.61	37	9.36
30- 39	66	10.08	14	4.97	15	7.61	35	8.86
20- 29	23	3.52	5	1.77	3	1.52	10	2.53
10- 19	5	.76	3	1.06			4	1.03
0- 9			1	.35				
Total	655	100.00	282	100.00	197	100.00	395	100.00
M	57.99		58.08		62.97		60.32	
Md	58.20		61.83		63.24		60.35	
S.D.	15.81		16.22		14.90		14.56	

Analysis of Table XXI - Literature.- This table shows the distribution of marks in Literature in the various types of schools. It will be noticed that a fourth type of school is added in this discussion. This is the consolidated school. The consolidated school is the result of the union of two or more school districts, each of which formerly operated its own school. The consolidated secondary schools have the advantage of being graded in at least some degree. The number of teachers ranges from two to eight or ten, for the whole school, including the elementary department. Most of the consolidated secondary schools are located in villages or small towns, and the children are usually transported to the school at the expense of the consolidated school district. The purpose of the inclusion of this type of school into this part of the discussion is to determine whether or not the achievement of their pupils is of a higher order than that of the ordinary schools. It must be remembered that in the distributions of one-, two-, and three-room schools, these consolidated schools are included. They were segregated later for the purpose of this analysis.

The purpose of the columns of percents in this and the succeeding tables is to make the distributions comparable for graphical purposes. In the figures of this chapter the percentage columns of the distributions for each type of school, excepting the consolidated schools, are set up in the form of frequency polygons in order that it may be seen at a glance what is the relationship between the achieve-

ment of one type of school and that of another.

In this analysis, and in those that follow, the statistical significance of difference in means, medians and standard deviations, was determined by means of formulae for probable error. The following formulae were used in the calculations:

$$P.E._M = \frac{.6745\sigma}{\sqrt{N}} \quad \text{(Probable error of the Mean)}$$

$$P.E._{Median} = \frac{.84535\sigma}{\sqrt{N}} = 1.2533\ P.E._M \quad \text{(P.E. of Median)}$$

$$P.E._\sigma = \frac{.6745\sigma}{\sqrt{N}} = .7071\ P.E._M \quad \text{(Probable error of Standard Deviation)}$$

$$P.E._{M_1 - M_2} = \sqrt{(P.E._{M_1})^2 + (P.E._{M_1})^2} \quad \text{(Probable error of the difference between the means)}$$

If the difference between any pair of measures is not greater than four times the probable error of the difference in the measures, the difference is not considered to be statistically significant. Since, as the figures in this chapter will show, the distributions of pupil achievement are not sufficiently skewed to preclude the possibility of normality, these formulae are assumed to be applicable to the measures which are being studied.

Table XXI shows that as the schools increase in size, there is an increase in the average mark in Literature. The difference between the means in one-and two-room schools is not statistically significant, but the difference between the median marks of these two schools shows with practical

certainty that the pupils in the two-room schools did better in Literature than those in the smallest type. The superiority of the pupils in three-room schools over the pupils in the other two, as far as this particular examination is concerned, is unquestioned. For the consolidated schools, the mean and the median are significantly higher than for the one-room schools, but lower than for the three-room schools. It should be mentioned here that the great majority of the consolidated schools are one-room high schools and that they are included in the general distribution of one-room schools. If the non-consolidated one-room schools had been considered separately, their averages would have been considerably lower.

The standard deviation of the distribution of marks in each type of school offers another means of comparing the achievement of the pupils. A decrease in standard deviation would indicate that the marks are grouped more closely about the mean. In other words, the lower the standard deviation, the more homogeneous is the achievement of the group. Theoretically, the larger schools, with their better grading and departmentalizing facilities, should produce greater homogeneity of achievement on the part of their pupils. In the smaller schools, the teacher, with his heavy teaching load is not able to give his pupils a large amount of individual attention, with the result that they are thrown more on their own resources. This fact

FIGURE IV--DISTRIBUTION OF MARKS IN LITERATURE

should tend to spread the range of achievement, and therefore increase the standard deviation of the distribution of marks in the smaller schools.

In Table XXI, the standard deviation for one-room schools is 15.81, for two-room schools 16.22, for three-room schools 14.9, and for consolidated schools 14.56. Between the one and two-room schools, the difference in standard deviation is not significant. Between the three-room schools and the other two, however, the difference is such that one cannot but conclude that greater homogeneity of achievement results in this type of school. The consolidated schools show the lowest standard deviation of all groups, and it seems safe to conclude that conditions in consolidated schools produce results which are not produced at least in the ordinary one-room high schools, as far as the subject of English Literature is concerned.

Figure IV shows the data in the body of Table XXI in graphical form. Two important details are noticeable. First, the form of the distribution in each type of school approaches normality, which would indicate that poor a measure of pupil achievement as the Departmental examination may be supposed to be, it at least has the merit of arraying the pupils in an order approaching that shown by the normal probability curve. This is an objective aimed at in the best standardized tests. Secondly, there is a consistent shift to the right of the curves corresponding to the change in the size of the school.

TABLE XXII

DISTRIBUTION OF MARKS IN COMPOSITION OF GRADE XI PUPILS IN MANITOBA SMALL HIGH SCHOOLS

Marks	One Room		Two Room		Three Room		Consolidated	
	No.	%	No.	%	No.	%	No.	%
90-100	2	.30					1	.24
80-89	16	2.37	9	3.12	11	5.16	17	4.11
70-79	55	8.13	44	15.28	31	14.55	41	9.93
60-69	201	29.78	91	31.60	66	30.99	122	29.54
50-59	258	38.22	99	34.37	66	30.99	160	38.74
40-49	100	14.81	32	11.11	24	11.27	54	13.07
30-39	36	5.33	11	3.82	13	6.10	25	6.05
20-29	7	1.06	2	.70	2	.94	3	.72
10-19								
0-9								
Total	675	100.00	288	100.00	213	100.00	413	100.00
Mean	57.57		60.07		59.93		58.63	
Median	57.54		60.00		60.07		60.20	
S. D.	11.32		11.30		12.29		11.87	

Analysis of Table XXII - Composition.- An analysis of the percentage columns for one- and two-room schools shown in Table XXII reveals that from the median group down the percentages in the two-room schools are consistently lower, while those above the median group are consistently higher than those of the one-room schools, for the subject of English Composition. The same is true for the

FIGURE V--DISTRIBUTION OF MARKS IN COMPOSITION

three-room schools with the exception of the 30-39 class.

The difference in means between the one and two-room schools is quite significant. The mean for one-room schools is 57.57 $\pm$ .29 and for two-room schools 60.07 $\pm$ .35. For these measures

$$P.E._{(diff.)} = \sqrt{(.29) + (.35)} = \pm .45$$

The difference between the means is 2.5. Four times the $P.E._{(diff)}$ amounts to only 1.8. This amounts to practical certainty that the difference is not due entirely to chance. It would seem therefore, that departmentalization even in the first degree results in a sharp increase in pupil achievement.

The standard deviations in the Composition distribution show no significant difference and the consolidated schools do not appear to be very much better than the one-room schools as a group, although the median for the consolidated group is significantly higher. It is well to remember that the probable error of the median is about twenty-five percent larger than the probable error of the mean, and a significant difference in means does not necessarily indicate a correspondingly significant difference in medians. The probable error of the standard deviation is nearly thirty percent less than that of the mean.

Figure V illustrates the data of Table XXII graphically. It will be noted that there are no marks in the small high schools in the class below 20-29, and in the two and three-room schools, there are no marks in the 90-100 class. The

subjectiveness of the composition examination probably accounts for this fact.

It will be recalled that Table V in Chapter IV shows that there is a much larger percentage of specialists in English in the two and three-room schools than in the one-room schools. Is it possible that the sharp increase in pupil achievement in the larger schools is due to the increased training of the teachers in English? This question will be more fully discussed in Chapter VII.

TABLE XXIII

DISTRIBUTION OF MARKS IN HISTORY OF GRADE XI PUPILS IN MANITOBA SMALL HIGH SCHOOLS

Marks	One Room		Two Room		Three Room		Consolidated Sc.	
	No.	%	No.	%	No.	%	No.	%
90-100	2	.30	2	.70	1	.48	2	.49
80-89	26	4.00	19	6.66	21	10.10	25	6.21
70-79	56	8.59	42	14.74	19	9.13	49	12.19
60-69	121	18.56	54	18.95	41	19.71	85	21.15
50-59	206	31.60	76	26.67	62	29.81	111	27.65
40-49	65	9.97	21	7.37	22	10.58	38	9.45
30-39	103	15.80	40	14.04	23	11.06	45	11.20
20-29	48	7.36	23	8.07	15	7.21	34	8.45
10-19	21	3.22	7	2.45	3	1.44	10	2.47
0-9	4	.60	1	.35	1	.48	3	.74
Total	652	100.00	285	100.00	208	100.00	402	100.00
M	51.94		55.00		55.77		54.95	
Md.	54.12		56.64		56.45		56.45	
S. D.	17.06		18.26		17.59		17.83	

FIGURE VI--DISTRIBUTION OF MARKS IN HISTORY

Analysis of Table XXIII. - History.- Table XXIII shows the distribution of marks in History for the small high schools under consideration. Here again, the means increase with the size of the school. A difference of over three marks between the means of one and two-room schools indicates the certain superiority of the departmentalized schools. Again the consolidated schools show a marked superiority over the one-room schools. The differences in standard deviations are negligible.

Figure VI illustrates Table XXII graphically. A striking feature of this figure is the dip which occurs in each curve between 30-39 class and the 50-59 class. This indicates a divergence from normality in the marks between 40 and 49. A probable reason for this is not hard to find. There is a tendency on the part of examiners to raise the marks of pupils who obtain between forty-five and forty-nine on the first reading to just over fifty. In any event, all papers between forty-five and forty-nine are re-read by the sub-chairman in charge of the examining committee. A great many of these papers are raised to the passing grade. Furthermore, when marks between forty and forty-nine are issued to pupils, these pupils very often request a re-reading, which results in a further elevation of the marks in this particular class. This cannot fail to illustrate the artificiality, and therefore the fallacy of the "passing grade". Ruch[1] makes the following criticism of the arbitrary passing mark:

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[1] G. M. Ruch. "The Objective or New Type Examination". Chicago: Scott Foresman and Company, 1929. p. 372.

"The use of an arbitrary passing mark.... is without adequate defense, and in its actual operation results in throwing the distribution of actual marks given into a skew distribution quite at variance with the probable facts. Judging from a mass of accumulated evidence, pupils of any school grade distribute themselves approximately normally, i.e., in rough accordance with the curve of chance, which in turn, seems to hold reasonably well for most phenomena of pure biological and psychological variation."

TABLE XXIV

DISTRIBUTION OF MARKS IN ALGEBRA OF GRADE XI PUPILS IN MANITOBA SMALL HIGH SCHOOLS

Marks	One Room		Two Rooms		Three Rooms		Consolidated Sc.	
	No.	%	No.	%	No.	%	No.	%
90-100	28	4.28	17	5.90	6	3.31	15	3.85
80-89	62	9.58	22	7.64	22	12.15	38	9.61
70-79	97	14.88	43	14.93	23	12.71	62	15.90
60-69	108	16.55	45	15.63	28	15.47	63	16.18
50-59	126	19.31	60	20.84	45	24.85	91	23.34
40-49	65	9.96	31	10.76	16	8.84	36	9.24
30-39	75	11.50	32	11.11	22	12.13	42	10.78
20-29	63	9.66	23	7.98	11	6.08	31	7.95
10-19	23	3.52	14	4.86	5	2.77	11	2.83
0-9	5	.76	1	.35	3	1.66	1	.26
Total	652	100.00	288	100.00	181	100.00	390	100.00
M	56.21		56.39		56.98		57.48	
Md.	57.54		57.17		57.44		58.13	
S.D.	21.14		21.33		20.73		20.04	

FIGURE VII--DISTRIBUTION OF MARKS IN ALGEBRA

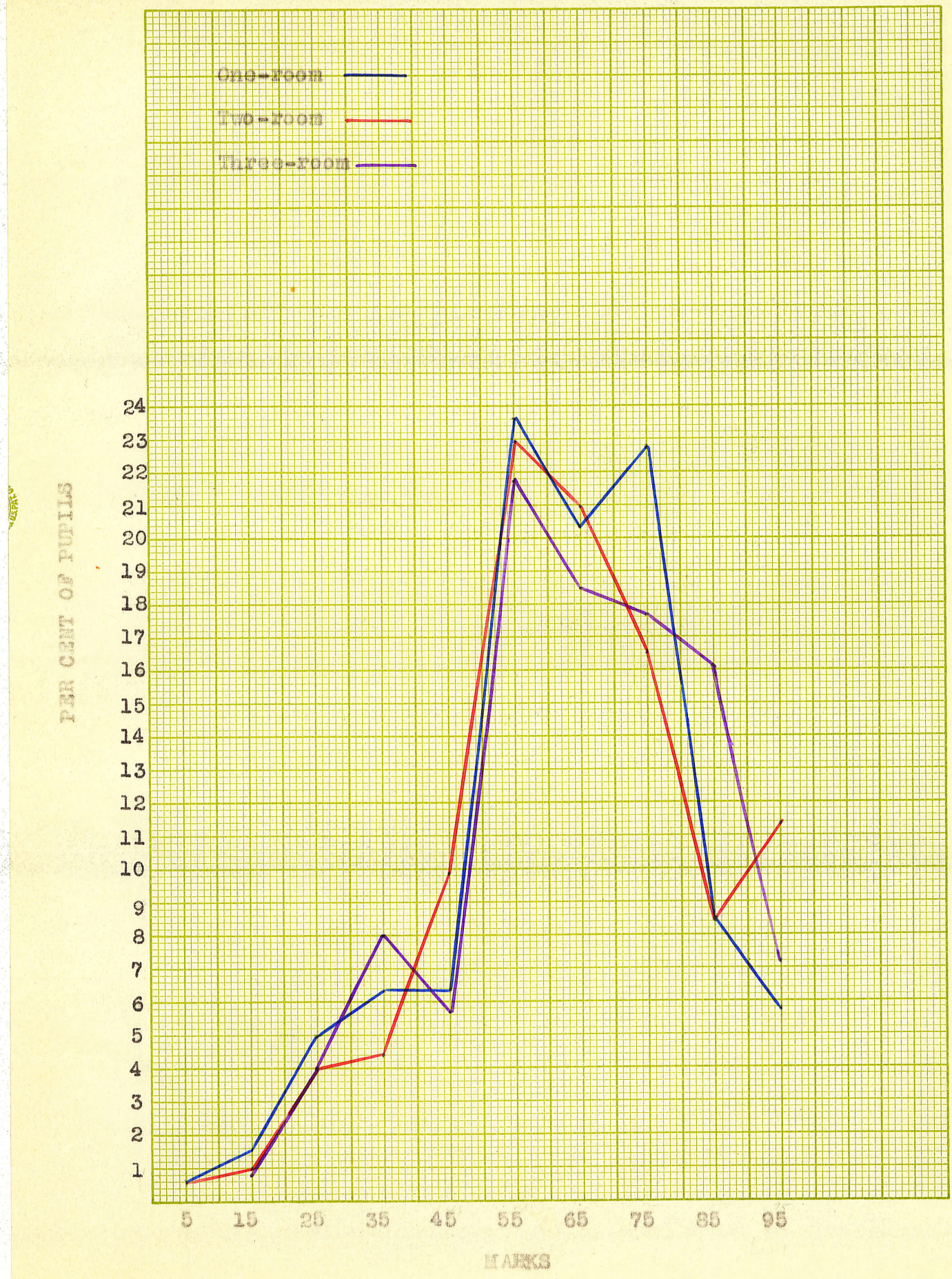
TABLE XXV

DISTRIBUTION OF MARKS IN GEOMETRY OF GRADE XI PUPILS IN MANITOBA SMALL HIGH SCHOOLS

Marks	One Room		Two Room		Three Room		Consolidated Sc.	
	No.	%	No.	%	No.	%	No.	%
90-100	26	5.92	23	11.44	9	7.26	11	4.25
80-89	37	8.42	17	8.46	20	16.13	25	9.57
70-79	96	22.90	33	16.42	22	17.74	54	20.67
60-69	89	20.27	42	20.90	23	18.55	60	22.98
50-59	104	23.59	46	22.88	27	21.78	64	24.51
40-49	28	6.37	20	9.96	7	5.64	20	7.65
30-39	28	6.37	9	4.48	10	8.07	16	6.12
20-29	22	5.01	8	3.98	5	4.03	11	4.25
10-19	7	1.59	2	.99	1	.80		
0-9	2	.46	1	.49				
Total	439	100.00	201	100.00	124	100.00	261	100.00
M	62.01		63.76		64.44		62.75	
Md.	63.20		63.45		65.22		63.25	
S. D.	18.52		18.57		19.03		16.55	

Analysis of Tables XXIV and XXV - Mathematics.- These tables and Figures VII and VIII present the data on pupil achievement in Mathematics. In Algebra, no significant differences appear in any of the measures of either average or dispersion between the various types of school. There are increases from the smallest to the largest schools, but from a statistical stand point, it cannot be asserted that these

FIGURE VIII---DISTRIBUTION OF MARKS IN GEOMETRY



differences are real. The largest difference, which is between the one-room schools and the consolidated schools, shows the chances are about four to one that the difference is real, and therefore due to some ascribable cause.

Here again, as in the case of History, there is to be noted a dip in the curves in the 40-49 class. The probable cause of this feature has already been discussed, although the deviation from normality is not as pronounced in the case of Algebra as it is in the case of History.

A study of the tables and figures for the subject of Geometry reveals a distinct rise in means with the size of the school. The differences between the one-and two-room schools, and between the one-and three-room schools being quite significant. The consolidated schools show only a slight advantage over the one-room schools, but it should be remembered that the one-room schools include a large number of consolidated schools, and had these been excluded from the one-room school distribution, the difference of nearly 2 in standard deviation between the one-room schools and the consolidated schools indicates a much better degree of homogeneity in the latter group of schools.

Analysis of Table XXVI - Chemistry.- Table XXVI and Figure IX show the distribution of marks in Chemistry. The deviations from normality are not nearly as pronounced as in the case of History and Mathematics. The difference in means between one-and two-room schools again shows the superiority of the latter type, probably due in no small

TABLE XXVI

DISTRIBUTION OF MARKS IN CHEMISTRY OF GRADE XI PUPILS IN MANITOBA SMALL HIGH SCHOOLS

Marks	One Room		Two Room		Three Room		Consolidated Sc.	
	No.	%	No.	%	No.	%	No.	%.
90-100	12	1.92	4	1.44	5	2.92	8	2.16
80-89	41	6.56	33	11.91	16	9.35	30	8.11
70-79	81	12.96	49	17.69	28	16.37	51	13.78
60-69	130	20.80	44	15.88	74	14.04	76	20.55
50-59	160	25.60	66	23.83	45	26.32	101	27.30
40-49	73	11.68	30	10.84	17	9.94	35	9.46
30-39	69	11.04	23	8.30	14	8.19	42	11.35
20-29	42	6.72	25	9.03	15	8.77	21	5.67
10-19	15	2.40	3	1.08	7	4.10	6	1.62
0-9	2	.32						
Total	625	100.00	277	100.00	171	100.00	370	100.00
M	55.89		58.39		56.75		57.54	
Md.	56.96		58.70		57.22		58.01	
S. D.	17.80		19.62		19.51		16.70	

measure to departmentalization, when the work is shared by two teachers. The consolidated schools show a distinct superiority over both the one-room and three-room schools, not only in mean and median achievement, but also in homogeneity of results as measured by the standard deviation.

FIGURE IX--DISTRIBUTION OF MARKS IN CHEMISTRY

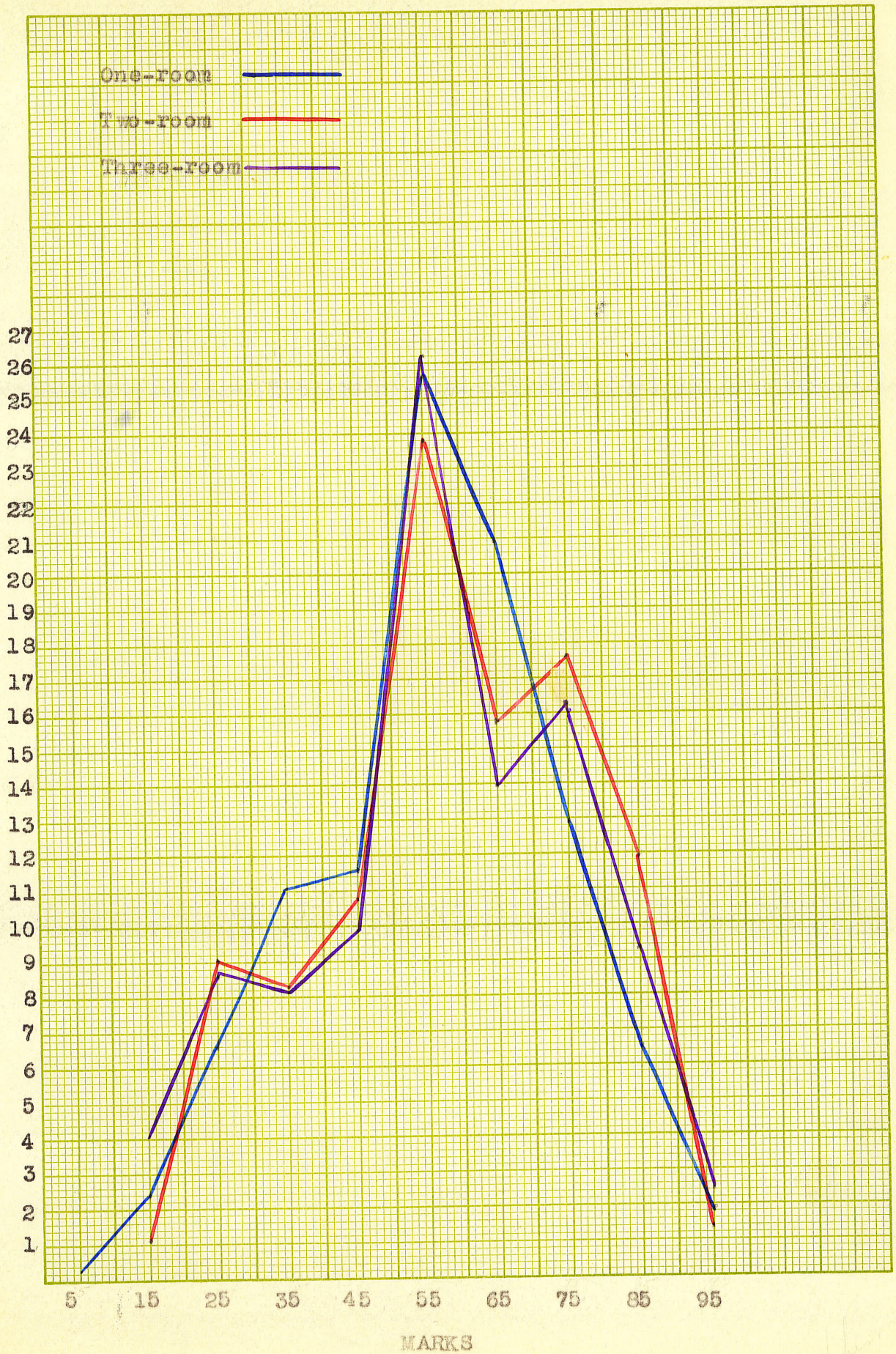


TABLE XXVII

DISTRIBUTION OF MARKS IN FRENCH OF GRADE XI PUPILS IN MANITOBA SMALL HIGH SCHOOLS

Marks	One Room		Two Room		Three Room		Consolidated Sc.	
	No.	%	No.	%	No.	%	No.	%
90-100	2	.46			1	.67	1	.35
80-89	10	2.29	17	6.97	8	5.40	12	4.27
70-79	43	9.88	32	13.14	27	18.24	32	11.39
60-69	65	14.94	52	21.31	27	18.24	57	20.29
50-59	121	27.82	68	27.86	45	30.42	78	27.77
40-49	40	9.20	20	8.19	17	11.49	33	11.74
30-39	73	16.78	30	12.30	11	7.44	29	10.32
20-29	44	10.12	15	6.15	8	5.40	25	8.89
10-19	23	5.29	7	2.86	2	1.35	10	3.55
0-9	14	3.22	3	1.22	2	1.35	4	1.43
Total	435	100.00	244	100.00	148	100.00	281	100.00
M	48.31		55.32		56.89		52.69	
Md.	51.94		56.9		57.55		55.06	
S. D.	19.2		18.34		17.40		17.54	

FIGURE X--DISTRIBUTION OF MARKS IN FRENCH

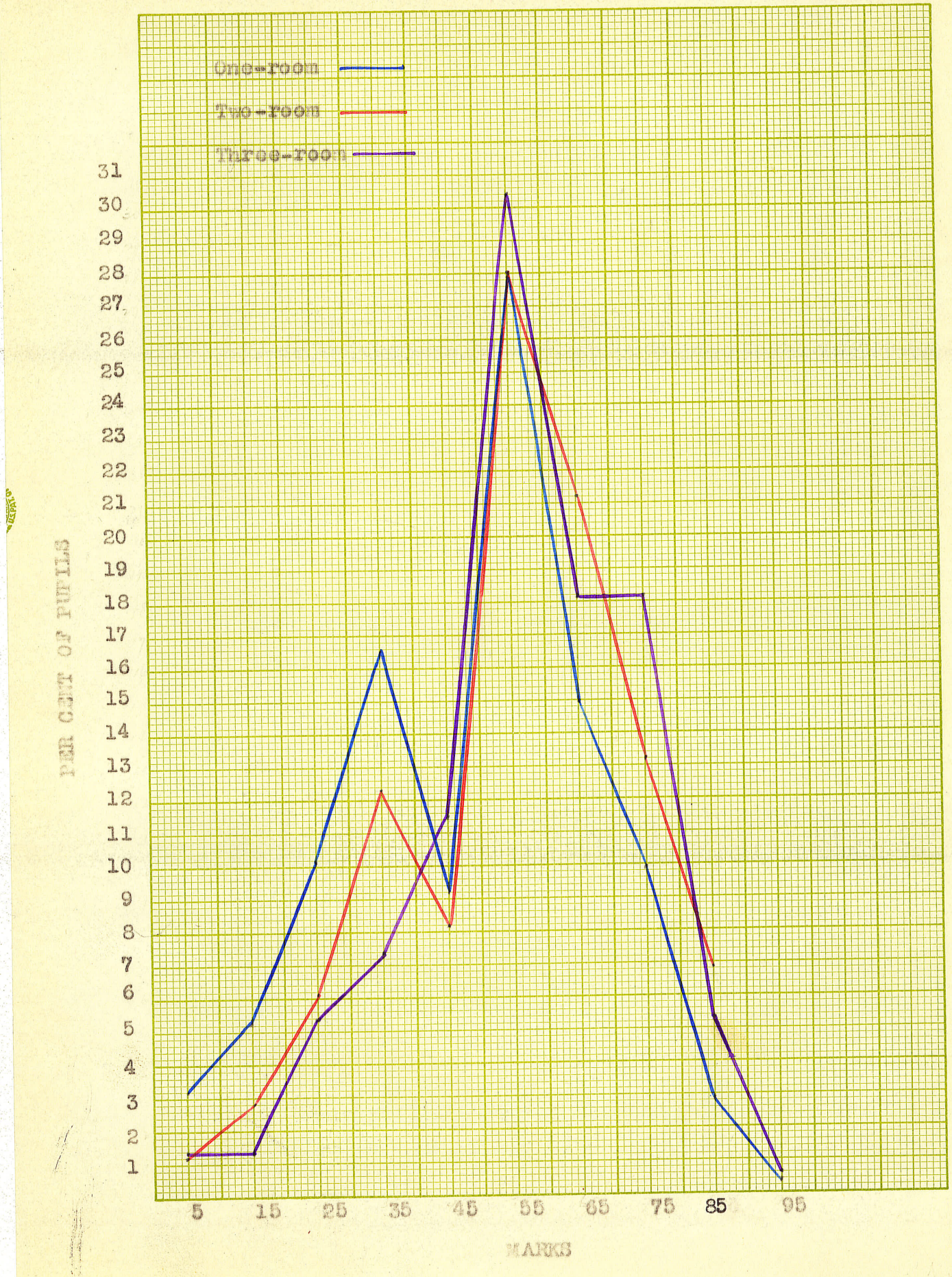


TABLE XXVIII

DISTRIBUTION OF MARKS IN LATIN OF GRADE XI PUPILS IN MANITOBA SMALL HIGH SCHOOLS

Marks	One Room		Two Room		Three Room		Consolidated Sc.	
	No.	%	No.	%	No.	%	No.	%
90-100			4	5.48	2	3.17	5	5.00
80-89	2	2.38	15	20.55	8	12.70	11	11.00
70-79	11	13.10	16	21.91	8	12.70	11	11.00
60-69	14	16.66	8	10.94	13	20.64	20	20.00
50-59	24	28.56	15	20.55	18	28.58	31	31.00
40-49	6	7.15	2	2.75	2	3.17	6	6.00
30-39	5	5.95	5	6.85	6	9.52	5	5.00
20-29	8	9.58	5	6.85	4	6.35	9	9.00
10-19	4	4.76	1	1.37	2	3.17	2	2.00
0-9	10	11.91	2	2.75				
Total	84	100.00	73	100.00	63	100.00	100	100.00
M	47.38		63.22		59.29		59.40	
Md.	53.75		68.12		59.72		59.03	
S. D.	22.87		21.73		19.18		19.05	

Analysis of Tables XXVII and XXVIII - Languages.- These tables and Figures X and XI present the data on pupil achievement in Foreign Languages. For French, Table XXVII shows beyond a shadow of a doubt that language work in the one-room

FIGURE XI--DISTRIBUTION OF MARKS IN LATIN

schools is far below standard when compared with the work done in two-room and three-room schools. A difference of over 7 in means between one- and two-room schools, and of over 8 between one-and three-room schools cannot but present a conclusive picture of the situation as regards language work in the various types of small high schools. Differences in medians are correspondingly significant, and standard deviation shows a marked decrease from the one-room schools to the three-room schools.

Abnormalities in the 40-49 class reappear in both French and Latin.

The consolidated schools again show that they produce better achievement on the part of their pupils than the one-room schools as a whole.

In Latin, as shown by Table XXVIII and Figure XI, the differences are really enormous. The chances are one in several million that the differences are unreal. Whether these are due to the poor training in languages of the teachers in one-room schools, as shown in Chapter IV, or whether they are due to the fact that the single teacher carries such a heavy load, cannot be fully stated until Chapter VII when the relationship between the training of the teachers and pupil achievement will be discussed. The fact remains however, that vast differences are seen in the achievement of pupils in schools of various numbers of teachers, whether these

differences are due to the number of teachers or not.

The irregularities in the graphs shown in Figure XI are due, of course, to the small sampling. Comparatively few pupils in small high schools are taking Latin, and there is no doubt that a larger distribution would have erased these deviations from normality.

Summary.- In this chapter, a detailed picture of the situation as regards pupil achievement in small high schools has been presented. It cannot be denied that there tends to be a general increase in achievement as the number of teachers doing the work increases. For some unaccountable reason, however, in a few cases the achievement in two-room schools seems to be slightly better than in three-room schools. The differences in these cases, however, are so small as to be statistically insignificant.

There is a general tendency also for the consolidated schools, as a group, to show a superiority over the one-room schools, as a group. The reason for this might well be ascribed to the fact that the pupils in the consolidated secondary schools have generally had the advantages of graded school teaching from the beginning of their school career.

Size of school in terms of the number of teachers doing the high school work has been considered as a factor in pupil achievement. The next chapter will discuss another pair of important factors, namely the training and experience of teachers.

CHAPTER VII

UNIT II - CONTINUED

The purpose of this chapter is to examine in detail the relationship between the achievement of the pupils of the small high schools under consideration and the qualifications and experience of the teachers. To determine whether or not a mathematical relationship exists between these factors, three correlation coefficients were obtained by means of the product-moment formula. These coefficients are defined as follows:

r_{at} - the relationship between pupil achievement and the academic training of the teachers.

r_{ae} - the relationship between pupil achievement and the experience of the teachers.

r_{et} - the relationship between the experience and academic training of the teachers.

Calculation of the correlation coefficients.- The coefficients as defined were calculated from scatter diagrams. In the scatter diagram for r_{at}, the vertical axis represents pupil achievement in terms of the average

mark for the school in the subject being considered. The horizontal axis represents the academic training of the teacher in the subject, in terms of the number of academic units with which he is credited. Figure XII shows the scatter diagram for the subject of Literature, together with complete calculation of the correlation coefficient. This is the only subject for which the complete computation will be shown. For the remaining subjects, the scatter diagrams, with the resulting coefficients only will be shown.

It will be observed that no probable errors are given for any of the correlation coefficients. The reason for this is that only the vertical array approaches normality in distribution. The horizontal array is distinctly abnormal, and therefore the ordinary fomula for the probable error of Pearson's "r" could not be applied.

From Figure XII, the mathematical relationship between pupil achievement in Literature and teacher training in English is given by $r_{at} = .149$. This coefficient is quite small, but it is distinctly positive. It would seem to indicate that there is a very small relationship between the factors it represents. The natural inference is that in a great many cases, the teachers with little academic training get as good results - as measured by the Departmental Examinations - as the teachers with a great deal of academic training. This would seem to indicate that there are factors other than the training of the teacher which

$$r = \frac{\Sigma f_{xy} d_x d_y - \frac{(\Sigma f_x d_x)(\Sigma f_y d_y)}{N}}{\sqrt{\left[\Sigma f_x d_x^2 - \frac{(\Sigma f_x d_x)^2}{N}\right]\left[\Sigma f_y d_y^2 - \frac{(\Sigma f_y d_y)^2}{N}\right]}} = \frac{a}{\sqrt{bc}}$$

UNITS

PUPIL ACHIEVEMENT.

	4	8	12	16	20	24	f_y	d_y	$f_y d_y$	$f_y d_y^2$
75 – 79.9		$_{5}1$	$_{5}1$	$_{15}3$		$_{10}2$	7	5	35	175
70 – 74.9	$_{12}3$	$_{16}4$	$_{4}1$	$_{36}9$		$_{4}1$	18	4	72	288
65 – 69.9	$_{9}3$	$_{18}6$		$_{30}10$		$_{6}2$	21	3	63	189
60 – 64.9	$_{20}10$	$_{10}5$	$_{14}7$	$_{30}15$		$_{4}2$	39	2	78	156
55 – 59.9	$_{8}8$	$_{8}8$	$_{3}3$	$_{6}6$	$_{2}2$	$_{2}2$	29	1	29	29
50 – 54.9	11	6	1	7		2	27	0		
45 – 49.9	$_{-2}2$	$_{-3}3$	$_{-2}2$	$_{-3}3$	$_{-2}1$	$_{-2}2$	13	-1	-13	13
40 – 44.9	2	4	4	5			15	-2	-30	60
35 – 39.9			$_{-3}1$			$_{-3}1$	2	-3	-6	18
30 – 34.9			$_{-4}1$	$_{-8}2$	$_{-4}1$		4	-4	-16	64
25 – 29.9								-5		
20 – 24.9								-6		
15 – 19.9	$_{-8}4$	$_{-14}2$					6	-7	-42	294
f_x	43	39	21	60	4	14	181	← N	170	1186
d_x	-2	-1	0	1	2	3			$\Sigma f_y d_y$	$\Sigma f_y d_y^2$
$f_x d_x$	-86	-39		60	8	42	-14	$\Sigma f_x d_x$		
$f_x d_x^2$	172	39		60	16	126	413	$\Sigma f_x d_x^2$		
$\Sigma f_{xy} d_y$	15	32	9	96	-3	21	170	$\Sigma f_y d_y$		
$d_x \Sigma f_{xy} d_y$	-30	-32		96	-6	63	91	$\Sigma f_{xy} d_x d_y$		

$\log b = 2.61479$
$\log c = 3.07349$
$\log \text{prod} = 5.68828$
$\log \sqrt{p} = 2.84414$

$\log d = 2.01766$
$\log \sqrt{p} = 2.84414$
$\log r = \bar{1}.17352$

$r = .149$

$a = 104.1$
$b = 411.9$
$c = 1184.5$

FIG XII Calculation of r at for Literature.

affect pupil achievement.

Another important factor in pupil achievement is the experience of the teacher. Figure XIII is the scatter diagram showing the relationship between these factors. The vertical axis represents pupil achievement in terms of the average mark in Literature for each school, while the horizontal axis represents the experience of the teacher in terms of the total number of years devoted to teaching. Probably a better measure of the latter factor would have been the number of years spent in teaching Literature, but as these data were not available, it was found necessary to use the total teaching experience. A significant feature of this, and all other scatter diagrams in this investigation involving the experience of the teachers, is that the resulting coefficient is negative. This would seem to indicate a decrease in pupil achievement with an increase in the length of experience. A study of the scatter diagram however, shows that in almost every case the negative coefficient is due to the presence in the small high schools of a large number of teachers with many years experience. From about the fifteenth year class to the thirty-sixth year class on the horizontal scale, there is a more or less regular decline in the average pupil achievement. To say that this is due to any particular cause would be presumptuous. In the first place the coefficients are very small, and if it were possible to

TEACHER EXPERIENCE

PUPIL ACHIEVEMENT	1 2	3 4	5 6	7 8	9 10	11 12	13 14	15 16	17 18	19 20	21 22	23 24	25 26	27 28	29 30	31 32	33 34	35 36	
75 - 79.9		1	1	3	1	1													7
70 - 74.9	1	3	5	2	3	1	2					1							18
65 - 69.9	4	5	5	4	1	1	1												21
60 - 64.9	5	4	1	6	5	4	3	4		4		1	2						39
55 - 59.9	2	6	1	3	6	3	1	4	1			1			1				29
50 - 54.9	1		4	4	2	5	2		3	1		2	1		1			1	27
45 - 49.9		2	3	1				3	2		1	1							13
40 - 44.9	3	4	4	1	1			1			1								15
35 - 39.9	1														1				2
30 - 34.9		1	1	1								1							4
25 - 29.9																			
20 - 24.9																			
15 - 19.9	1	1											1	1	1	1			6
	18	27	25	25	19	15	9	12	6	5	2	7	4	1	4	1		1	181

$r_{ae} = .220$

FIGURE XIII--Scatter diagram for r_{ae} for literature

compute the probable errors, there is a distinct possibility that, in some cases at least, as will be shown later, the coefficient might just as easily have been positive. Secondly it might just have happened that all of these teachers with long experience were in schools in which the pupils were of lower mental ability. It has also been shown in Chapter VI that pupil achievement increases on the average more or less regularly with the size of the school, and since many of the long experienced teachers are in one-room high schools, it is quite possible that the drop in pupil achievement is due more to the size of the school than to the overly long experience of the teacher in the small high school positions.

A further study of Figure XIII shows a concentration of higher average marks in the classes of experience between the fourth and twelfth years. This might seem to indicate that the teacher's most effective years lie within this period, and if the teachers with experience beyond fifteen years had been left out of the distribution, there might have been a distinctly positive correlation between pupil achievement and the experience of the teachers.

Figure XIV is the scatter diagram showing the relationship between the experience and training in English of the teachers. The resulting coefficient was determined for the purpose of partial correlation for the three variables, pupil achievement, teacher training, and teacher experience. The vertical axis represents the experience

TEACHER TRAINING

TEACHER INTURY SCORE	4	8	12	16	20	24	
35 - 36	1						1
33 - 34							
31 - 32		1					1
29 - 30	2	1				1	4
27 - 28	1						1
25 - 26	2		1	1			4
23 - 24	2	2		3			7
21 - 22			1		1		2
19 - 20		2	2	1			5
17 - 18	2	2	1			1	6
15 - 16	5	2	2	2	1		12
13 - 14	4		1	3		1	9
11 - 12	4	2	3	3	1	2	15
9 - 10	6	5	2	4		2	19
7 - 8	3	8	1	7		6	25
5 - 6	3	9	4	8		1	25
3 - 4	6	3	2	15	1		27
1 - 2	2	2	1	13			18
	43	39	21	60	4	14	181

$r_{ot} = -.183$

FIGURE XIV--Scatter diagram for r_{ot} for Literature

of the teachers, while the horizontal axis represents the training of the teachers in English in terms of the number of units of credit. The negative coefficient, though quite small, would seem to indicate a tendency for the less experienced teachers to be somewhat better academically trained in English than those with more experience. The fact that in recent years the number of graduates teaching in small high schools has increased would give weight to this inference.

The three coefficients obtained from the diagrams shown thus far are:

$$r_{at} = +.149$$

$$r_{ae} = -.220$$

$$r_{et} = -.183$$

These coefficients were substituted in the formula for the partial correlation coefficient for three variables which is given as:

$$r_{at.e} = \frac{r_{at} - (r_{ae})(r_{et})}{\sqrt{(1 - r_{ae}^2)(1 - r_{et}^2)}}$$

Where $r_{at.e}$ is the coefficient of correlation between pupil achievement and teacher training, with the experience factor kept constant. The calculation was made with the aid of Holzinger's Tables of $\sqrt{1 - r^2}$ and resulted in a partial correlation coefficient of +.115 for $r_{at.e}$, a decrease of .034 from the raw coefficient r_{at}. This would seem to indicate that when experience is kept constant, the effect

	4	8	12	16	20	24	
75 - 79.9			1	2			3
70 - 74.9	2	2		2			6
65 - 69.9		4	1	10		2	17
60 - 64.9	10	6	4	13	2	3	38
55 - 59.9	8	10	5	12	1	3	39
50 - 54.9	12	8	7	14		4	45
45 - 49.9	3	4	2	6	1		16
40 - 44.9	1	3	1	2			7
35 - 39.9	1						1
30 - 34.9			1			1	2
25 - 29.9	1						1
20 - 24.9							0
15 - 19.9	2			1			3
	40	37	22	62	4	13	178

PHYSICAL EDUCATION TEST

$r_{at} = .121$

FIGURE XV--Scatter diagram for r_{at} for Composition

TEACHER EXPERIENCE

PUPIL ACHIEVEMENT

	1 2	3 4	5 6	7 8	9 10	11 12	13 14	15 16	17 18	19 20	21 22	23 24	25 26	27 28	29 30	31 32	33 34	35 36	
75 - 79.9		2								1									3
70 - 74.9		1		1	1	2	1												6
65 - 69.9	4	1	2	5		1		2		1		1							17
60 - 64.9	6	4	7	5	4	2	2	3	3		1		1						38
55 - 59.9	3	8	4	5	7	3	2	1	1	1	1	1	1		1				39
50 - 54.9	6	7	8	6	5	6	2			1			1		2			1	45
45 - 49.9	3	1	2	1	2	1		3	1			2							16
40 - 44.9		1	1	2								3							7
35 - 39.9												1							1
30 - 34.9									1						1				2
25 - 29.9		1																	1
20 - 24.9																			0
15 - 19.9			1				1						1						3
	22	26	25	25	19	15	8	9	6	4	2	8	4	0	4	0	0	1	178

$r_{ae} = -.359$

FIGURE XVI--Scatter diagram for r_{ae} for Composition

TEACHER TRAINING

TEACHER EXTENSION

	4	8	12	16	20	24	
35 – 36	1						1
33 – 34							0
31 – 32							0
29 – 30	2	1				1	4
27 – 28							0
25 – 26	2		1	1			4
23 – 24	3	2		3			8
21 – 22			1		1		2
19 – 20		2	2				4
17 – 18	2	2	1			1	6
15 – 16	3	2	1	2	1		9
13 – 14	4		1	2		1	8
11 – 12	4	2	3	3	1	2	15
9 – 10	6	4	3	5		1	19
7 – 8	2	8	1	8		6	25
5 – 6	3	9	4	8		1	25
3 – 4	5	3	2	15	1		26
1 – 2	3	2	2	15			22
	40	37	22	62	4	13	178

$r_{et} = -.185$

FIGURE XVII--Scatter diagram for r_{et} for Composition

of teacher training on pupil achievement is lessened somewhat, and that the experience of the teacher is a very considerable factor. This is further shown when $r_{ae.t}$ is calculated. The partial correlation coefficient $r_{ae.t}$ represents the relationship between pupil achievement and teacher experience when the training factor is kept constant. It was shown in Figure XIII that r_{ae} was $-.220$. The calculation of $r_{ae.t}$ reduces this to $-.198$, an increase of .022 from the raw rae, when the training factor is constant, indicating that when the training factor is eliminated there is a small but significant effect due to the experience of the teachers.

Composition.- Figures XV, XVI and XVII show the scatter diagrams for the subject of Composition. A small correlation coefficient, $r_{at} = +.149$, indicates that there is probably some direct relationship between pupil achievement in Composition and the academic training of the teacher in English. The coefficient r_{ae}, however, is distinctly negative, being very close to $-.36$. A study of the scatter diagram from which this coefficient was obtained shows that there is a likelihood that if the horizontal distribution were cut off at about the 17-18 year class, the correlation would have been very close to zero, and may possibly have been slightly positive.

The correlation between achievement and training, when experience is constant, as expressed by $r_{at.e}$, is lowered considerably from the raw coefficient r_{at}, the difference being .06. There can be no doubt that experience as a factor played a large part in bringing up the raw coefficient

TEACHER TRAINING

PUPIL ACHIEVEMENT	0	4	8	12	16	20	24	
75-79.9		1				1	1	3
70-74.9	1	1	2	1	2			7
65-69.9	1	6	3		3		1	14
60-64.9	2	8	1	3	5			19
55-59.9	4	12	5	2	6		2	31
50-54.9	6	12	3	3	2	1	2	29
45-49.9	3	12	4		3	1	2	25
40-44.9	1	5	4	1	4		1	16
35-39.9	1	7	2	5	2		1	18
30-34.9		2	3		1		2	8
25-29.9	1			1				2
20-24.9		2						2
15-19.9		6			1			7
	20	74	27	16	29	3	12	181

$r_{at} = .549$

FIGURE XVIII--Scatter diagram for r_{at} for History

TEACHER EXPERIENCE

	1/2	3/4	5/6	7/8	9/10	11/12	13/14	15/16	17/18	19/20	21/22	23/24	25/26	27/28	29/30	31/32	33/34	35/36	
75-79.9	1				1	1													3
70-74.9		1		2	1	2			1										7
65-69.9		4	3	1	2	1					1	2				1			14
60-64.9	2	6	2	5	1		2	1											19
55-59.9	3	2	3	8	3	3	1	1	1	1	1		2	1	1				31
50-54.9	2	1	6	2	5	2	3	3	1		1	1			1			1	29
45-49.9	3	2	2	3	3	3	2	3	1			1			1			1	25
40-44.9	1	2	2	1	4	3						2	1						16
35-39.9	3	3	3	1	2	2	1		2	1									18
30-34.9		2	3								1		1		1				8
25-29.9				2															2
20-24.9									1	1									2
15-19.9	1						1			1		1	2	1					7
	16	23	24	25	22	17	10	8	7	4	4	7	6	2	4	0	0	2	181

PRESENT ACTIVITY TIME

$r_{ae} = -.191$

FIGURE XIX--Scatter diagram for r_{ae} for History

TEACHER TRAINING

TEACHER EXPERIENCE	0	4	8	12	16	20	24	
35-36		2						2
33-34								0
31-32								0
29-30		3					1	4
27-28		2						2
25-26		5	1					6
23-24		4	1	1	1			7
21-22		1	3					4
19-20		1		1	2			4
17-18	1	5	1					7
15-16	1	4	2		1			8
13-14	3	4		1	1		1	10
11-12	2	7	3	1	2	2		17
9-10	2	8	3	3	2		4	22
7-8	5	6	3	3	4	1	3	25
5-6	3	10	6	1	4			24
3-4	2	7	2	4	6		2	23
1-2	1	5	2	1	6		1	16
	20	74	27	16	29	3	12	181

$r_{et} = -.259$

FIGURE XX--Scatter diagram for r_{et} for History

to + .121. On the other hand, when training is constant, as expressed by $r_{ae.t}$, the raw coefficient is increased by .031 to − .328, a further indication of the probability of the teacher's experience being an important factor in pupil achievement, whether it be for improvement or deterioration.

History.- Figures, XXVIII, XIX and XX are the scatter diagrams for the correlations in History. The coefficient r_{at} is the highest of all the correlations computed, being + .549. This would appear to be a most significant coefficient, showing as it does that there is probably a very direct relationship between pupil achievement in History and the training of the teacher in History. It should be rem remembered, of course that this relationship is only a mathematical one, and it does not necessarily follow that there is a causal relationship corresponding to this relatively high correlation coefficient. Any number of factors such as pupil I.Q., pupil ability in History, the nature of the examination itself, the experience of the teacher in teaching History, etc., may have made their contribution towards the directness of the relationship. However, when the experience factor is kept constant, there is not a great deal of change in the coefficient as expressed $r_{at.e}$, which was found by partial correlation to be + .528.

The relationship between pupil achievement and teacher experience is again negative in the case of History, and the

	0	2	4	6	8	10	12	14	16	18	20	22	24	
75-79.9			3	1	2	2								8
70-74.9			10	7	1		1	1					1	21
65-69.9			11	5	3		1		2					22
60-64.9	1		9	7		4								21
55-59.9			7	7	5			2		1				22
50-54.9			9	9	4	1	1			1				25
45-49.9			8	6	2		1		1					18
40-44.9	2		4	3	1								2	12
35-39.9			3	3		2	2						1	11
30-34.9			2	2		2						1	1	8
25-29.9			1	4	1									6
20-24.9		1	1											2
15-19.9	1		6	2	1				1					11
	4	1	74	58	20	11	6	3	4	2	0	1	5	187

$r_{at} = .025$

FIGURE XXI--Scatter diagram for r_{at} for Algebra

TEACHER EXPERIENCE

PUPIL ACHIEVEMENT	1 2	3 4	5 6	7 8	9 10	11 12	13 14	15 16	17 18	19 20	21 22	23 24	25 26	27 28	29 30	31 32	33 34	35 36	
75 - 79.9		1		1	1	2		1	1		1								8
70 - 74.9		1	3	5	5	1	1					5							21
65 - 69.9	1	2		4	4	1	3	4	1	1					1				22
60 - 64.9		2	2	3	3	4		3	1		1	1		1					21
55 - 59.9		2	5	1	3	3	1		1	1	3				1			1	22
50 - 54.9	2	2	2	2	3	5	1	3	2	1			1		1				25
45 - 49.9	1	2	3	2	3		2	2	1			1						1	18
40 - 44.9	3	1	3	2	1						1	1							12
35 - 39.9		1	2		1	2	1	1	1				2						11
30 - 34.9	1		2	1		1		1		1		1							8
25 - 29.9	1	1			1	2			1										6
20 - 24.9		1					1												2
15 - 19.9	1	2					1			1			2	1	2	1			11
	10	18	22	21	25	21	11	15	9	5	6	9	5	2	5	1	0	2	187

$r_{ae} = -.119$

FIGURE XXII--Scatter diagram for r_{ae} for Algebra

SCORES ON ACHIEVEMENT TEST

	0	2	4	6	8	10	12	14	16	18	20	22	24	
35-36			1		1									2
33-34														0
31-32	1													1
29-30			1	3					1					5
27-28			1	1										2
25-26			1	2	1	1								5
23-24			3	4		1	1							9
21-22			2	2	2									6
19-20			3	1			1							5
17-18			1	6	1	1								9
15-16			10	4	1									15
13-14		1	2	7	1									11
11-12	1		8	6	1	2		1					2	21
9-10	1		9	7	3	1	1	1	2					25
7-8			10	3	4		1		1	1			1	21
5-6	1		5	7	3	3	1			1		1		22
3-4			10	3	1	2	1	1						18
1-2			7		1								2	10
	4	1	74	58	20	11	6	3	4	2	0	1	5	187

$r_{ot} = .112$

FIGURE XXIII--Scatter diagram for r_{ot} for Algebra

	0	2	4	6	8	10	12	14	16	18	20	22	24	
75 - 79.9			9	3	3	2	1	1					1	20
70 - 74.9			10	2		1	1							14
65 - 69.9			10	11	2	1	2		1	1			1	29
60 - 64.9			7	13	3				1					24
55 - 59.9			6	7	5		1	1		1			2	23
50 - 54.9		1	6	4		1	1						1	14
45 - 49.9			1	4		1		1						7
40 - 44.9	1		2	5	2	1								11
35 - 39.9			4			1								5
30 - 34.9	1		1	1	1									4
25 - 29.9			1			2								3
20 - 24.9			1									1		2
15 - 19.9			1	1	1	1								4
	2	1	59	51	17	11	6	3	2	2	0	1	5	160

$r_{at} = -.007$

FIGURE XXIV--Scatter diagram for r_{at} for Geometry

TEACHER EXPERIENCE

PUPIL ACHIEVEMENT

	1 2	3 4	5 6	7 8	9 10	11 12	13 14	15 16	17 18	19 20	21 22	23 24	25 26	27 28	29 30	31 32	33 34	35 36	
75 - 79.9	2	1	2	4	4	2	1	1	1		1							1	20
70 - 74.9	1	1	1	1	2	3	1	2		1		1							14
65 - 69.9	1	1	2	7	5	3	4	2	1		2	1							29
60 - 64.9		2		3	6	2		2	3		1	3			2				24
55 - 59.9	1	4	4	1	2	2	3	1	1		2	1							23
50 - 54.9	1	2	2		1	2	1	2				1	1		1				14
45 - 49.9		1	2	1		1		1				1							7
40 - 44.9	1	1	3	1		1			2			1						1	11
35 - 39.9	2			1	1								1						5
30 - 34.9			1			2				1									4
25 - 29.9		2	1																3
20 - 24.9	1		1																2
15 - 19.9	1		1	2															4
	11	15	20	21	21	18	10	11	8	2	6	9	2	1	3	0	0	2	160

$r_{ac} = -.078$

FIGURE XXV--Scatter diagram for r_{ac} for Geometry

	0	2	4	6	8	10	12	14	16	18	20	22	24	
35-36			1		1									2
33-34														0
31-32														0
29-30				3										3
27-28				1										1
25-26				1		1								2
23-24			3	4		1	1							9
21-22			2	2	2									6
19-20				1			1							2
17-18				7	1									8
15-16			7	3	1									11
13-14		1	2	6	1									10
11-12	1		6	5	1	2		1					2	18
9-10			9	6	2	1	1	1	1					21
7-8			9	4	4		1		1	1			1	21
5-6	1		5	6	3	2	1			1		1		20
3-4			8	2	1	2	1	1						15
1-2			7			2							2	11
	2	1	59	51	17	11	6	3	2	2	0	1	5	160

$r_{et} = -.113$

FIGURE XXVI--Scatter diagram for r_{et} for Geometry

	0	4	8	12	16	20	24	f
75 - 79.9	1	6	1					8
70 - 74.9	1	6			1		1	9
65 - 69.9	4	15	1		1		1	22
60 - 64.9	3	22	5		2			32
55 - 59.9	9	10	4		1			24
50 - 54.9	6	14	1					21
45 - 49.9	8	9						17
40 - 44.9	2	7		1	1			11
35 - 39.9	2	6	1	1				10
30 - 34.9		4						4
25 - 29.9	1	5						6
20 - 24.9		1						1
15 - 19.9	4	11	2		1			18
	41	116	15	2	7	0	2	183

$r_{at} = .092$

FIGURE XXVII--Scatter diagram for r_{at} for Chemistry

coefficient is again quite small. The third to the twelfth years of experience seem to bring the best results, as far as the Departmental examinations are concerned.

A rather remarkable feature of the correlations in History appears when $r_{ae.t}$ is calculated. In this coefficient, the training factor is constant, and the difference between r_{ae} and $r_{ae.t}$ is .161, showing that in all probability the experience of the teacher was a very considerable factor in pupil achievement in History, seemingly tending to react unfavorably in the cases of very long experience.

Mathematics.- Figures XXI to XXV inclusive are the scatter diagrams from which the correlations in Algebra and Geometry were computed. All the coefficients obtained in these subjects were particularly small, and probably insignificant, since it is quite likely that if the probable errors could have been calculated, they would show that the coefficients might be either very slightly positive or negative. The scatter diagrams themselves give probably a better picture of the situation than the coefficient. The range of teacher training in Mathematics is relatively narrow. In one hundred and ten out of the one hundred and sixty schools from which Grade XI Mathematics results were available, the teachers had either four or six units of credit. When it is seen, therefore, that about 6.2 per cent of the schools are in two classes of the horizontal array, it is not difficult to understand why the mathematical correlations are insignificant.

TEACHER EXPERIENCE

	1 2	3 4	5 6	7 8	9 10	11 12	13 14	15 16	17 18	19 20	21 22	23 24	25 26	27 28	29 30	31 32	33 34	35 36	f
75 - 79.9			2		1	2			1					1				1	8
70 - 74.9			1	3	2		1				1	1							9
65 - 69.9		2	1	5	6	2	2	1	2		1								22
60 - 64.9	2	5	2	4	3	5	4	1	2	1	1		1		1				32
55 - 54.9	1	2	4	1	2	4	2	3	1		2	2							24
50 - 54.9	2			5	2	3	2	3	1		2	1							21
45 - 49.9		1	5	2	3	1			1			3						1	17
40 - 44.9	2	2	1	2	1	1			1						1				11
35 - 34.9	1	4			2		1				1				1				10
30 - 34.9			1									1	2						4
25 - 29.9			2			1				3									6
20 - 24.9			1																1
15 - 19.9	3	3	1	1			1	2				1	2	1	2	1			18
	11	19	21	23	22	19	13	10	9	4	8	9	5	2	5	1	0	2	183

PUPIL ACHIEVEMENT

$r_{ae} = -.086$

FIGURE XXVIII--Scatter diagram for r_{ae} for Chemistry

	0	4	8	12	16	20	24	
35-36	1	1						2
33-34								0
31-32	1							1
29-30	2	2			1			5
27-28		2						2
25-26		5						5
23-24	3	5	1					9
21-22	2	5	1					8
19-20		3	1					4
17-18	1	6	2					9
15-16	1	8	1					10
13-14	4	7	2					13
11-12	5	13			1			19
9-10	3	16	2		1			22
7-8	6	12	1	1	2		1	23
5-6	6	12	2				1	21
3-4	4	14	1					19
1-2	2	5	1	1	2			11
	41	116	15	2	7	0	2	183

$r_{et} = -.135$

FIGURE XXIX--Scatter diagram for r_{et} for Chemistry

PUPIL ACHIEVEMENT

	0	4	8	12	16	20	24	
75-79.9	1		2		1			4
70-74.9	2		4					6
65-69.9	2	2	2		2			8
60-64.9	3	1	6	1	2			13
55-59.9		2	6	2	5		2	17
50-54.9	2	6	4	2	7			21
45-49.9	4	5	4	1	3			17
40-44.9	3	1	3	1				8
35-39.9	7	4	4	3	2			20
30-34.9	4	2	2		1			9
25-29.9	3	2		1				6
20-24.9			1	1				2
15-19.9	14	10	10		4		1	39
	45	35	48	12	27	0	3	170

$r_{at} = .297$

FIGURE XXX--Scatter diagram for r_{at} for French

TEACHER EXPERIENCE

	1 2	3 4	5 6	7 8	9 10	11 12	13 14	15 16	17 18	19 20	21 22	23 24	25 26	27 28	29 30	31 32	33 34	35 36	
75 - 79.9		2					1					1							4
70 - 74.9		1		1	1	1		1				1							6
65 - 69.9		2	2		1	1		1	1										8
60 - 64.9	2	2	1	4	1		2	1											13
55 - 59.9	5	2	3	2	3	1	1												17
50 - 54.9	2	1	5	1	3	3	1		2	1	2								21
45 - 49.9	3	3	3	2	2	1		2			1								17
40 - 44.9	4	1	1	1				1											8
35 - 39.9	3	3	1	1	6	1			2			2			1				20
30 - 34.9	1	1	1			2	4												9
25 - 29.9		2		1				1		1		1							6
20 - 24.9			1			1													2
15 - 19.9	2	2	5	6	4	3	1	1	1	1	1	2	4		4	1		1	39
	22	22	23	19	21	14	10	8	6	3	4	7	4	0	5	1	0	1	170

AGE AT ENTRY

$r_{ae} = -.302$

FIGURE XXI--Scatter diagram for r_{ae} for French

	0	4	8	12	16	20	24	
35-36		1						1
33-34								0
31-32		1						1
29-30	4				1			5
27-28								0
25-26	2		2					4
23-24	1	2	3		1			7
21-22		2	1		1			4
19-20	1		1	1			1	3
17-18	3		1		1		1	6
15-16	3	2	2		1			8
13-14	5	2	2				1	10
11-12	3	7	2	2				14
9-10	5	4	7	1	4			21
7-8	5	5	8				1	19
5-6	8	3	6	1	5			23
3-4	3	5	6	4	4			22
1-2	2	1	7	3	9			22
	45	35	48	12	27	0	3	170

$r_{et} = -.211$

FIGURE XXXII--Scatter diagram for r_{et} for French

FULL ACHIEVEMENT

	0	4	8	12	16	20	24	f
75-79.9								0
70-74.9		1	1					2
65-69.9		1						1
60-64.9								0
55-59.9	2	1	1					4
50-54.9	3		1					4
45-49.9	2							2
40-44.9	2							2
35-39.9	1							1
30-34.9								0
25-29.9								0
20-24.9								0
15-19.9	1							1
	11	3	3	0	0	0	0	17

$r_{at} = .543$

FIGURE XXXIII--Scatter diagram for r_{at} for Latin

PUPIL ACHIEVEMENT	1 2	3 4	5 6	7 8	9 10	11 12	13 14	15 16	17 18	19 20	21 22	23 24	25 26	27 28	29 30	31 32	33 34	35 36	
75 - 79.9																			0
70 - 74.9												1	1						2
65 - 69.9				1															1
60 - 64.9																			0
55 - 59.9			2			1		1											4
50 - 54.9		2	1			1													4
45 - 49.9	1				1														2
40 - 44.9					1			1											2
35 - 39.9											1								1
30 - 34.9																			0
25 - 29.9																			0
20 - 24.9																			0
15 - 19.9															1				1
	1	2	3	1	2	2	0	2	0	0	1	1	1	0	1	0	0	0	17

$r_{ae} = -.113$

FIGURE XXXIV--Scatter diagram for r_{ae} for Latin

	0	4	8	12	16	20	24	f
35-36								0
33-34								0
31-32								0
29-30	1							1
27-28								0
25-26		1						1
23-24			1					1
21-22	1							1
14-20								0
17-18								0
15-16	1		1					2
13-14								0
11-12	2							2
9-10	2							2
7-8		1						1
5-6	2	1						3
3-4	1		1					2
1-2	1							1
	11	3	3	0	0	0	0	17

COMPLETION OF TASKS

$r_{et} = +.098$

FIGURE XXXV--Scatter diagram for r_{et} for Latin

Chemistry and Languages.- Figures XXVII to XXXV show the scatter diagrams from which the correlation coefficients for Chemistry and languages were calculated. The coefficients for Chemistry follow the general trends of the other subjects. The coefficients in French seem to be much more significant. A measure of correlation of nearly .3 would seem to indicate a fair degree of relationship between pupil achievement in French and the academic training of the teachers in French. Next to the case of the subject of Composition, r_{ae} for French is the largest negative coefficient.

In Latin, r_{at} is comparatively large, r_{ae} is small but negative, while r_{et} is very small, but positive. The sampling in the distributions for Latin is quite small, but the scatter diagram shows that there is a tendency for the more experienced teachers of Latin to have a little more academic training in Latin. This might be explained by the fact that earlier graduates usually took some Latin in their University course, while the present tendency in Language training is towards the moderns.

When $r_{at.e}$ was calculated for Latin it was found to exceed by .017 the coefficient r_{at}. In other words, when the experience factor was constant, there seemed to be a tendency for the relationship between achievement and teacher training to increase. This supports the evidence

in the previous correlations that the experience factor seems to have a retrogative effect upon pupil achievement, as far as the data in this investigation are concerned. On the other hand, the calculation of $r_{ae.t}$, in which teacher training is constant gives a coefficient of - .077 which is .022 greater than r_{ae}, giving further support to this contention. Too much weight, however, must not be attached to these coefficients. They are very small, and a calculation of their probable errors might erase their significance altogether.

TABLE XXIX

SUMMARY OF CORRELATION COEFFICIENTS DETERMINED FROM SCATTER DIAGRAMS SHOWN IN FIGURES XII TO XXXV

Subject	r_{at}	r_{ae}	r_{et}	$r_{at.e}$	$r_{ae.t}$
Literature	+ .149	- .220	- .183	+ .115	- .198
Composition	+ .121	- .359	- .185	+ .061	- .328
History	+ .549	- .191	- .259	+ .528	- .061
Algebra	+ .025	- .119	- .112	+ .012	- .117
Geometry	- .007	- .078	- .113	- .151	- .072
Chemistry	+ .092	- .086	- .135	+ .081	- .075
French	+ .297	- .302	- .211	+ .251	- .259
Latin	+ .543	- .113	+ .098	+ .560	- .077

Summary.- In this chapter, a number of correlation coefficients were calculated in an effort to determine whether or not a mathematical relationship exists between the factors

of pupil achievement, academic training of teachers, and experience of teachers, corresponding to a hypothetical causal relationship between these factors. Table XXIX is a summary of these correlation coefficients. It is seen that there is a distinct tendency towards positiveness in the relationship between pupil achievement and the academic training of teachers. The fact that the measures are small, and in some cases insignificant, would lead one to believe that there are many disturbing factors which may be just as important in the matter of pupil achievement, as the training of the teacher. The measures of relationship between pupil achievement and teacher experience are invariably negative, although some are apparently insignificant. It has been explained that this may be due to the presence of a considerable number of teachers in the smallest high schools with long experience in whose schools pupil achievement seemed to decline generally. Can it be possible that these teachers have been so long in this type of position that they have lost their effectiveness as teachers? Or may it be that their effectiveness as teachers is not measured by the Departmental Examinations taken by their pupils? To answer either of these questions either affirmatively or negatively would require a great deal more study than the scope of this investigation justifies.

The column headed r_{et} in Table XXIX shows that with the exception of the subject of Latin, there is a tendency for

the more recent entrants into the teaching profession to be better academically qualified than those who have taught for some time. This would seem to be a reasonable inference, since the standards for entrance into the profession have been steadily raised in recent years.

With this chapter, the presentation of the data of the investigation is concluded. In the last chapter, several possible implications of the data will be discussed.

CHAPTER VIII

INFERENCES AND IMPLICATIONS

Throughout this study, inferences have been made and conclusions have been drawn from the data. At the risk of some repetition a few of these will be briefly reviewed in this chapter.

The data show with a fair degree of conclusiveness that with the exception of two subjects, namely English and History, the teachers of the small high schools of the Province of Manitoba are not particularly well trained from the academic standpoint. In all other subjects the average training is much below that which would ordinarily be required if the teachers were to qualify as specialists in their subjects. Nevertheless, these teachers are teaching the same curriculum that specialists in the largest Collegiate Institutes in the Province are teaching, and their pupils are tested by the same examinations as those pupils who are taught entirely by specialists. A significant feature of the data in some subjects is the large percentage of teachers who are giving instruction without apparently having had any academic training beyond Grade XI in these

subjects. Of course there is always the possibility that these teachers have prepared themselves to teach the subject by extra-mural study and have thus attained a degree of competence in the subject which enables them to get good results. Some such explanation as this might account, in part at least, for the fact that in many cases, teachers with little academic training get as good results as those who have considerable academic training.

One important implication at least arises from the data on the qualifications of the teachers in the small high schools. "The small high school," says Gaumnitz,[1] "has its reason for being in the facts that rural people believe in secondary education and that they are insistent upon making this level of educational opportunity easily available to their children." It has already been inferred that there is every likelihood at the present time, and in Manitoba at least, of a continuance of this type of school. It seems reasonable to suggest, therefore, that there is need of economic planning in the matter of supplying teachers for this type of school. We have in Manitoba a system of small high schools in which the teachers are required to teach a great many subjects. A goodly proportion of the teachers in these schools are University graduates, and many are nearing the graduation stage. In their University courses, they have

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[1] Walter H. Gaumnitz. "The Smallness of America's Rural High Schools." Bulletin No. 13, 1930, Washington, D.C.: United States Bureau of Education, p. 58.

specialized to a certain extent in one or two subjects. If during their academic careers they have consciously planned to enter the teaching profession, they have done so with the idea of eventually obtaining a position as a specialist. Opportunities for specialization, it cannot be denied, are few. When these teachers go out into the field, they are faced with the task of teaching a range of subjects, for some of which they appear to be inadequately prepared. The data bearing upon pupil achievement in relation to size of school justify the conclusion that the results obtained do not measure up to the standards reached by the larger schools.

In this connection, another quotation from Gaumnitz is very specific. He says:

"....The teacher problems obtaining in the rural high schools call attention to one of the most obvious inconsistencies of our school system: The high school teacher with the more inferior equipment is called upon to do by far the more difficult task. In the discharge of this task she must rely almost entirely upon her own resources and initiative, since little or no supervision is made available to her; she is limited in instructional materials and equipment; and she is not specifically trained for the difficult position she must fill. And if she shows unusual ability, she is lured away to the larger school. Too frequently, training schools fit their candidates to teach only one or two subjects, a teaching program which is possible only in the larger schools. We may, therefore, say that high school teachers are, by and large, trained to teach in the urban school; they are compelled to get their first experience in the smaller schools, gathering this experience almost entirely by trial and error, and forming teaching habits peculiar to rural situations; and those that survive are finally expected to make their professional contribution to the city schools. A more costly, unscientific, and chaotic scheme can hardly be imagined. The educational injustices

resulting to rural children from inadequate teacher adjustments alone are far-reaching." [2]

Gaumnitz also quotes the recommendations of the survey of small high schools in the State of Ohio. They urge:

" (5) That in the selection of teachers for small high schools special care be exercised in the selection of teachers so as to accord with the curricula of some schools."

" (6) That the teacher-training institutions be urged to formulate definite programs of guidance for students in education so as to accord with the field demands in subjects to be taught in the small high schools of the State, and so as to prevent an oversupply in certain subjects, and a paucity of teachers in other subjects." [3]

The facts concerning the experience and tenure of the teachers considered in this investigation require but little comment. It has been shown that the teachers are on the whole very well experienced, the average length of time spent in teaching ranging from a little over eleven years in one-room schools to over nine and a half years in three-room schools. It has also been shown that while the

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[2] Ibid., p. 63.

[3] Ibid., p. 77.

average period of tenure is comparatively short, being between three and four years, it is not quite as serious as the situation in the United States for similar types of schools. It has been further shown that when the relationship of teacher experience to pupil achievement is considered, the teachers with experience of from three to ten years obtain even better results, as measured by the Departmental Examinations, than the teachers with very long experience. A significant feature of this section of the data was that the typical teacher had changed his position on the average about three and a half times during his teaching experience.

In Chapter VI an attempt was made to show in both tabular and graphical form the relationship of size of school, in terms of the number of teachers doing the high school work, to pupil achievement. The frequency polygons shown in the figures of this chapter are extremely interesting. With but few exceptions there is a general shift to the right in the curves, corresponding to an increase in the number of teachers. The differences are not great, but they are in most cases statistically significant.

In discussing the problem of centralization, Ferris says:

"Experience has shown that extremely small high schools cannot afford either adequately or economically secondary education of desirable variety and quality.... While it will be necessary, probably for a long time to come, to maintain in some parts of the country some two- and three-teacher high schools, in a large majority of

sections, better educational facilities might be afforded by increased centralization of secondary education. With larger schools, a larger staff of instructors, better equipment, better curriculum content and organization, and better teaching are made practicable..... To place secondary education within reach of every boy and girl in rural and village communities must continue to be one of the objectives in the development of education in this country. Of equal importance, however, is a program of centralization so far as possible for bringing together pupils in sufficient numbers to make practicable teaching staffs, buildings and equipment, and curriculums of the range and variety required by modern secondary education." 4

The problem referred to in this quotation has been met in a small way in Manitoba by consolidation. The data on pupil achievement indicate in a measure the worth of this movement. Notwithstanding that many of the consolidated schools are one-room high schools, as a group they have been shown to produce better results than the one-room schools as a group, and in some cases, their average achievement even exceeds that in two- and three-room schools.

Considering the same problem, Foght, in the Saskatchewan Survey of 1918, outlines a plan by means of which municipal rural high schools would be set up to offer secondary education of a better quality to all pupils in rural communities desiring education beyond the elementary school.[5]

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[4] E. N. Ferris. "Secondary Education in Country and Village." New York: D. Appleton & Co., 1927, p. 323-4.

[5] H. W. Foght. "Survey of Education in Saskatchewan." Regina, Sask.: The King's Printer, 1918, pp. 73-4.

Chapter VII dealt specifically with the relationship between pupil achievement, teacher training, and teacher experience. The magnitudes of the correlation coefficients derived from the data hardly warrant the drawing of very definite conclusions. On the other hand, the smallness of the coefficients itself indicates that factors other than those mentioned, contribute greatly either to the advantage of or the detriment of pupil achievement. If such strong factors as the training and experience of the teacher cannot be shown to have a very large bearing on pupil achievement, then the factors which offset these require a great deal of study to determine their effect and importance. The personality of the teacher, his professional training, the intelligence of the pupils, physical conditions in the schools would all be worth investigating in their relationship to pupil achievement, if adequate measures for them could be derived.

BIBLIOGRAPHY

Book references:

Department of Education. "Regulations for Secondary Schools." Effective July 1, 1932

Ferris, E. N. "Secondary Education in Country and Village". New York: D. Appleton & Co., 1927, pp. 323-4.

Foght, H. W. Survey of Education in Saskatchewan. Regina, Sask.: The King's Printer, 1918, pp. 73-74.

Gaumnitz, W. H. "The Smallness of America's Rural High Schools". Office of Education. Bulletin No. 13, Washington, D. C.: 1930, pp. 63-77.

National Survey of Secondary Education. United States Department of the Interior. Bulletin No. 17, 1932, p. 74.

Ruch, G. M. "The Objective or New Type Examination". Chicago: Scott Foresman and Co., 1929, p. 372.

Rufi, John. The Small High School. Bureau of Publications, Teacher's College, Columbia University, 1926, p. 3.

Spaulding, Francis D. The Small Junior High School. Cambridge, Mass.: Harvard University Press, 1927, p. 3.

The National Survey of Education. "The Smaller Secondary Schools". E. M. Ferris, et al. Washington, D.C.: 1933.

University of Manitoba. Winnipeg: Calendar of Arts and Science including Pharmacy. Session 1934-35. p. 25.

APPENDIX A

AVERAGE NUMBER OF PUPILS PER TEACHER IN ONE-, TWO- AND THREE-ROOM HIGH SCHOOLS OF MANITOBA

One-room	21.78
Two-room	22.69
Three-room	19.65

APPENDIX B.

Questionnaire to Graduates of Universities

Other Than Manitoba University

Please fill in the following table using a check mark (v) to indicate the subjects taken during your University Course.

The information will be treated confidentially, and used only for summarizing purposes.

A stamped, addressed envelope is enclosed for your reply.

Thanking you,

Yours very truly,

Harry L. Stein

Subject	1st.Yr.	2nd.Yr	3rd.Yr.	4th.Yr.	5th.Yr.
English					
History					
French					
Latin					
Maths.					
Physics					
Chemistry					
Economics					
Philosophy					
Psychology					
Geology					
Astronomy					
Botany					
Zoology					