"PRACTICAL ESTIMATION of PUPILS' PROGRESS in SECONDARY SCHOOLS."

by

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C O N T E N T S.

FOREWORD.

In this Thesis an attempt is made to solve one or two important practical problems which for some time have been awaiting investigation and solution regarding Secondary Education in Scotland.

In the first place, little or nothing has been done in Scotland on the lines of the English Commission[1] to decide at what age a child should complete his primary education and proceed to the higher work of the Secondary School. This is a fundamental matter, for on its right solution rests the entire fabric of the educational system in Scotland.

In addition, the type of school to which a pupil must transfer on Qualifying, requires the closest consideration. The whole question of Advanced Divisions and Secondary Schools awaits authoritative investigation, for it will be agreed that the present condition of affairs is far from satisfactory.

Then again, who has to decide the fitness of the pupil/

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(1) English Board of Education. Consultative Committee. Chairman - Sir Henry Hadow.

3 Reports:- 1922. "The Differentiation in Curriculum between boys and girls in Secondary Schools.
1924. "Psychological Tests of Educable Capacity
1927. "The Education of the Adolescent.

pupil to enter the Secondary School? Has there to be an examination and if so, what is to be its nature? This brings up the whole question of examinations, especially the value of external examinations, not only at the Qualifying Stage; but later all through the Advanced or Secondary School.

One remembers that not so very long ago the progress of pupils depended almost entirely on the results of a single annual examination conducted by H.M. Inspector.

The value of this type of examination is now largely discounted, with the result that the pendulum has swung to the opposite extreme. To-day the tendency is, as far as possible, to do away with external examinations, and to rely on the opinion of the teachers concerned. So much is this the case, that it is possible, since the abolition of the Intermediate Certificate in 1924, for pupils in our Secondary Schools to go right through their full Secondary Course from the 1st to the 6th year, without once having to undergo an official test from an external examiner, not excluding H.M. Inspector.

The responsibility for the pupils' progress, advancement, or retardation is thus placed almost wholly/

wholly on the shoulders of the teachers and especially of the Head Teachers.

If this important responsibility is to be adequately met, if internal tests are to replace external examinations, it is clearly evident that within the schools, the system of testing, of marking and of estimating marks, should be of the most thorough and reliable nature.

The type of test to be given will, ofcourse, depend upon what one is testing for.

If one wishes to test the "Intelligence" of the pupil, there are available to-day many authoritative standardised "Intelligence Tests" both "Individual" and "Group".(1) The acceptance of "Intelligence" Test results as a valuable aid towards the estimation of pupils' progress should ultimately cause little anxiety; for the best known tests have been so skilfully compiled and standardised that they form an almost indispensible adjunct to school testing technique.

But/

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(1) The Binet-Simon. Stanford Revision. Terman.
The National Intelligence. U.S.A National Research Council
The Northumberland. Prof. Godfrey Thomson.
The Chelsea. Dr. Ballard.
etc. etc.

But when one comes to ordinary school class and Term Tests, the same clarity and freedom from doubt as to the authenticity of the results do not exist.

Class Tests, Term Tests, School Tests are tests of attainment, of achievement, of knowledge (call it what you will) destined to test the pupil's progress in his school work. These tests vary according to the subject, to the grade, and to the ultimate aim and scope of the pupil's curriculum.

It is useless to deny that tests of that sort must, for a very long time to come, form the back-bone of the school testing system.

In the main, Secondary School pupils are working with the view of gaining a Leaving Certificate or of passing an entrance examination to some college or institution. A certain standard of attainment in every subject professed is demanded, and the Secondary Schools, which prepare pupils for such examinations, must therefore be continually testing for achievement. The Standardised Tests of Achievement (1) at present on the market/

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(1) Some of the best known are:-
Courtis: Standard Tests in Arithmetic.
Starch: English Grammar Tests.
Thorndike: English Composition.
Ayres: Spelling Scale.
Thurstone: Algebra and Geometry Tests.
Burt: Northumberland Standardised Tests (1925 Series)

market (the majority formulated in U.S.A. to suit the conditions there), are seldom or never suitable for Scottish Secondary Schools.

The varying requirements from year to year of the Leaving Certificate, University Entrance, and other Examinations, preclude the hope, at least in the meantime, that standardised tests of achievement can entirely take the place of the usual Class Tests for achievement in the various branches of the Secondary School curriculum.

But at this point there emerges an almost insuperable difficulty. Everyone is conscious, and investigation has proved, that the standard of teachers' marking varies as the individual.

The opinion of teachers as to the value to be assigned to any test is, as a rule, so diverse, so personal, so subjective, and so unstable, that grading, based solely on teachers' marks, becomes very unreliable. This is a problem that must be faced if school tests are to have the value they ought to have.

Sufficient has been said therefore to indicate that there are important questions in Secondary Education awaiting research and, if possible, solution.

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In this Thesis it is proposed to deal with some of these questions.

I. The Qualifying Examination will be discussed with special reference to:-

(a) the age when pupils should finish the primary course and be drafted to the Secondary School.

(b) the type of examination (if any) there should be at that stage,

(c) the value and bearing of the Qualifying Mark on the pupil's Secondary Course.

II. The estimation of the pupil's progress throughout the Secondary School will then be considered.

(d) In this connection new methods of marking class and term examination papers, and of eliminating the personal element in teachers' marking are proposed.

(e) Further, the theory of a class constant capacity is advanced. With this as basis, a system of five averages is built up which shows, in every subject, the pupil's individual progress in comparison with that of every other pupil in his own form and class.

(f) As a result of some years' practical experience, class record sheets have been evolved which show these five averages and other data at a glance. It is claimed that with these Class Record Sheets before one, it is possible to "place" a pupil, so far as his achievement is concerned, with celerity, precision and justice.

(g) The value of Intelligence Tests, and recent attempts to establish an A.Q. (accomplishment quotient) will be discussed in so far as they bear on the main subject, viz. the practical estimation of pupils' progress in Secondary Schools.

The/

The actual investigations have, of necessity, been carried out in a large Secondary School whose pupils are drawn from a comparatively extensive area; but it is hoped that the results will be of general interest.

Chapter 1.

THE "QUALIFYING" EXAMINATION.

The problem for the Secondary School begins when the pupil reaches the Qualifying stage.

For 6 or 7 years the child has been in the Primary School slowly and quietly acquiring the necessary mechanical arts of reading, writing and arithmetic.

Now for the first time in his career, he has to face a real barrier, the Qualifying Examination.

It is just here that there emerges the first debate-:able point, "Should there be an examination at all?"

With some justification, Headmasters of Primary Schools say "Why not take our word for it? We have had these pupils for 6 or 7 years: we have watched their progress and know their powers. We tell you that they have reached the age and standard which warrant their entrance to a Post-Qualifying or Secondary School."

The Report of the Director of Education for Lanark-:shire on the Qualifying Control Examination held in that County in 1922 seems to support this view.**

Before the Control Examination took place, there were sent on to the Central Office, schedules containing the/

** See Educational Journal, September, 1922, pp 686-7

the teachers' estimates of the pupil's progress and scholastic attainments based on the records of work and the usual class tests.

In order to prevent any suggestion of collusion the Educational Institute of Scotland was asked to draw up the papers on the general lines previously laid down.

The teachers of the respective schools corrected the papers, and inscribed on the schedules on which they had already placed the "record" marks, the results in the various subjects of the Control Examination, and any remarks they might wish to make in the case of individual pupils regarding any marked discrepancy between the record marks and the individual results of the Control Examination, together with a statement of the intention of the parents as to the future instruction of the pupils.

The number of individual pupils examined was 7348, drawn from 207 schools. The number who passed was 6967.

"The most striking feature was that the estimates of the pupils' work given by the teacher coincided so largely with the results of the examination, and that virtually all the pupils recommended for a "pass" by the teachers/

teachers passed the examination on a sufficiently high standard".

Later, the Report goes on to draw certain conclusions, some of which are here quoted.

"It is also clear that an examination of such an elaborate scale is not necessary annually".

"The estimates of the teachers were as has already been stated, surprisingly in consonance with the results of the Control Examination and where there was discrepancy, the explanation thereof was, as a general rule, simple".

"The danger of recurring examinations, in unduly stereotyping the instruction in a School, and the temptation to teach for examination purposes rather than for educational ends, are too great risks to run, while the only compensating advantage is the avoidance of a trifling number of possible errors of judgment as to the educational promise of a few pupils. Such errors may be rectified otherwise without difficulty".

"Teachers know better than anyone else the potentialities of the children under their charge, and the educational attainments of individual pupils can be more/

more adequately ascertained from a careful study of their records of work and educational history, than from any examination, however approaching perfection that examination may be".

The Report goes on finally to visualise a time, in the near future, when the connection between the primary and post-primary Schools will be so intimate that there will be little reason for any form of intervention from outside, and that the promotion of pupils from elementary to Secondary will be a matter of arrangement between the respective Headmasters.

This has actually come to pass in Lanarkshire. Since 1921, there has been no Control Examination held throughout the County, but an examination only in the case of particular Secondary Schools where the accommo-:dation was limited and only a certain number could be admitted.

The normal method of procedure from 1922 has been the advancement of pupils from Primary to Secondary Schools by arrangement between the respective Headmasters. This arrangement seems to be working satisfactorily.

One has quoted the Director's report rather fully because/

because it gives the reasoned opinion of an expert on the value of a Control Examination after it has been given a fair trial.

The Editor of the Educational Journal gives the Report his blessing and thinks it will be greatly appreciated by most teachers, and "commends it to the thoughtful study of those Authorities who still believe in external examinations."[xx]

On the other hand, an extremely illuminating and instructive series of articles on this very subject of "Control Examinations and Promotion at the Qualifying Stage", appeared under the pen of Dr. Boyd, in the issue of the Educational Journal from October, 1924, till March 1925. These articles give the results of enquiries made all over Scotland, by the Research Committee of the E.I.S., (a body of Educational experts whose opinion cannot be lightly treated.) The results of these enquiries, strange to say, lead to conclusions, in many ways fundamentally opposed to those expressed by the Director for Lanarkshire.

From the replies, it was found that two thirds of the Education Authorities in Scotland hold an external examination/

[xx] Educational Journal, 24th. Feb. 1925.

examination conducted by a Board on which their teachers are represented. About one quarter have no external examination; but rely on examinations conducted by the children's teachers present or prospective. Nine Authorities have no county examination for promotion purposes but six of these have a county examination for bursaries.

Only three counties have really no county examination.

The examination papers which consist chiefly of questions on English and Arithmetic, to which a few Authorities add History, Geography and Grammar, are set by the Executive Officer in 12 cases; by an Examination Board in 8 cases; by outside examiners in 5, and by Headmasters in 2 cases.

The scripts are corrected mainly by the teachers of the sending schools, although Teachers of the receiving schools (3), Examination Board (3), Selected Teachers (3) and Outside Examiners (7) also do the work to the number indicated in brackets.

Teachers' estimates usually receive considerable attention and the teachers of the receiving schools seem generally to have a considerable say with regard to entrants.

In/

In 9 cases there is, in the Form where the results are tabulated, a column for the course of study desired by the parents and recommended by the Headmaster.

The general result established by the enquiry shows, that in the main, Education Authorities adopt some form of Control Examination at the Qualifying Stage.

In a later article in the Educational Journal of February, 13th, 1925, the Research Committee make certain suggestions and recommendations for the improvement of the promotion system in the light of its study of all the schemes adopted by the Authorities.

Very wisely, the problem before Authorities and their teachers is shown to be really <u>two</u> problems, not one. The <u>first</u> is how best to test the fitness of boys and girls at the end of the primary course, for the more advanced studies of the Secondary.

The <u>second</u> is to ascertain the particular course of study for which each pupil is fitted by his special aptitudes and the degree of his general ability - two quite distinct problems demanding possibly quite different treatment. "This fact does not seem to have been adequately grasped by some Authorities".

If/

If there is to be a test of fitness at the Qualifying Stage - and all are agreed that some form of test must be given - how is this to be done?

The simplest method is to put the responsibility for the judgment regarding a pupil's attainments and possibilities on some external examiner; but as this implies a subjection of the teachers' will and person-:ality the Research Committee says, "In the interests both of teachers and scholars, the external examiner must, in these times, give up the power to over-ride teachers' judgment in examinations and tests, and either disappear from the scene or be content to act as the associate of the teacher on a footing of equality. This stricture also applies to the Executive Officer when he takes upon himself inspectorial functions".

Then the problem is discussed, of putting the whole responsibility on the teacher of the Primary School. Certain objections are stated to this policy:-

(1) The inheriting schools are as much concerned with the matter of fitness as the sending schools, and may be in a better position to assign pupils to their proper courses."

(2) That however competent primary teachers be, many of/

of them have rather hazy ideas of standards and with every desire to judge fairly rate their pupils too high or too low."

(3) That in certain cases, self-interest enters into the judgment, as for example, in the over-marking of work by the incompetent teacher or in the acceptance of low standards by the headmaster who has primary pupils of his own to promote, and is eager to keep up the number of advanced pupils."

(4) That, especially in small towns and in rural areas, the knowledge that the teacher had sole responsibility for promotion would inevitably lead to friction with the parents of pupils failed or held back."

While the Research Committee agree that the Primary Teacher cannot have full responsibility, the article goes on to admit that the Primary Teacher must be the most important factor in the judgment of fitness, that he must train himself to be worthy of his high calling and that he must study such books as Dr. Boyd's "Measuring Devices" and other material which give definite guidance in regard to standards of marking.

There is, however, need for control, and the final paragraph/

paragraph is quoted here in full:

"The word 'control' is perhaps unfortunate. But that apart, it has got to be recognised by qualifying teachers - that when a judgment which affects the whole future career of scholars has to be given, not even the wisest and most experienced man is good enough to be left to his own uncontrolled discretion. The experience of both schools and universities is that the opinion of the inside man needs to be combined with an external judgment to ensure steadiness as well as justice. The real question for the teacher is not whether there should be such a check, but whether the form the check takes is one which is consonant with the amour propre of an educated man."

The Research Committee arrive at the following conclusions regarding the various methods to be adopted:

They agree

(1) that the method where the Executive Officer acts as an Inspector and over-rides the teachers' judgment should be discontinued.

(2) that the method of appointing an external examiner should also be discontinued, unless the teachers are conjoined on equal footing.

(3) That/

(3) that whilst the method of leaving the decision to the teachers of the receiving schools has much to commend it, there is the danger of lack of common standard.

In conclusion, the Committee suggest that the best method is by a County Board which includes not only head, but other teachers of both sending and receiving schools.

These expert opinions, first by the Executive Officer for Lanarkshire and second, by the Research Committee of the E.I.S, have been quoted at some length, because the conclusions arrived at are diametrically opposite.

The Director makes out a case for No Control examination, and the Research Committee a case for a Control examination conducted by a County Board.

It would seem therefore, that there is some scope for a further detailed enquiry into the merits of the conclusions suggested above.

Now, it so happens that the writer is in a Secondary school which receives pupils from various Primary Schools examined at the Qualifying stage under a County scheme somewhat similar to that advocated by the Research Committee./

Detailed results of the Term Examinations held in the Secondary School during the years 1923-26 are now available, and it is proposed minutely to examine these, to compare them with the marks gained at the Qualifying Examination, and, if possible, to arrive at some finding with regard to the value, especially the predictive value, both of the Qualifying Mark and of the mark at the First Term Examination.

Original Data filed with this Thesis.

Chapter 11.

THE ACTUAL CONDITIONS

in

THE SELECTED AREA.

In the area under review the Central High School** is fed by 7 Primary Schools, hereafter called A.B.C.D. E.F.G.

Schools A.B.C.D send all pupils who pass the Qualifying Examination.
Schools E.F.G send selected pupils.

Twice a year, a Qualifying Examination, conducted by a Committee composed of Teachers selected by the E.I.S. and of Authority Members, with the Executive Officer and H.M. Inspector for the County as assessors, is given to pupils who have, in the opinion of the Primary Head Teacher, reached the necessary standard.

The papers are marked in the Primary Schools by the pupils' own teachers, and the marks gained are, in a form, set alongside the teachers' opinion marks.

After a consultation between the Headmaster of the receiving Secondary School and the sending Primary Schools, an agreed final mark (usually the average of the Qualifying Examination Mark and the opinion mark) is set down.

Forms are then issued to parents suggesting a course from one of the following:-

(1) A/

** Already referred to. page 17.

(1) A Two Language Course, leading ultimately to the University and a Profession.

(2) A One Language Course with a Technical or Commercial bias for boys, or with a Domestic or Commercial bias for girls.

(3) A Non-Language Course with a Technical bias for boys, or with a Domestic bias for girls.

It is evident therefore, that the Qualifying Examination decides two quite distinct questions,

(1) the fitness of the pupil to profit by higher instruction, and

(2) the course of study which the pupils will follow in the Secondary School.

The E.I.S. Research Committee, whose findings were quoted in the previous chapter, rightly pointed out that the test of fitness, and the allocation of courses, were fundamentally different questions, and that Education Authorities and Qualifying Committees seem not as yet completely to have grasped this point. To test the fitness of a pupil to go forward to higher instruction is a comparatively simple matter compared with the extremely vital question of deciding which course a pupil should follow in the Secondary School.

Once a pupil has begun a particular course in a Secondary/

Secondary School it is extremely difficult to change over to another, at least without loss of time. A Professional Course pupil may, even after one term, find it impossible to join on with pupils who began at the same time a Commercial or a Technical Course, for already one term's work has been covered which is unknown to the pupil in another course.

Similarly, a pupil in a Non-Language Course would soon find it very difficult to link up with pupils who are six or twelve months ahead with one or more languages.

It is evident, therefore, that the Dumbartonshire Control Examination is going to have very far-reaching effects on the after life of the pupils, and, if any serious mistakes are made, either in the marking of the papers or in the standardisation of marks, or in the selection of the proper course, not only is the pupil's future career prejudiced; but the organisation of the Secondary School is bound to be put out of gear from the very start.

The results of the Qualifying Examinations for the last few years are available; but it is proposed here to make an intensive study of the Qualifying Examination, June 1923, because the career of the pupils who qualified at/

at that date can be traced through a series of years.

In August, 1923 the number coming from the various Primary Schools to the High School were:-

School.	A	B	C	D)	
				)	All pupils who
No. of Pupils.	120	70	117	72)	qualified.

School.	E	F	G	)	
				)	Selected pupils.
No. of Pupils.	14	6	22	)	

The average mark stated as a percentage for these pupils in each school was

A	B	C	D
72·3%	65·2%	70·9%	75·7%

E	F	G
81·9%	81·1%	79·3%

Excluding schools E.F.G., which were sending selected pupils, there seems to be a difference in the standard of marking in the four main schools. The average pupil in School B. was receiving the mark 65, while the average pupil in School D. was getting 76. Of course it could be argued that one school might send, in any particular year a very bright set of pupils whose average/

average might be distinctly high, whilst another school might have in the same year a poor lot. Whatever doubts one might have on the matter one had simply meanwhile to accept the figures.

The Education Authority's Regulations allowed pupils with 75% and upwards to gain admission to the Professional Two Language Course, whilst those with 65% just managed to secure admission to the One Language Course, those below 65% getting no foreign language.

The pupils, therefore, arrived at the High School already classified and allocated to Courses. (Of the 427 new pupils, 115 had chosen and were eligible to take the Professional Course, 131 the One Language Courses and 181 the non-Language Courses.)

One awaited with considerable curiosity the results of the first term examination in December, 1923. Few forms of examination are intrinsically perfect, but this merit at least could surely be claimed for the December Term Examination of 1923, that for the first time all the children from the various schools were being subjected to tests under similar conditions.

The marks obtained at the first Term Examination were/

were carefully tabulated, and a comparison made with the Qualifying Marks. In order that the fairest measure might be found, only the marks for subjects common to all the Courses were taken, viz. English, History, Geography and Mathematics.

Note: The criticism may be advanced that the marks for Languages, (French and/or Latin) for those taking the one or two language courses ought to have been included or investigated.

If such an argument is sound, then, with equal justice one should include all the subjects taken by all pupils:- Art, Science, Technical Drawing (boys), Needlework(girls) Music, etc.

It seems to me that the whole essence of a true comparison between pupils is, that the content and conditions of an examination (for rating purposes) ought to be, as far as possible, the same.

English, History, Geography and Mathematics were the only four subjects common to all the pupils in all the courses. Moreover these subjects compare almost exactly with the subjects of the Qualifying Examination:- English, History, Geography and Arithmetic. If a pupil gained a good Qualifying Mark, it was on the strength of these four subjects.

The averages given as a percentage for the various schools at the first Term Examination in December, 1923 worked out as follows:-

School/

School.	A	B	C	D
1st Term Exam.	53·7	48·5	47.7	47·2
Qualifying "	72·3	65·2	70·9	75·7

School.	E	F	G
1st.Term Exam.	61·2	56·6	57
Qualifying "	81·9	81·1	79·3

Neglecting the data from schools E.F.G. sending selected pupils, as unlikely to give satisfactory results, one noticed on a rough inspection, that the average percentage mark at the Term Examination had, compared with the average percentage mark at the Qualifying Examination for schools A.B.C and D respectively dropped 18.6, 16·7, 23·2 and 28·5 per cent.

To state the matter, however, more exactly, the original figures were made comparable by reducing the average of each group of marks to 50 and the other figures proportionately.

On this basis the figures now are:-

	Qualg.Mark.	1st.Term Exam.
School A.	49·3	53·1
B.	44·3	48·3
C.	48·2	47·5
D.	51·5	46·5

From/

From these figures it will be seen that Schools A. and B. had been marking rather severely at the Qualifying Examination, whereas C. and especially D. had been rating their pupils too highly.

It is worthy of note that on the same basis the figures for the following year 1924, to the nearest whole number, showed a similar tendency.

	Qualg. Mark.	1st. Term Exam.
School A.	50	50
B.	49	52
C.	48	43
D.	51	46

While A. had been this year marking absolutely to standard, B. again had been too severe, whilst C. and D. had both again valued the pupils too highly at the Qualifying Stage.

Here then was positive evidence that though the pupils had all tried the same questions at the Qualifying Examination, their answers had been judged on various standards, some severe, some easy, according to the personal standard of the teachers in the various schools.

When/

When one considers that entry to certain courses depended on securing a certain percentage mark, then variations in the standard of marking did make a very real difference. For example, 75% and upwards gained admission to the highest or Professional Course.

Taking the figures given.

		Qual.	Term.					
School B.	1923.	44	48	∴	75%	really	meant	81·8%
	1924.	49	52	∴	75%	"	"	80%
School D.	1923.	51	46	∴	75%	"	"	67·6%
	1924	51	46	∴	75%	"	"	67·6%

That is to say a pupil from School B. in 1923 who made 74% really equivalent to the standard 80% , was being excluded and denied the privilege of entering the Professional Course, whilst a pupil from School D. with 75% equivalent on our standard to 67·6% was securing admission. Not only was serious injustice being done to the pupil, but the Secondary School, forced to adopt this classification was being organised on wrong lines from the beginning.

Meanwhile, however, until further definite evidence was/

** See page 23.

was forthcoming, it might with some justification be argued that there was no guarantee (however strongly one might be inclined to believe) that the Qualifying Examination Marks were wrong and the Term Examination mark right. Those who were responsible for the Qualifying Examination, could quite well assert that the Term Examination was on wrong lines with as much justification as those who on the other hand condemned the Qualifying marks for lack of standard.

Further independent investigation therefore, seemed to be necessary, which might either confirm or throw additional light on the results already obtained.

In the first place the correlation for the two sets of figures for each school was obtained. The data sheet prepared by Professor Thurstone,** Carnegie Institute of Technology, Pittsburg, Pa, U.S.A., was used in the calculation of the coefficients.

** A data sheet for the Pearson Correlation Coefficient G.L.L. Thurstone, Steolting Co. Data Sheet No. 10155. See also Journal of Educational Research, June, 1922. for full details regarding use of this data sheet.

(Facsimile of these sheets reproduced here.)

The following correlations have been checked by Miss D.A. Reid, M.A.(1st class Hons.), Principal Teacher of Mathematics, Dumbarton, who was for one year a research scholar in America with Prof. Thurstone.

Chapter 111.

CORRELATION

of

QUALIFYING RESULTS

with

FIRST TERM RESULTS.

Dec. 1923.

	26	31	36	41	46	51	56	61	66	71	76	81
	30·9	35·9	40·9	45·9	50·9	55·9	60·9	65·9	70·9	75·9	80·9	85·9
X	4	3	2	1	0	1	2	3	4	5	6	7
94 96·9											II	
91 93·9									I		I	
88 90·9							I	I	I	II		
85 87·9				I					IIII	I		
82 84·9					I		II	III		II		
79 81·9				I	I			III	I			
76 78·9			I	I	III	I	III	II				
73 75·9				I	I	IIII	III	II	I	I		
70 72·9				I	IIII	III	IIII	I	II			I
67 69·9			II	II	I	III	II	I				
64 66·9		I	II	II	IIII	I	I					
61 63·9		I		IIII	I	II						
58 60·9	I		II	II	III	II						
55 57·9	I		I	I								
52 54·9			I									
f	2	2	9	17	19	16	17	13	9	6	3	1
X	4	3	2	1	0	1	2	3	4	5	6	7
fx	8	6	18	17	0	16	34	39	36	30	18	7
fx^2	32	18	36	17	0	16	68	117	144	150	108	49

f	y	fy	fy^2	Σx −	Σx +	$\Sigma x'$ −	$\Sigma x'$ +	Σxy −	Σxy +
2	8	16	128		12		12		96
2	7	14	98		10		10		70
5	6	30	180		19		19		114
5	5	25	125	1	17		16		80
8	4	32	128		23		23		92
6	3	18	54	1	13		12		36
11	2	22	44	3	13		10		20
13	1	13	13	1	25		24		24
17	0	0	0	31					
11	1	11	11	6	10		4	4	
11	2	22	44	9	3	6			12
9	3	27	81	8	2	6			18
10	4	40	160	10	2	8			32
3	5	15	75	7		7			35
1	6	6	36	2		2			12

$\Sigma x_{pos} = 180$ $\Sigma y_{pos} = 170$ $\Sigma xy_{++} = 641$

$\Sigma x_{neg} = 49$ $\Sigma y_{neg} = 121$ $\Sigma xy_{--} = 4$

$\Sigma x = 131$ $\Sigma y = 49$ $\Sigma xy = 637$

$\Sigma x^2 = 755$ $\Sigma y^2 = 1177$ $N = 114$

$dx = \frac{\Sigma x}{N} = \frac{131}{114}$ $dy = \frac{\Sigma y}{N} = \frac{49}{114}$

$dx = 1{\cdot}149$ $dx^2 = 1{\cdot}32$ $dy = {\cdot}43$ $dy^2 = {\cdot}185$

$\sigma_x^2 = \frac{\Sigma x^2}{N} - dx^2$ $\sigma_y^2 = \frac{\Sigma y^2}{N} - dy^2$

$= \frac{755}{114} - 1{\cdot}32$ $= \frac{1177}{114} - {\cdot}185$

$= 5{\cdot}3$ $= 10{\cdot}14$

$\sigma_x = 2{\cdot}3$ $\sigma_y = 3{\cdot}2$

$$r = \frac{\Sigma xy/N - dx \cdot dy}{\sigma_x \sigma_y}$$

$$= \frac{\frac{637}{114} - (1{\cdot}149)({\cdot}43)}{(2{\cdot}3)(3{\cdot}2)}$$

$$= \frac{5{\cdot}096}{7{\cdot}36}$$

$r = {\cdot}692$

(P.E = ·033)

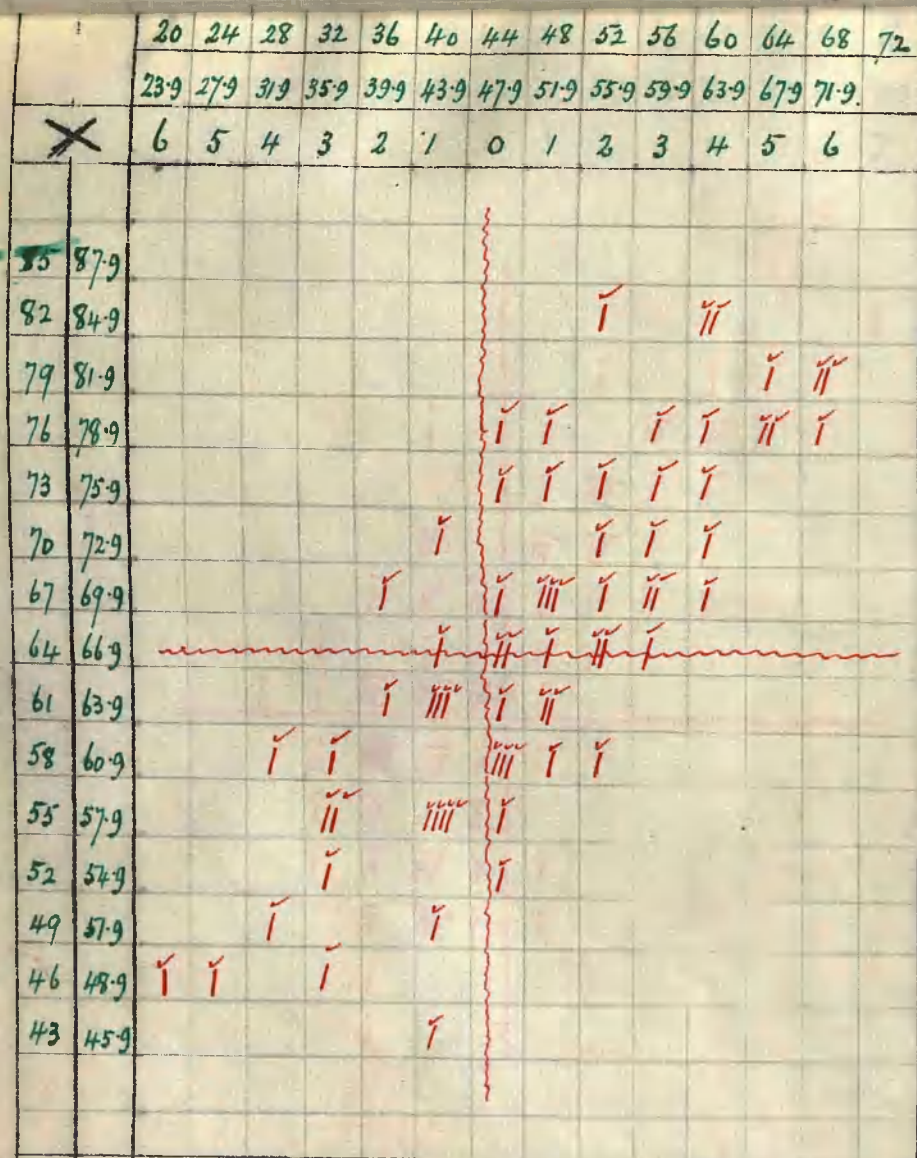
X-variable Term Exam^n Marks Dec 1923

Y-variable Qualifying Marks June 1923

Subjects School "A"

Computer K.M.

Page 29



f	1	1	2	5	2	11	11	9	7	6	6	3	3
x	6	5	4	3	2	1	0	1	2	3	4	5	6
fx	6	5	8	15	4	11	0	9	14	18	24	15	18
fx^2	36	25	32	45	8	11	0	9	28	54	96	75	108

f	y	fy	fy^2	Σx −	Σx +	$\Sigma\bar{x}$ −	$\Sigma\bar{x}$ +	Σxy −	Σxy +
3	6	18	108		10		10		60
3	5	15	75		17		17		85
7	4	28	112		24		24		96
5	3	15	45		10		10		30
4	2	8	16	1	9		8		16
9	1	9	9	2	15		13		13
7	0	0	0	−	−		−		−
7	1	7	7	5	2	3			3
7	2	14	28	7	3	4			8
7	3	21	63	10	0	10			30
2	4	8	32	3		3			12
2	5	10	50	5		5			25
3	6	18	108	14		14			84
1	7	7	49	1		1			7

$\Sigma x_{pos} = 98$ $\Sigma x_{pos.} = 93$ $\Sigma xy_{pos} = 469$

$\Sigma x_{neg} = 49$ $\Sigma y_{neg} = 85$ $\Sigma xy_{neg} = 0$

$\Sigma x = 49$ $\Sigma y = 8$ $\Sigma xy = 469$

$\Sigma x^2 = 527$ $\Sigma y^2 = 702$ $N = 67$

$dx = \frac{\Sigma x}{N} = \frac{49}{67}$ $dy = \frac{\Sigma y}{N} = \frac{8}{67}$

$dx = .73$ $dx^2 = .533$ $dy = .12$ $dy^2 = .0144$

$\sigma_x^2 = \frac{\Sigma x^2}{N} - dx^2 = \frac{527}{67} - .533 = 7.332$

$\sigma_x = 2.707$

$\sigma_y^2 = \frac{\Sigma y^2}{N} - dy^2 = \frac{702}{67} - .0144 = 10.463$

$\sigma_y = 3.23$

$$r = \frac{\Sigma xy/N - dx \cdot dy}{\sigma_x \sigma_y}$$

$$= \frac{\frac{469}{67} - (.73)(.12)}{(2.707)(3.23)}$$

$$= \frac{6.912}{8.743}$$

$r = .791$

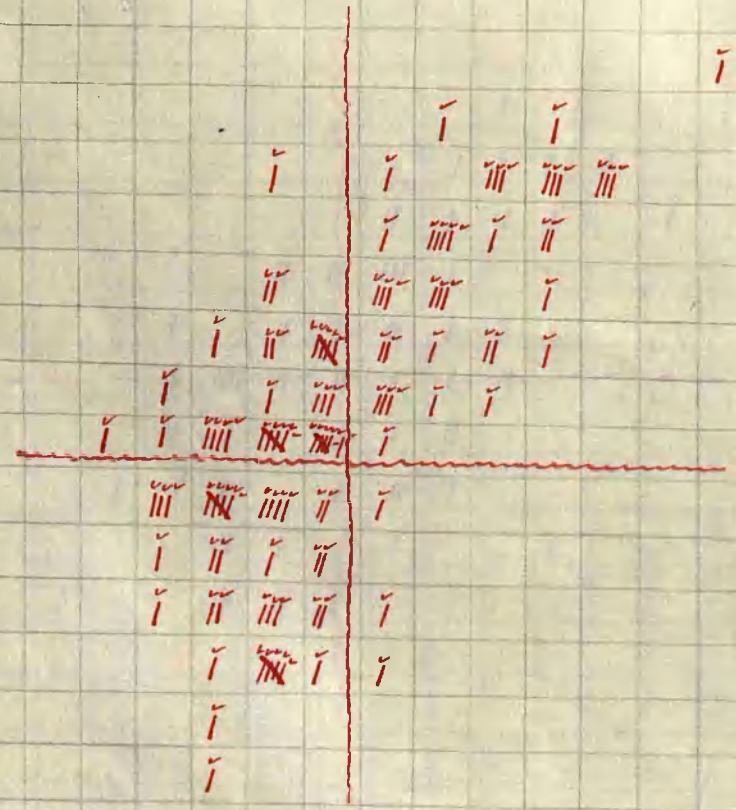
(P.E = .031)

X-variable Term Exam^n Marks Dec 1923

Y-variable Qualifying Marks June 1923

Subjects School "B"

Computer M.I.



X	20	26	32	38	44	50	56	62	68	74	80	86
	25·9	31·9	37·9	43·9	49·9	55·9	61·9	67·9	73·9	79·9	85·9	91·9
	5	4	3	2	1	0	1	2	3	4	5	6	7
92	94·9												
89	91·9												1
86	88·9							1		1			
83	85·9				1		1		3	3	3		
80	82·9						1	4	1	2			
77	79·9				2		3	3		1			
74	76·9			1	2	5	2	1	2	1			
71	73·9		1		1	3	3	1	1				
68	70·9	1	1	4	5	5	1						
65	67·9		3	5	4	2	1						
62	64·9		1	2	1	2							
59	61·9		1	2	3	2	1						
56	58·9			1	5	1	1						
53	55·9			1									
50	52·9			1									
f		1	7	17	24	21	14	10	7	8	3	0	1
X		4	3	2	1	0	1	2	3	4	5	6	7
fx		4	21	34	24	0	14	20	21	32	15	0	7
fx^2		16	63	68	24	0	14	40	63	128	75	0	49

f	y	fy	fy^2	Σx −	Σx +	Σxy −	Σxy +
1	7	7	49		7		7	49
2	6	12	72		6		6	36
11	5	55	275	1	37		36	180
8	4	32	128		20		20	80
9	3	27	81	2	13		11	33
14	2	28	56	4	14		10	20
10	1	10	10	4	8		4	4
18	0	0	0	–	–		–	–
15	1	15	15	23	1	22		22
6	2	12	24	8	0	8		16
9	3	27	81	10	1	9		27
8	4	32	128	7	1	6		24
1	5	5	25	2		2		10
1	6	6	36	2		2		12

$\Sigma x_{pos} = 109$ $\Sigma x_{pos.} = 171$ $\Sigma xy_{pos} = 513$

$\Sigma x_{neg} = 83$ $\Sigma y_{neg} = 97$ $\Sigma xy_{neg} = 0$

$\Sigma x = 26$ $\Sigma y = 74$ $\Sigma xy = 513$

$\Sigma x^2 = 540$ $\Sigma y^2 = 980$ $N = 113$

$dx = \frac{\Sigma x}{N} = \frac{26}{113}$ $dy = \frac{\Sigma y}{N} = \frac{74}{113}$

$dx = .23$ $dx^2 = .0529$ $dy = .655$ $dy^2 = .429$

$\sigma_x^2 = \frac{\Sigma x^2}{N} - dx^2$ $\sigma_y^2 = \frac{\Sigma y^2}{N} - dy^2$

$= \frac{540}{113} - .0529$ $= \frac{980}{113} - .429$

$= 4.7257$ $= 8.243$

$\sigma_x = 2.17$ $\sigma_y = 2.87$

$$r = \frac{\Sigma xy/N - dx \cdot dy}{\sigma_x \sigma_y}$$

$$= \frac{\frac{513}{113} - .151}{6.228}$$

$$= \frac{4.389}{6.228}$$

$r = .705$ (P.E. = .0319)

X-variable Term Examination Marks Dec. 1923

Y-variable Qualifying Marks June 1923

Subjects School "C"

Computer A.C.

✓ Bak.

	12	18	24	30	36	42	48	54	60	66	72	78
	17·9	23·9	29·9	35·9	41·9	47·9	53·9	59·9	65·9	71·9	77·9	83·9
X	5	4	3	2	1	0	1	2	3	4	5	6
98 —												1
94 97·9									1			
90 93·9								1	1	1	1	
86 89·9							11	1	1	1		1
82 85·9					11	4	111	1				
78 81·9			1		1	4	11	1	1			
74 77·9			1	1111	11	4	1	1	11			
70 73·9			1	1	1	11	1	11				
66 69·9		1	1	1		4	111	1				
62 65·9				11	1		1			1		
58 61·9	1			1	11	4						
54 57·9						1						
f	1	1	4	7	9	11	13	8	6	3	1	2
X	5	4	3	2	1	0	1	2	3	4	5	6
fx	5	4	12	18	9	0	13	16	18	12	5	12
fx^2	25	16	36	36	9	0	13	32	54	48	25	72

f	y	fy	fy^2	Σx −	Σx +	Σxy −	Σxy +
1	6	6	36		6		36
1	5	5	25		3		15
4	4	16	64		14		56
6	3	18	54		17		51
8	2	16	32	2	5		6
7	1	7	7	4	7		3
13	0	0	0	−	−	−	−
8	1	8	8	6	5	1	
9	2	18	36	9	5	4	
5	3	15	45	5	5	0	
5	4	20	80	9	0	9	
1	5	5	25	−	−	0	

$\Sigma x_{pos} = 76$ $\Sigma x_{pos.} = 68$ $\Sigma xy_{pos} = 212$

$\Sigma x_{neg} = 48$ $\Sigma y_{neg} = 66$ $\Sigma xy_{neg} = 0$

$\Sigma x = 28$ $\Sigma y = 2$ $\Sigma xy = 212$

$\Sigma x^2 = 366$ $\Sigma y^2 = 412$ $N = 68$

$dx = \frac{\Sigma x}{N} = \frac{28}{68}$ $dy = \frac{\Sigma y}{N} = \frac{2}{68}$

$dx = .41$ $dx^2 = .168$ $dy = .03$ $dy^2 = .0009$

$\sigma_x^2 = \frac{\Sigma x^2}{N} - dx^2$ $\sigma_y^2 = \frac{\Sigma y^2}{N} - dy^2$

$= \frac{366}{68} - .168$ $= \frac{412}{68} - .0009$

$\sigma_x = 2.283$ $\sigma_y = 2.46$

$$r = \frac{\Sigma xy/N - dx \cdot dy}{\sigma_x \sigma_y}$$

$$= \frac{3.118 - .0123}{5.609}$$

$$= \frac{3.106}{5.609}$$

$r = .554$

(P.E = .057)

X-variable "Term Exam" Marks Dec. 1923

Y-variable Qualifying Marks June 1923

Subjects School "D"

Computer M.I. checked by D.A.R.

p. 32

The foregoing correlations between Term and Qualifying Marks are here tabulated.

School.	A.	·692
	B.	·791
	C.	·705
	D.	·554

Correlation results however have to be used with considerable caution. The very ease with which the formula may be employed is apt to produce misleading results, owing to their application to data which have not been scientifically collected.

To decide whether the data have been so collected and whether a sufficient number of cases has been examined to justify the result, a futher calculation of the "Probable Error" has to be made.

"A coefficient of correlation has little or no significance unless it is at least two to five times as great as its probable error. A coefficient five times as great as the probable error occurs by chance only once in 1000 trials: accordingly where a high correlation such, for instance, as would give a coefficient -- $r = \cdot 50$, obtains between two functions, its/

its existence may be satisfactorily demonstrated by about a dozen cases. A coefficient only twice as large as the probable error occurs about once in six times by mere chance. Hence such small coefficients can but suggest, not prove, the existence of real correspondences. "**

The Probable error for the correlation based on the Pearson formula is obtained from the further formula

$$P.E. = \frac{\cdot 6745\ (1 - r^2)}{\sqrt{n}}$$

The P.E. for the various schools worked out as follows:-

School	A.	·0329
	B.	·0318
	C.	·0319
	D.	·057

The final results, therefore, are:-

School	A.	r =	·692	which is	21 times	P.E. =	·0329
	B.	r =	·791	" "	25 "	P.E. =	·0318
	C.	r =	·705	" "	22 "	P.E. =	·0319
	D.	r =	·554	" "	9·7 "	P.E. =	·057

All/

** British Journal of Psychology Vol. 111. P 109. and Dr. Rusk's "Experimental Education". P. 19.

All the correlation coefficients, therefore, were sufficiently high above the probable error to be significant.

One point which is notable in the above results is that the Qualifying marks of School B. which rated its pupils so stringently, showed the highest correlation (·791) with the Term Examination marks; whereas those from School D. whose pupils at the Qualifying Examination were marked so liberally had the lowest correlation (·554) with the First Term marks.

That is to say School B. had not only marked its pupils most severely but had them arranged, so far as one could judge from comparison with the Term Examination, in the best order of merit, and School D. the easy marker, had the worst order of merit.

However interesting these correlation results might be in themselves, or however valuable they might prove later, it was evident at this stage of the discussion, that the Correlation results, although decidedly suggestive, afforded no definite conclusions regarding the validity of the Qualifying Marks as compared with those of the Term Examinations.

In/

In order, therefore, if possible to arrive at some satisfactory finding, it seemed necessary that another investigation on different lines should be tried and the result so obtained used as an arbiter between the two conflicting sets of figures.

Consequently it was decided that a group Intelligence Test should be given to all the pupils who qualified in June, 1923. To attempt with so many pupils individual tests was out of the question, so after talking the matter over with Dr. Boyd, it was agreed to set the American National Group Intelligence Tests,** both Form A. and Form B. of which an English Version had just been published.

Note: It might have been better to have given Standardised Tests in English and Arithmetic. The Qualifying Examination and the Term Examination were both achievement tests, and a test that was to act as arbiter should logically have been of a similar nature.

It must however be understood that standardised tests of attainment with norms for British (and especially Scottish) pupils were not available in 1923.

Dr. Cyril Burt's "Northumberland Standardised Tests" (1925 Series) has removed this deficiency.

Numerous American Standardised Tests were certainly available notably those of Starch, Ayres, Thorndike, Haggarty, Hillegas, Courtis and Whipple; but they did not hold out the hope that either/

Cyril Burt:- Northumberland Standardised Tests (1925 Series), University of London, Press.

** National Intelligence Tests - Harrap.

either the context or the norms would suit Scottish pupils. The National Intelligence Tests however seemed to be trustworthy.

To secure uniformity these Tests were all given by one person during the week preceding the First Term Examination in December.

After the papers had been marked and the total score for each pupil obtained, the median score for each age represented was ascertained. In their instructions the National Research Council state:

> "Median or average scores for grade, age and other groups are indispensable in using Group Intelligence Tests. They show the teachers what may be reasonably expected of the typical school child of a certain grade, age or other specified group."

The majority of children under review fell into the two groups - those aged 12 and those aged 13. The numbers of children 11 years old and 14 years old were so small that they did not form representative groups.

The following pages give the details of this investigation.

Medians are calculated according to

H.O. Rugg "Statistical Methods applied to Education". pp 110 - 114.

Note: Rugg calls particular attention to the fact that $\frac{N}{2}$ gives the correct median. On p.112 he says: "the definition of the median as the $\left(\frac{N+1}{2}\right)$ th. measure leads to inconsistemt results."

Chapter 1V.

INTELLIGENCE TESTS

The "NATIONAL"

Age 12 years.

NATIONAL INTELLIGENCE TESTS.

	Form A. Median 115·1		Form B. Median 113·2	
155 - 159	I	1		
150 - 154	III	3		
145 - 149	II	2		
140 - 144	𝍸 - I	6	II	2
135 - 139	𝍸 - III	8	𝍸 - I	6
130 - 134	𝍸 - III	8	𝍸	5
125 - 129	𝍸 - 𝍸	10	𝍸 - 𝍸 - III	13
120 - 124	𝍸 - 𝍸 - 𝍸	15	𝍸 - 𝍸 - 𝍸 - 𝍸 - II	22
115 - 119	𝍸 - 𝍸 - 𝍸 - III	(18)	𝍸 - 𝍸 - 𝍸	15
110 - 114	𝍸 - 𝍸 - I	11	𝍸 - 𝍸 - 𝍸 - III	(18)
105 - 109	𝍸 - 𝍸 - II	12	𝍸 - 𝍸 - IIII	14
100 - 104	𝍸 - III	8	𝍸 - 𝍸 - II	12
95 - 99	𝍸 - 𝍸 - I	11	𝍸 - 𝍸 - 𝍸 - III	18
90 - 94	𝍸 - III	8	III	3
85 - 89	𝍸 - III	8	IIII	4
80 - 84	III	3	𝍸	5
75 - 79	III	3	II	2
70 - 74	II	2		
65 - 69	II	2		
60 - 64	I	1		
59 & under	I	1		

70 pupils

58 pupils

N = 141

$\frac{N}{2}$ = 70·5

Median = $115 + \frac{·5 \times 5}{18}$

115·1

N = 139

$\frac{N}{2}$ = 69·5

Median = $110 + \frac{11·5}{18} \times 5$

$110 + \frac{57·5}{18}$

110 + 3·2

113·2

Age 13 years.

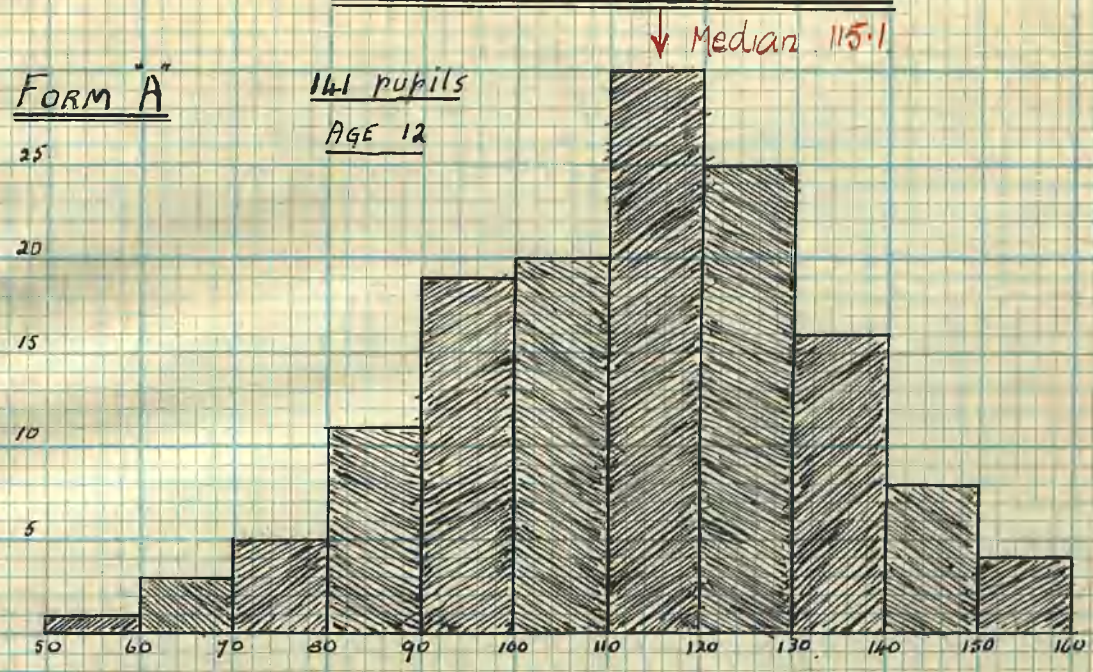
NATIONAL INTELLIGENCE TESTS.

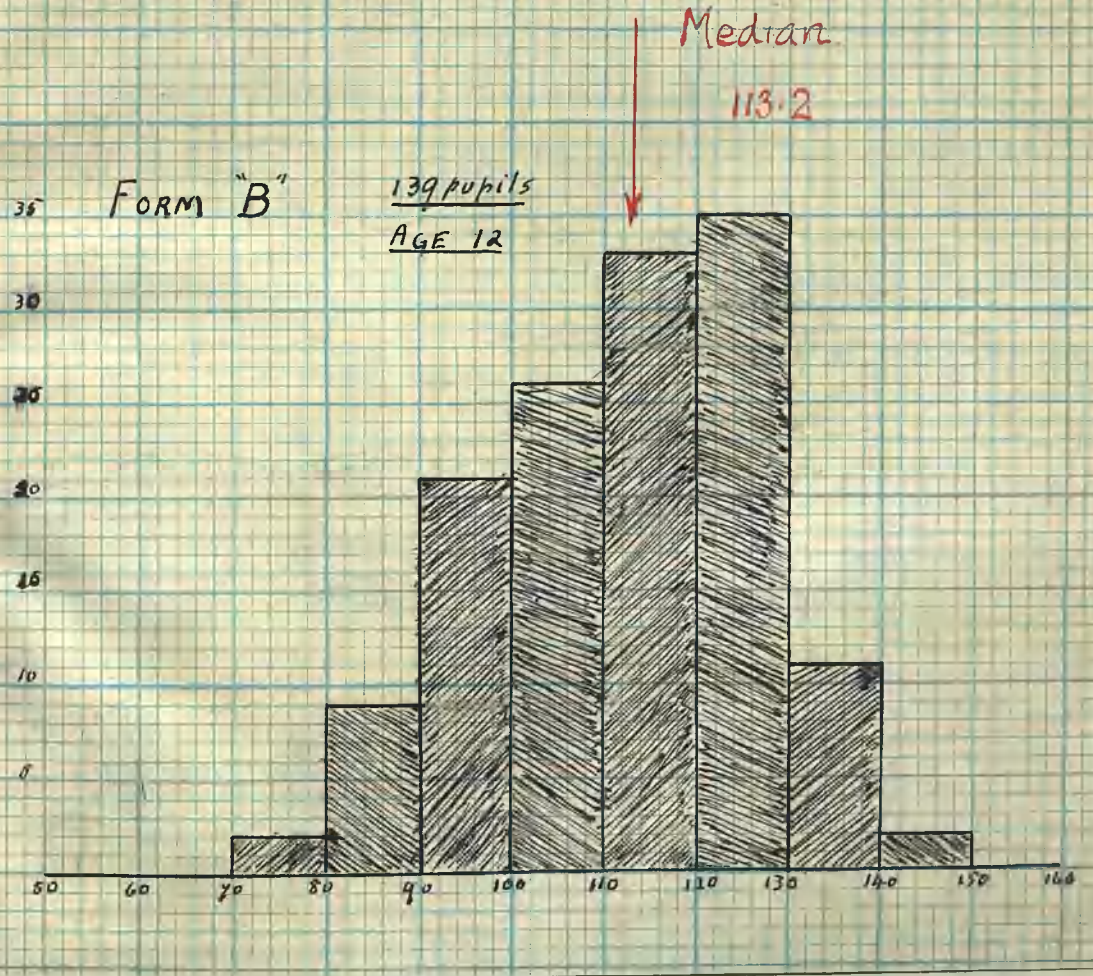
	Form A.		Form B.	
		Median 115·3		Median 113·2
165 - 170	I	1		
160 - 164	II	2		
155 - 159	III	3		
150 - 154	III	3	I	1
145 - 149	III	3	III	3
140 - 144	𝍸 - IIII	9	IIII	4
135 - 139	𝍸 - 𝍸 - 𝍸 - III	18	𝍸 - I	6
130 - 134	𝍸 - 𝍸 - 𝍸 - IIII	19	𝍸 - 𝍸 - 𝍸 - III	18
125 - 129	𝍸 - 𝍸 - 𝍸 - I	16	𝍸 - 𝍸 - 𝍸 - 𝍸 - 𝍸 - II	27
120 - 124	𝍸 - 𝍸 - 𝍸 - 𝍸 - 𝍸 - 𝍸	(30)	𝍸 - 𝍸 - 𝍸 - 𝍸 - 𝍸 - 𝍸	31
115 - 119	𝍸 - 𝍸 - 𝍸 - 𝍸 - 𝍸 - 𝍸	(30)	𝍸 - 𝍸 - 𝍸 - 𝍸 - 𝍸 - 𝍸 - IIII	34
110 - 114	𝍸 - 𝍸 - 𝍸 - 𝍸 - I	21	𝍸 - 𝍸 - 𝍸 - 𝍸 - 𝍸 - III	(28)
105 - 109	𝍸 - 𝍸 - 𝍸 - 𝍸 - IIII	24	𝍸 - 𝍸 - 𝍸 - 𝍸 - 𝍸 - 𝍸 - 𝍸	40
100 - 104	𝍸 - 𝍸 - 𝍸 - 𝍸 - II	27	𝍸 - 𝍸 - 𝍸 - III	18
95 - 99	𝍸 - 𝍸 - 𝍸 - II	17	𝍸 - 𝍸 - 𝍸 - IIII	24
90 - 94	𝍸 - IIII	9	𝍸 - 𝍸 - 𝍸 - I	16
85 - 89	𝍸 - 𝍸 - 𝍸 - I	16	𝍸 - III	8
80 - 84	𝍸 - IIII	9	𝍸 - I	6
75 - 79	II	2	II	2
70 - 74	III	3	II	2
65 - 69	II	2	I	1
60 - 64		N = 264		N = 268
		$\frac{N}{2}$ = 132		$\frac{N}{2}$ = 134
		Median = $115 + \frac{2}{30} \times 5$		Median = $110 + \frac{18}{28} \times 5$
		115·3		113·2.

130 pupils

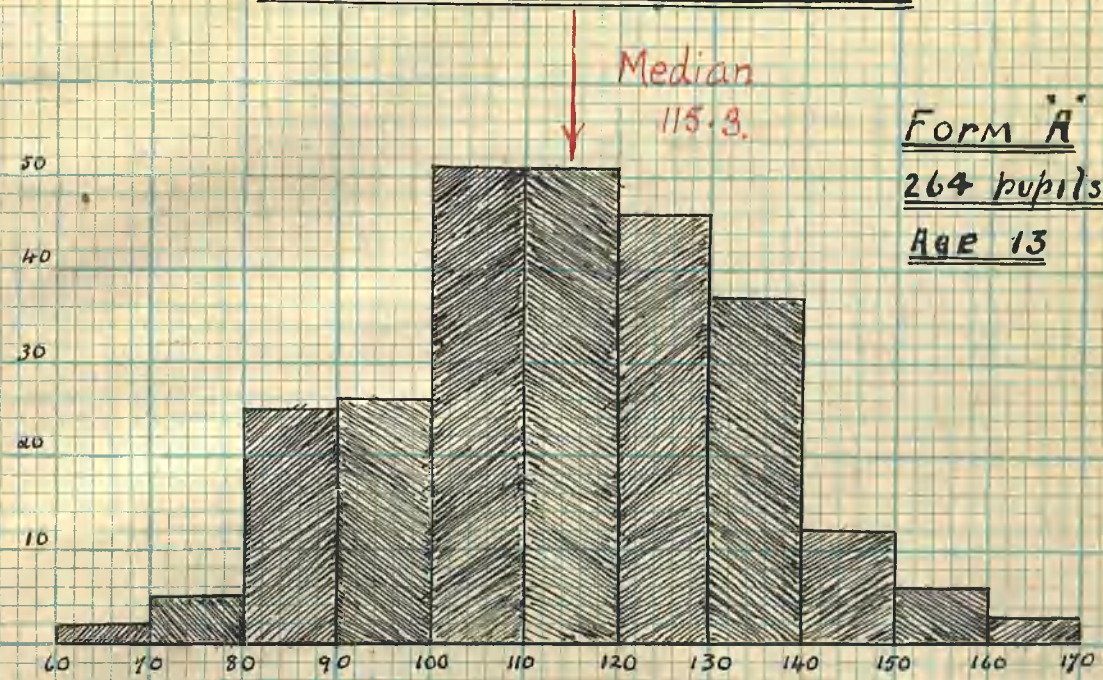
116 pupils

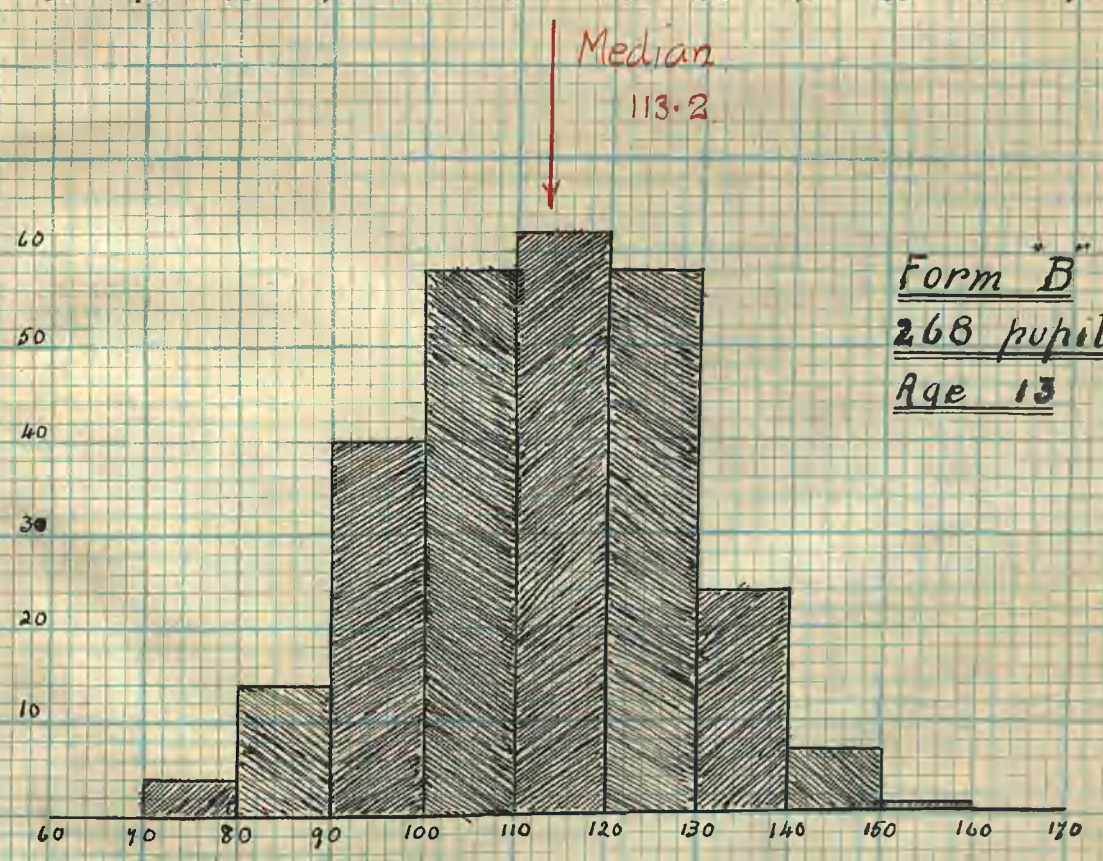
Graph of Intelligence Tests





Graph of Intelligence Tests





It is remarkable that the median scores for the pupils 12 years of age, and those of 13 years of age were the same.

	Form A.	Form B.
12 years.	Median 115·1	Median 113·2
13 "	" 115·3	" 113·2

The corresponding norms in the "National" Tests made at Washington and Pittsburg are listed as under:-

Washington.

	Form A.	Form B.
Age 12.	(280 pupils) 113	Median 111.
13.	(252 ") 119	" 119

Pittsburg.

Age 12.	(169 ") 113	" 113
13.	(182 ") 128	" 129

Perhaps the equality in scoring in our case arose from the fact that the 13 years old pupils were not a perfectly representative group, but pupils who had been retarded in the Primary School and were judged to be on the same level as the pupils 12 years old. If this was so then the Primary Schools were correct in their judgment. If one examines the spread of the marks, it is noticeable that some 13's have by far the highest marks and none fall so low as some of the 12's.

Chapter V.

COMPARISON of "NATIONAL" with "QUALIFYING" and FIRST TERM RESULTS

With the scores for the "National" Intelligence Tests available one's task was now to reconsider the relation between the Qualifying Marks and the First Term Marks.

One desired especially to consider individual cases where Qualifying and Term Marks disagreed widely, and by taking the "National" as arbiter, to arrive, if possible, at some finding with regard to the value of Qualifying and Term Marks.

Various methods of approach suggested themselves. One method now extensively used to determine a person's relative position by rank, is to express his absolute rank in terms of "percentile rank".

In this case one states the rank the person would have if there were one hundred members in the group. The first influential educational use of the percentile rank method of scoring was made by Woolley (1) in her series of tests at Cincinnati. The method of scoring was later adopted by Pintner and Paterson in their scale of performance tests, by Pintner in his "Mental Survey", by Seashore in his music tests and by others.

An/

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(1) See - F. Freeman "Mental Tests" page 284-5.

An elaborate method of calculating and interpreting percentile ranks is given by Prof. Thurstone in an article in the Journal of Educational Psychology for October, 1922.[1] These calculations involve the use of a calculating machine and he advocates the drawing of a percentile curve so that one "can therefore read directly from the chart the percentile range for each class interval."

The advantages of a percentile curve are thus set forth by Otis.[2] " A percentile curve shows at a glance not only the median score of a class but also the range and variability of the scores. It shows at a glance what per cent of the scores of a class is exceeded by the score of any given individual, and just what per cent of the class attains or exceeds any given score."

Two or more curves on the same graph are very useful, not only as a means of giving a convenient measure of the position of an individual in a distribution; but of comparing the individual's position in different distributions.

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(1) "The Calculation and Interpretation of Percentile Ranks." L.L. Thurstone. Journal of Education Psychology. 1922. Vol.6. pp 225 sq.

(2) A.S. Otis. "Manual of Directions." and Key to Self Administrative Tests of Mental Ability." World Book Co. 1922.

Prof. Freeman in his recent book on "Mental Tests" says "The Percentile rank has the advantage of simplicity and convenience. It has the theoretical defect however that it assumes the rectangular distribution of abilities instead of the normal distribution to which the distribution of abilities in fact more nearly conforms. To illustrate, according to the normal distribution, the lowest ten per cent of a group of individuals would cover a much wider range of the scale, which is represented by the base line of the distribution than would a ten per cent group near the centre of the distribution. By the rectangular distribution however, the ten per cent at the low end or the high end of the scale would cover the same distance as the ten per cent in the middle. As a consequence, the percentile method is not suitable for precise scoring." (1)

However, as has already been remarked, in this investigation one was concerned not so much with very precise scoring as with the settlement of the point whether the First Term mark or the Qualifying mark, especially in cases where there were wide divergences, gave the better result when compared with the National Intelligence Test marks.

There follows:-

(1) Percentile Graph showing (a) Intelligence Test marks, (b) Qualifying Examination marks, (c) First Term Marks.

(2) Correlation of "Qualg" and "National" marks.

(3) " "Term" " "National" "

(4) " "Term" " "Qualifying" "

(5) Cases of outstanding differences.

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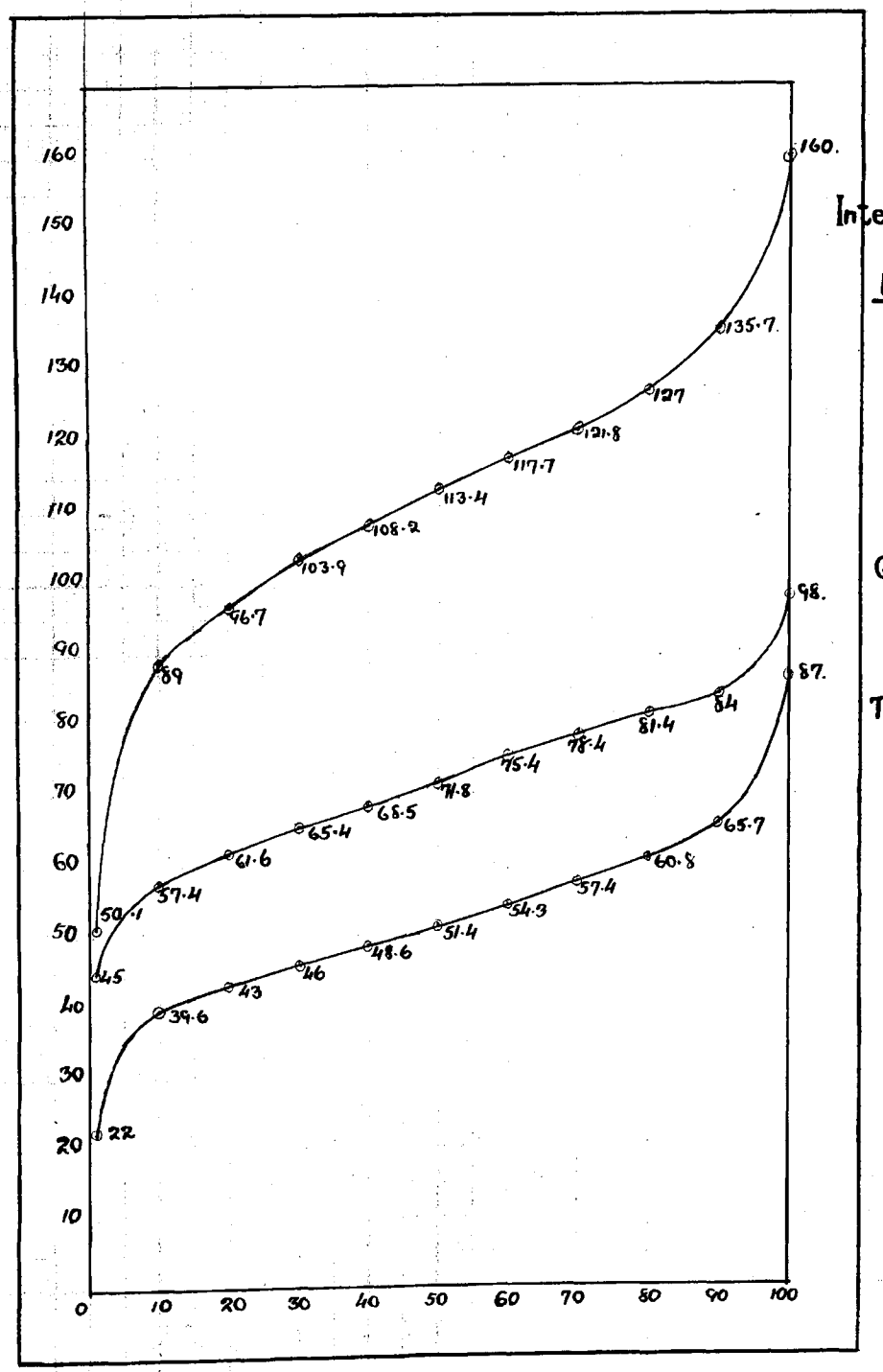
(1) "Mental Tests". Frank N. Freeman. pp 285 (Harrup)

Percentile Graphs.

1923



Intelligence.

$\frac{A+B}{2}$

Qualifying.

Term.

Note. A percentile Graph Chart prepared by Prof. W.S. Miller, University of Minnesota is filed with this Thesis.

The complete use of this chart is explained in an article "The Administrative Use of Intelligence Tests in the High School."
(21st. year book of National Society for the Study of Education. pp 189 - 222.)

There are also filed data showing all the scores reduced to percentiles.

	45	50	55	60	65	70	75	80	85	90	95
	49·9	54·9	59·9	64·9	69·9	74·9	79·9	84·9	89·9	94·9	99·9
X	5	4	3	2	1	0	1	2	3	4	5
f	3	19	46	55	74	65	76	66	29	14	3
x	5	4	3	2	1	0	1	2	3	4	5
fx	15	76	138	110	74	0	76	132	87	56	15
fx^2	75	304	414	220	74	0	76	264	261	224	75

		f	y	fy	fy^2	Σx −	Σx +	Σy −	Σy +	Σxy −	Σxy +
168	–										
161	167·9										
154	160·9	3	6	18	108		7		7		42
147	153·9	6	5	30	150		18		18		90
140	146·9	10	4	40	160		29		29		116
133	139·9	25	3	75	225	11	38		27		81
126	132·9	44	2	88	176	16	54		38		76
119	125·9	73	1	73	73	34	88		54		54
112	118·9	78	0	0	0	78	52		26		0
105	111·9	74	1	74	74	70	30	44			148
98	104·9	47	2	94	188	54	12	42			84
91	97·9	49	3	147	441	69	28	41			123
84	90·9	25	4	96	384	33	8	25			100
77	83·9	11	5	55	275	24	2	22			110
70	76·9	5	6	30	180	15	–	15			90
63	69·9	1	7	7	49	0	0	0			

$\Sigma x_{pos.} = 366$ $\Sigma y_{pos.} = 374$ $\Sigma xy_{pos.} = 1015$

$\Sigma x_{neg.} = 413$ $\Sigma y_{neg.} = 503$ $\Sigma xy_{neg.} = 0$

$\Sigma x = -47$ $\Sigma y = -179$ $\Sigma xy = 1015$

$\Sigma x^2 = 1987$ $\Sigma y^2 = 2483$ $N = 450$

$dx = \frac{\Sigma x}{N} = \frac{-47}{450}$ $dy = \frac{\Sigma y}{N} = \frac{-179}{450}$

$dx = -.104$ $dx^2 = .011$ $dy = -.397$ $dy^2 = .16$

$\sigma x^2 = \frac{\Sigma x^2}{N} - dx^2$ $\sigma y^2 = \frac{\Sigma y^2}{N} - dy^2$

$= \frac{1987}{450} - .011$ $= \frac{2483}{450} - .16$

$= 4.415 - .011$ $= 5.57 - .16$

$\sigma x = 2.09$ $\sigma y = 2.31$

$$r = \frac{\frac{\Sigma xy}{N} - dx \cdot dy}{\sigma x \cdot \sigma y}$$

$$= \frac{\frac{1015}{450} - (-.104)(-.397)}{(2.09)(2.31)}$$

$$= \frac{2.21}{4.83}$$

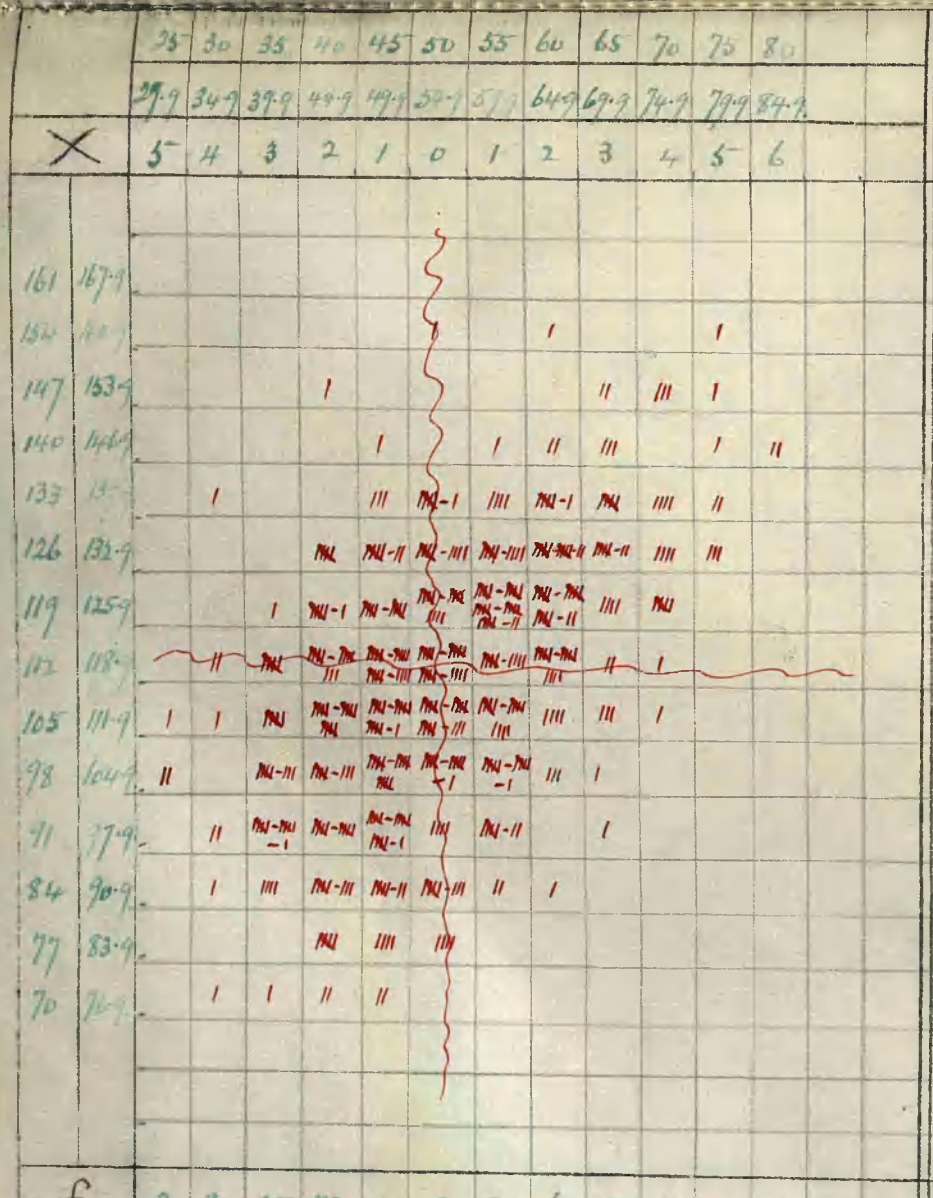
$r = .46 \pm .022$

X-variable Qualifying Marks 1923

Y-variable National Intelligence Tests 1923

Subjects

Computer M.L. checked by D.A.R.



f	3	8	35	73	100	94	84	60	28	18	8	2
X	5	4	3	2	1	0	1	2	3	4	5	6
fx	15	32	105	146	100	0	84	120	84	72	40	12
fx^2	75	128	315	292	100	0	84	240	252	288	200	72

f	y	fy	fy^2	Σx −	Σx +	Σy −	Σy +	Σxy −	Σxy +	
3	6	18	108		7		7			42
7	5	35	175	2	23		21			105
10	4	40	160	1	31		30			120
31	3	93	279	7	57		50			150
56	2	112	224	17	85		68			136
84	1	84	84	25	93		68			68
84	0	0	0	68	47	21				0
78	1	78	78	70	35	35				35
59	2	118	236	65	20	45				90
51	3	153	459	77	10	67				201
31	4	124	496	39	4	35				140
13	5	65	325	14	–	14				70
6	6	36	216	13	–	13				78

$\Sigma x_{pos.} = 412$ $\Sigma y_{pos.} = 382$ $\Sigma xy_{pos.} = 1235$

$\Sigma x_{neg.} = 398$ $\Sigma y_{neg.} = 574$ $\Sigma xy_{neg.} = 0$

$\Sigma x = 14$ $\Sigma y = -192$ $\Sigma xy = 1235$

$\Sigma x^2 = 2046$ $\Sigma y^2 = 2840$ $N = 513$

$dx = \frac{\Sigma x}{N} = \frac{14}{513}$ $dy = \frac{\Sigma y}{N} = \frac{-192}{513}$

$dx = .027$ $dx^2 = .0007$ $dy = -.374$ $dy^2 = .14$

$\sigma x^2 = \frac{\Sigma x^2}{N} - dx^2$ $\sigma y^2 = \frac{\Sigma y^2}{N} - dy^2$

$= \frac{2046}{513} - .0007$ $= \frac{2840}{513} - .14$

$= 3.99 - .0007$ $= 5.54 - .14$

$\sigma x = 1.99$ $\sigma y = \frac{5.4}{2.3}$

$$r = \frac{\frac{\Sigma xy}{N} - dx \cdot dy}{\sigma x \cdot \sigma y}$$

$$= \frac{\frac{1235}{513} - (.027)(-.374)}{(1.99)(2.3)}$$

$$= \frac{2.407 + .010}{4.6}$$

$$r = \frac{2.397}{4.6}$$

$$.525 \pm .021$$

X-variable Term Examination 1923

Y-variable National Intelligence Tests 1923

Subjects

Computer M. checked DMK.

	25	30	35	40	45	50	55	60	65	70	75	80
	29·9	34·9	39·9	44·9	49·9	54·9	59·9	64·9	69·9	74·9	79·9	84·9
X	5	4	3	2	1	0	1	2	3	4	5	6
95 98·9		1					1					1
91 94·9							II	I		III	III	
87 90·9					I	I	II	𝍸	IIII	II	I	I
83 86·9			I	II	𝍸-I	I	𝍸-II	𝍸-III	𝍸-I	IIII	II	
79 82·9		I	II	IIII	IIII	𝍸-𝍸	𝍸-𝍸	𝍸-IIII	𝍸-I	II		
75 78·9		I	IIII	𝍸-II	𝍸-I	𝍸-𝍸 I	𝍸-𝍸 I	𝍸-𝍸	III	I		
71 74·9		I	II	𝍸	𝍸-𝍸	𝍸-𝍸 II	𝍸-II	II	I		I	
67 70·9		I	II	𝍸-𝍸	𝍸-𝍸 IIII	𝍸-𝍸	𝍸-II	III	I			
63 66·9			I	𝍸-IIII	𝍸-𝍸 -I	𝍸-𝍸 IIII	𝍸	II	I	I		I
59 62·9		I		𝍸	𝍸-𝍸 -I	𝍸-𝍸 𝍸-I	𝍸-𝍸	I				
54 58·9		I	I	III	𝍸-𝍸 -I	𝍸-II	IIII	𝍸	II	I		
50 53·9				III	I	𝍸-II	II	I				
46 49·9			I									
42 45·9				I								

	3	9	34	68	85	78	65	43	23	12	8	2
f												
X	5	4	3	2	1	0	1	2	3	4	5	6
fx	15	36	102	136	85	0	65	86	69	48	40	12
fx^2	75	144	306	272	85	0	65	172	207	192	200	72

f	y	fy	fy^2	Σx −	Σx +	Σy −	Σy +	Σxy −	Σxy +
3	7	21	147	4	7		3		21
9	6	54	324		31		31		186
17	5	85	425	1	43		42		210
38	4	152	608	13	69		56		224
49	3	147	441	22	54		32		96
65	2	130	260	36	49		13		26
146	1	146	146	30	19	11		11	
58	0	0	0	72	16	56			0
45	1	45	45	67	12	53			55
49	2	98	196	58	7	51			102
35	3	105	315	47	12	35			105
14	4	56	224	18	1	17			68
1	5	5	25	4	0	4			20
1	6	6	36	2	0	2			12

$\Sigma x_{pos.} = 320$ $\Sigma y_{pos.} = 635$ $\Sigma xy_{pos.} = 1125$

$\Sigma x_{neg.} = 374$ $\Sigma y_{neg.} = 315$ $\Sigma xy_{neg.} = 11$

$\Sigma x = -54$ $\Sigma y = 320$ $\Sigma xy = 1114$

$\Sigma x^2 = 1790$ $\Sigma y^2 = 3092$ $N = 430$

$dx = \frac{\Sigma x}{N} = \frac{-54}{430}$ $dy = \frac{\Sigma y}{N} = \frac{320}{430}$

$dx = -.125$ $dx^2 = .016$ $dy = .74$ $dy^2 = .55$

$\sigma x^2 = \frac{\Sigma x^2}{N} - dx^2$ $\sigma y^2 = \frac{\Sigma y^2}{N} - dy^2$

$= \frac{1790}{430} - .016$ $= \frac{3092}{430} - .55$

$= \frac{4.162 - .016}{4.146}$ $= \frac{7.19 - .55}{6.64}$

$\sigma x = 2.03$ $\sigma y = 2.58$

$$r = \frac{\frac{\Sigma xy}{N} - dx \cdot dy}{\sigma x \cdot \sigma y}$$

$$= \frac{\frac{1114}{430} - (-.125)(.74)}{(2.03)(2.58)}$$

$$= \frac{2.59 + .092}{5.24}$$

$$r = \frac{2.682}{5.24}$$

$$.51 \pm .025$$

X-variable Term marks Dec 1923

Y-variable Qualifying Marks all Schools 1923

Subjects

Computer M. checked by D.A.K.

The summary of the preceding pages shows the following correlations:-

"Term" with "Qualifying".	·51	±	·025
"Qualifying" with "National".	·46	±	·022
"Term" with "National".	·525	±	·021

The "National Intelligence" therefore showed a slightly better correlation with the Term mark than with the "Qualifying".

The correlation of "Term" with "National" is as high as one expects between an "Intelligence" and an achievement test.(1)

One however was naturally more concerned with individual cases where Term and Qualifying marks were widely at variance.

All those who showed in percentile rank a difference of 30% were compared with the percentile mark given by the "National".

Note./

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(1) See Arthur I. Gates. "Correlations of Achievement in School Subjects with Intelligence Tests and Other Variables." where average correlation is found to be round about ·5 .
Journal of Educational Psychology. Vol. 13 pp. 277-85. 1922

Note. The choice of 30% is quite arbitrary. From an empirical study of the percentile graphs it is evident, from their flat contour, that it requires 30% at least to show a decided difference in marks, to take less might lead one into doubtful conclusions.

Original data will be filed with this Thesis showing all the pupils' percentile marks, with an index mark placed opposite those pupils whose Term and Qualifying percentile marks differed 30% or more.

Of the 104 cases so found

(a) "National Intelligence Test favoured the Qualifying 31
(b) " " " " " Term. 73

That is to say the "National" score was in agreement with that of the Qualifying in 29·8% of the cases and in 70·2% of the cases in the Term. .

The large amount of calculation necessary to arrive at these results, makes a simpler method of procedure desirable.

One had found sufficiently accurate for all practical purposes the arrangement of pupils in seven groups or grades for each set of marks. This seven-fold grouping has this further advantage that it corresponds with the grading usually adopted in ordinary class work when pupils are allocated letter marks.

A, B, C+, C, C-, D and E.

In/

In principle the method is the same as the percentile method, the range of marks from the lowest to the highest as extremes, being divided into seven groups instead of ten in the percentile method. The advantage is the same in both methods - there is a common basis of comparison. The same disadvantage however pertains to both methods - the groups at the top and the bottom cover the same distance as the group in the middle, although in a normal distribution the lowest and the highest groups cover a much wider range than a similar group in the middle of the distribution.

SEVEN FOLD GROUP TABLE.

Group.	Qualifying.	Term.	Intelligence.
1.	88% and over.	75% and over.	146 and over.
2.	81% - 87%	67% - 74%	133 - 145
3.	74% - 80%	59% - 66%	120 - 132
4.	67% - 73%	51% - 58%	107 - 119
5.	61% - 67%	43% - 50%	94 - 106
6.	54% - 60%	35% - 42%	81 - 93
7.	Below 53%	Below 35%	Below 80

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PUPILS SHOWING A DIFFERENCE OF 3 GRADES BETWEEN QUALIFYING AND TERM MARKS.

Class.	No.	Pupil.	Qualg. Mark.	Term Mark.	Intell. Test Mark.	Qual. & Int. Agree.	Term & Int. Agree.
1a.	1.	Hamilton, W.	89 (1)	49 (5)	142 (2)	Yes.	-
	2.	McWilliams, J.	81 (2)	41 (6)	131 (3)	Yes.	-
	3.	Smyth, Wm.	82 (2)	36 (6)	120 (3)	Yes.	-
	4.	Ryrie, Jas.	77 (3)	31 (7)	112 (4)	Yes.	-
	5.	Todd, Robert,	82 (2)	47 (5)	102 (5)	-	Yes.
1b.	6.	Anderson, J.	80 (3)	34 (7)	86 (6)	-	Yes
	7.	Coull, D.	85 (2)	47 (5)	123 (3)	Yes.	-
	8.	Hyde, G.	83 (2)	47 (5)	96 (5)	-	Yes
	9.	Sinclair, J.	90 (1)	51 (4)	123 (3)	-	Yes
	10.	Wilson, Margt.	85 (2)	46 (5)	106 (5)	-	Yes
1c.	11.	Finnick, E.	77 (3)	44 (5)	97 (5)	-	Yes
1e.	12.	Grozier, H.	90 (1)	56 (4)	112 (4)	-	Yes
1f.	13.	Ellis, Robt.	58 (6)	62 (3)	107 (4)	-	Yes
	14.	Ferrier, Jas.	63 (5)	75 (1)	138 (2)	-	Yes
	15.	Morrison, D.	65 (5)	68 (2)	137 (2)	-	Yes
1g.	16.	Dyball, Matt.	76 (3)	41 (6)	92 (6)	-	Yes
1h.	17.	Dick, Ena,	81 (2)	43 (5)	108 (4)	-	Yes
1k.	18.	Orr, Minnie,	69 (4)	28 (7)	106 (5)	Yes	-
	19.	Todd, Chris.	76 (3)	38 (6)	103 (5)	-	Yes
1L.	20.	Merriles, M.	83 (2)	47 (5)	97 (5)	-	Yes
	21.	Mort, J.	85 (2)	45 (5)	135 (2)	Yes	-
	22.	Thomson, E.	81 (2)	39 (6)	91 (6)	-	Yes
	23.	Smith, Cath.	76 (3)	37 (6)	98 (5)	-	Yes
	24.	Wilson, H.	85 (2)	47 (5)	93 (6)	-	Yes
	25.	Hamilton, A.	51 (7)	52 (4)	114 (4)	-	Yes
	26.	Caldwell, E.	74 (3)	35 (6)	87 (6)	-	Yes
	27.	McNab, S.	71 (4)	34 (7)	68 (7)	-	Yes
1m.	28.	Hamilton, Annie,	51 (7)	52 (4)	114 (4)	-	Yes
A.	29.	Fairley, T.	52 (2)	59 (5)	108 (5)	-	Yes
	30.	Brown, H.	85 (2)	44 (5)	95 (5)	-,	Yes
B.	31.	Finch, Ed.	53 (7)	64 (3)	128 (3)	-	Yes
	32.	Milligan, Alex.	53 (7)	60 (3)	120 (3)	-	Yes
C.	33.	Robb, J.	69 (4)	31 (7)	97 (6)	-	Yes
	34.	Benjamin, A.	76 (3)	42 (6)	102 (5)	-	Yes
2h.	35.	Campbell, A.	76 (3)	36 (6)	90 (6)	-	Yes
	36.	Gunningham, R.	56 (6)	66 (3)	124 (3)	-	Yes
C.	37.	McDonald, A.	85 (2)	40 (6)	104 (5)	-	Yes

The results of the investigation by this method may be summarised thus: The Intelligence Tests were used as a deciding factor in cases where the Qualifying Marks and the Term Marks differed by 3 grades or by 2 grades.

Grades of difference between Qualg. and Term Results.		Qualg.	Term.	Total.
3	Intelligence Tests favoured.	7	30	37
2	" " "	12	29	41
		19	59	78

(No decision in 2 grade investigation in 20 cases.)

That is to say, out of 78 cases where a definite decision was possible the Intelligence Test bore out the Term Examination Marks 59 times and the Qulaifying 19 times.

Stated as a percentage the Intelligence Test decided in favour of the Term in 75·6% of the cases submitted, and in favour of the Qualifying 24·4%, a result which is in substantial agreement with the conclusion already reached. (p 51).

It is evident from all the foregoing, that, although there has been a very large measure of correspondence (correlation) between the Qualifying

Examination/

Examination and the Term Examination, there has been in practically one-fourth of the cases (104 out of 407, see page 51.) a serious discrepancy. The National Intelligence Tests seem to bear out the fact that in these cases of divergence , the Term marks were nearer the truth and more reliable than the Qualifying mark. One does not wish to dogmatise on this; but sufficient evidence has been cited to make one hesitate to place full confidence in a Qualifying Examination conducted on the lines indicated.

If the Qualifying mark alone is going to decide the future course of the pupil, then one must have confidence that the mark is as just and reliable as one can make it.

One cannot sufficiently emphasize the importance of proper grading at the beginning of the Secondary Course. If a pupil is placed in a Grade or Course beyond his ability, the resultant failure and retardation have tremendously discouraging effects on the pupil's mind and outlook. Enthusiasm is checked and self-confidence is shaken. The pupil regards himself as a failure when asked to go into a lower section or into a less ambitious course.

On the other hand, sometimes it is extremely difficult from a practical point of view to advance a child/

child; for, once settled in a Course, it is not too easy to join him up with pupils who have, at the beginning started additional or different subjects. For example, a pupil who has been put into a Non-lamguage Section may, even a few months later, find it a severe handicap to link up with those in a Language Section.

It is imperative, therefore, that as few mistakes as possible in diagnosis of ability should be made at the beginning of the Secondary School Course.

This takes us back again, therefore, to the conditions which govern the Qualifying Examination, not only in the particular area under review, but generally all over Scotland, and since the matter is one of prime importance for the Secondary School, some definite guiding principles may be formulated based on the experience of the present investigations.

It will be remembered that the E.I.S. Research Committee recommended ** that the best method of conducting the Qualifying Examination was by a County Board which included both head teachers and other teachers of both sending and receiving schools.

These conditions, with one important reservation, existed in the Qualifying Examination under consideration. Here, according to the E.I.S. Research Committee, were all the elements which might guarantee success - a County Board composed of Head and other Teachers from both sending and receiving schools, the Executive Officer, members of the Authority and H.M. Inspector; all resolved to get the fairest and most reliable results. And yet - what did one find? : (1) wide variations in standard of marking/

** See page 17.

marking between school and school, (2) within certain schools pupils marked highly who were proved to be unworthy of high marks and vice-versa, (3) pupils allocated to courses which they could not successfully pursue, and (4) pupils denied, because of severe marking, admission to certain courses for which they had the required ability.

Not for one moment does one doubt the integrity or the desire of the various schools to give the fairest and truest mark to every pupil. That is not the point. That is not where the difficulty or fault, if any, lies.

As long as there is an examination even under the best system, held at various schools, with papers marked by the teachers there, so long will there be variations in standard of marking. The personality of each teacher and the tradition of each school enter into every pupil's mark. Even when justice is meted out between pupil and pupil in the same school, there is still the difficulty that 67% in one school may be equal to 81% in another. (1)

To obviate all this, various remedies have been suggested. (2) New methods of framing examinations, papers such/

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(1) See page 27.

(2) For full discussion of these New Methods see Dr. Ballard's "The New Examiner".

such as the True-false, analogies, completion, etc. where the amount of answer writing is reduced to a minimum, and where the question admits of but one true answer, have on the lines of Group Intelligence Tests, been tried with considerable success.

The time seems ripe when standardised tests in the various subjects of Primary School work should be formulated, tried out and norms established for Scottish Schools.

The American tests of Starch, Ayres, Courtis, Thorn-:dike etc. have not "caught on" in this country, nor are they likely to do so, because of dis-similar educational standards and conditions existing between the two countries. Norms which suit one country may not be suitable for another.

Besides, standards may vary even within the same country if A's scale is used for writing, B's for Reading and C's for Arithmetic.

It would be better not only from the Statistical but also from the not immaterial point of view of expense that one scale should be adopted for all subjects.

This has just recently been done in America where/

where Prof. Terman and his colleagues at Stanford University (1) have issued a comprehensive test embracing all the primary subjects on a uniform scale. Probably for somewhat similar reasons, the excellent tests formulated by Dr. Burt in London, the "Chelsea", and "One Minute" tests of Dr. Ballard, and the "Northumberland Tests" of Prof. Godfrey Thomson, have not made rapid headway in Scotland.

It seems to us a matter of prime and urgent importance that a Scottish National Committee of experts (subsidised if necessary by the Education Department) should at an early date proceed to formulate and issue authoritative standardised tests for use in Scottish Schools

Meanwhile one must use the material already to hand, and attempt to improve existing methods.

Some effort should certainly be made to standardise teachers' marks. One device might be tried to this end, that in marking the Qualifying papers one teacher might mark one question right through all the papers. In a large/

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(1) "Stanford Achievement Test" World Book Co. Yonkers, New York.

large area this would clearly, from sheer numbers, be extremely difficult; but if the numbers were small it would be worth a trial.

The device employed with some success in the marking of Leaving Certificate papers might with profit be utilised:-

(a) In the first instance detailed instructions are issued as to the system of marking, and exact values to be given to each item in a question etc.

(b) Thereafter each examiner's work is tested by the Chief Examiner, and a factor assigned for the increase or reduction of his marks.

A third remedy to improve unsatisfactory estimation and standardisation of marks is one that obviously arises from the investigation detailed in the previous pages of this thesis. If a well-known Intelligence Test like the National had been given to the pupils entering the Secondary School in 1923, then 70% of the extreme discrepances might not have arisen. One says "might not have arisen" advisedly, for the caveat must clearly be borne in mind that even although an Intelligence Test such as the National had been given, the results might have been very different from what our investigation gave.

The conditions of giving the test might vary from school to school. The teachers conducting the test might/

might not all be equally expert, they might not all be scrupulously exact in their instructions to the pupils or in their timing of the tests.

> It is on record that one teacher interrupted an Intelligence Test, given to all the schools in the County, to interview a parent, and continued the Test half an hour later.

Consequently results would be obtained that, from a scientific point of view would be comparatively worthless.

> This statement is doubted by Prof. G. Thomson, and Mr. W.A.F. Hepburn who gave Intelligence Tests to pupils in large areas and had no cause to doubt the efficacy.

There is much to be said for the view that the giving of an Intelligence Test should be deferred until all those pupils who are to run the educational race alongside one another in the same Secondary School can be gathered together and given the same Intelligence Test under the same condition. It would be unfortunate if a child came to a Secondary School labelled with a certain intelligence mark which, owing to the uncertainty or the invalidity of the Group Test itself, or to the variation of conditions under which it was given, might be misleading.

, In the same way it seems equally unfortunate that a child should come to a Secondary School "labelled" with a Qualifying mark which may or may not be a true index of his ability.

And/

And arising out of this there is this further important question. Is it right, is it just, nay is it possible, on the sole evidence of a qualifying mark, to label a pupil at the Qualifying Stage? Is the child at 11+ mature enough for anyone, definitely, to state his capabilities? Does the curriculum of the Primary School offer sufficient scope for that creative, adaptive energy which characterises the really intelligent child? Is it not the case that in the narrower, and necessarily more mechanical curriculum of the Primary School, the less gifted child, by intensive drill and reiteration of the same limited matter may for a time seemingly equal his more gifted rival?

Our whole argument seems to have led us to this conclusion:-

The Qualifying Examination (if there is to be any) should be for the sole purpose of deciding whether the child has sufficiently mastered the mechanical arts of the Primary Curriculum, and is fit to proceed to the wider course offered by the Secondary School. He should proceed there "unlabelled", and not definitely committed to any particular course.

Any marks gained by the child at the Qualifying Stage should be treated with considerable reserve because of/

of the variety of conditions existing in the separate schools and the variations of standards between them.

If marks are given, these should certainly not be altogether neglected; but should be filed away for future reference. These marks should never be determinates, as neither the maturity of the child nor the extent of the Primary School Course warrants anything like a final judgment being come to at this stage.

This opinion is confirmed by the decisive view expressed by the Report of the Consultative Committee of the Board of Education.

> "We desire to call attention to one general conclusion which has impressed itself upon us with steadily increasing force as our enquiries have proceeded: It is that any system of selection whatever, whether by means of psychological tests, or by means of examination, which determines at the age of 11+ the educational future of children is and must be gravely unreliable."
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> (1)

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(1) Report by Consultative Committee on Psychological Tests of Educable Capacity - Page 108.

Chapter VII.

ADVANCED DIVISIONS

and

SECONDARY SCHOOLS.

The recent institution in Scotland of "Advanced Divisions". has given a new importance to this discussion. An endeavour is being made to segregate Post-Qual ifying pupils into two distinct and separate types of school:- Advanced Division Schools, and Secondary Schools, the former offering a two years' course with probable extension to three, and the latter offering courses extending to five or six years.

A new problem has therefore come into prominence, viz. the separation of the Advanced Division type of pupil from the Secondary type.

How is one going to discover the real Secondary pupil? If the problem were purely educational, a straight and satisfactory solution could be suggested; but in the main the question is economic. The ability and the desire of parents to keep their children at school beyond the legal leaving age of 14, are important factors in the discussion. Educationally, however, as conditions are at present, the practice of dividing Post-Qualifying Education into two distinct channels has little to commend it.

If the types of schools were equal and parallel there/

there would be little objection: But it is clear that Advanced Division Schools both in personnel and work are designedly meant to be of an inferior type.

There are many things besides mere intellectual training that a good Secondary School can offer. The mere fact of being one of a great community where older boys and girls, by their presence and example, can give tone and power and guidance, is an inspiration to young minds more open to suggestion and impression from their older comrades than even from their teachers. To deny such facilities to any one because of economic difficulties seems unworthy of Scottish tradition. But if these facilities are denied through any mistaken diagnosis of intelligence at the Qyalifying Stage, then deplorable injustice will be done.

And in the preceding pages enough has been said to prove that mistakes in diagnosis of intelligence are not infrequent at that stage.

If the Secondary School can offer within its walls, curricula varied in aim, in content and in degree; courses parallel yet equal; courses with ever widening orbits round a central core, wherein the pupil of whatever/

whatever talent or grade may find a worthy place and be encouraged upward to a nobler height, then allocation to a school of admittedly inferior status, on doubtful evidence need not and should not take place.

All Post-Qualifying education should be held in equal honour, and should be called by one name "Secondary". (or any other suitable word.) Naturally, Secondary Schools would differ widely from one another both as to courses, which would be framed to suit the requirements of the town or district, and to the duration of these courses. But whatever the course offered or length of these, the schools would rejoice in a common name. In our opinion no more fatal policy has ever been promulgated than the segregation of post-qualifying pupils into "advanced division" pupils and "secondary pupils".

One has considerable sympathy with Dr. Bagley's views as expressed in his "bombshell" address (as Prof. Terman put it) against Educational Determinism -

> "that the right of the individual to share in the spiritual life of the race should not be invaded or invalidated, short of the most conclusive proof that the individual is quite incompetent to avail himself of his share in the human heritage."

"The/

See full discussion: Prof. Terman editorial, "The "Psychological Determinist". June 1922, Journal of Educational Research. pp.57-62

Dr. Bagley's Rejoinder. Same vol. pp 371 - 385.

"The current teachings of educational determinism are dangerous because they proceed with a dogmatic disregard of the possibilities of insuring progress through environmental agencies."

"Nurture" and "nature" are the two great forces at work in developing intelligence. "Horizontal growth (stimulated by environmental forces) compensates in many important ways for the differences in vertical growth (due to native factors)".

"Present day psychology is ascribing vastly more significance to nature and far less significance to nuture than the facts warrant."

If nature and environment, therefore, are going to be important agents in developing intelligence, at least horizontally it seems invidious that one should offer to pupils less endowed a meaner environment than is to be granted to their more naturally gifted fellows. Justice demands therefore equal opportunity for all so far as horizontal nurtural environmental development is concerned - vertical development will always differ with the degree of innate ability of the pupils.

"Secondary Education for all" is no mere slogan; but a scientific necessity - the one school offering equal environment and nuture to all its pupils, while at the same time grading them according to ability.

Seeing that this present investigation deals solely with Secondary pupils, Advanced Divisions need not be further considered, and the argument may be resumed.

Chapter VIII

THE FIRST STEP after the "QUALIFYING"

Once the pupils , who have been declared fit, are gathered together in the Secondary School, then and then only should the problem of classification and of allocation to various courses be considered.

For one term at least, the pupils in the Secondary School should, at the beginning, as far as is possible, all follow a modified general preparatory course.

If any rough preliminary classification is attempted, it should be done on the result of an Intelligence Group Test given either by an expert psychologist or thoroughly trained expert teacher, who would be able to give all the pupils such a test under identical conditions at the same time.

During this preparatory Term (or Terms) the pupils would be under the closest observation,

There would soon begin to accumulate data of all kinds:- (1) reports and observations from the various teachers, (2) results of small oral and written class tests, (3) personal facts gleaned from interviews with parents, (4) how the child is facing the new set of circumstances and adapting himself to the wider, freer, and more comprehensive life of the Secondary School, etc. These/

These, when tabulated, would soon grow into a large and valuable body of statistics, which would at least form the groundwork for basing an opinion after definite formal tests have been given.

When the first preparatory term begins to draw to a close, the question becomes urgent what kind of formal test is to be given.

The children have been studying, under presumably well thought out schemes, various subjects such as English, History, Geography, Mathematics, Art, Science, and probably, the first steps of a foreign language.

What then is the next step? Is there to be another Intelligence Test? One must be clear what one is wishing to get. If it is further evidence of "Capacity to Learn", then certainly another Intelligence Test would not be out of place. The probability however, is that one would get, in the majority of cases, a series of marks or results varying but little from the first Intelligence Test.(1) If one did not, then confusion would be worse confounded, because one would be at a loss to decide whether the first or the second Intelligence Test/

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(1) This is borne out by many experts in re-tests. W.A.F. Hepburn writes:- "I have tested pupils by half a dozen reliable tests over a period of two years, and found little or no variation."

Test gave the better result.

It is here, I think, that standardised tests in the major subjects of the normal Secondary School Curriculum prepared and issued by authoritative experts for Scottish children would be an inestimable boon. Such tests would, in addition to Intelligence Tests, throw a flood of light on to the special capacities, the strength and weakness of each pupil, and would indicate to the organiser of the school what one might expect from the individual in each subject, and so give guidance as to course or courses to be followed. However, as already explained (page 4) "ad hoc" class tests must for a long time continue to play an important part in the estimation of pupils' progress.

It does not follow however that one must continue to follow old methods of examination, often defective and rarely satisfactory. One hopes to suggest improved methods of marking examination questions and of tabulating data so that in the future class-room tests of attainment will give results more stable and indicative of the pupil's ability than has been the case in the past.

The ordinary type of class examination to which one has been so long accustomed is open to serious criticism from/

from many points of view.

(1) Questions were often either badly selected or of insufficient range to give every pupil an equal chance.

(2) Answers, in almost every instance, demanded linguistic fluency - the balance was always on the side of the clever language pupil.

(3) And most important defect of all :- there was no guarantee of any just and equable marking of the tests by the teacher. To the wide variations in style and capacity of the examinee there entered the wide variations of the standard of the examiner - the personal element of the teacher.

To obviate (1) and (2) many devices for "Examinations without Tears." have come recently into vogue. Perhaps the more prominent and helpful of these are the True-false Multiple choice, Analogies, and Completion methods. These certainly overcome the linguistic difficulty because the writing of answers is reduced to a minimum. But these methods have their limitations.

(a) They simplify the pupils' response for the sake of objective marking; but they simplify it overmuch, and do not test some of the essential phases of learning:- the power of sustained synthetic thought, aestheic appreciation, and mathematical reasoning.

(b) It is very difficult, if not impossible, for the teacher, correcting these special tests (by means of a stencil it may be) to get the feel of the pupil's mind: He gets a mark that means little or nothing in human terms. The objective method is de-personalised.

In the True-false and multiple choice methods a good guesser may score. A Headmaster in a district where betting/

betting is rife said:- "My little nippers can spot the winner every time."

This may be an exaggeration; but it will scarcely be denied that there are types of intelligence fostered largely by training and environment.(1) The street urchin of our large cities may be decidedly more "cute" than his confrere in the country, though possibly not so "intelligent"(having capacity to learn).

Until more definite data are forth-coming regarding the reliability(2) of the True-false and the Selective methods, one will hesitate to substitute them entirely for ordinary tests of attainment.

With all its defects the ordinary method of examination is not open to the above objections. It is at least worth trying to see whether something cannot be done/

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(1) See Gordon's results of testing gypsy and bargee children.

(2) See Dr. Boyd's brochure on "True-false."
H.H. Hahn - "A criticism of Tests reguiring Alternative Responses." in Journal of Educ. Research. Vol.6. pp.236-40
"The procedure breaks down purely on the theory of chances."
Wm. Asher. "The Reliability of Tests requiring Alternative Responses." J.E.R. Vol.9. 1924. pp 134-40
Paul and West. "A Critical Study of Right-Wrong Method". J.E.Research. Vol.8. 1923 pp 1-8.
Gates's investigation in J.E. Psychology. May, 1921. pp.276-87.

Chapter IX.

THE PERSONAL ELEMENT in TEACHERS' ESTIMATES.

done to modify it so as to conserve its virtues and to eliminate its defects.

A great deal of the trouble in the past, as has already been said, has arisen from the fact that no two teachers can mark papers on the same standard. The individual teacher's personality, prejudices, training a and health all find reflection in the final estimates of the pupils' ability or achievement. Whatever devices one employs, there still remains this insuperable difficulty of the personal element of the teachers' estimates.

It is in this regard that Standardised Tests have so great an advantage over ordinary testing. Intelligence Tests can be marked objectively and in most instances are fool-proof. If one could only eliminate the personal element in Teachers' marking, one would go a long way towards removing the reproach that has so long been associated with ordinary class room examinations.

What one means is this:- One teacher "A" marks a set of Algebra questions. If a pupil is wrong in a particular question, "A" who is a hard marker says 'NIL', or if not usually hard, he may have had a worrying day and is feeling nervy - again 'NIL'. "B" on the other hand is a sympathetic marker. He says: "Poor John, he has/

has just made a slight slip near the end." - 7/10, and so on and so on. When it comes to English, especially correction of essays, it would be futile to deny that it is almost impossible to get absolute agreement of standard, or anything like it, in the marking of teachers.

An extensive enquiry into this very point was made recently in Dumbartonshire when 12 short essays of Qualifying pupils were issued to numbers of teachers for estimation. While there was fairly general agreement on which papers were the best and the worst, there was practically no agreement in the middle cases.

An interesting piece of research on this particular point by Mr. C.E. Hulten, superintendent of Schools, Wisconsin, is detailed in the Journal of Educational Research for June, 1925. Twenty-eight teachers were given five passages that had been evaluated and standardised from the Hudelson English Composition Scale and told to mark them on the 100 standard with 75% as a pass mark. The results were interesting and illuminating. The marks ranged for paragraph (1) 20-84
(2) 55-95
(3) 65-93
(4) 60-97
(5) 60-95

Passage/

Passage.	1.	2.	3.	4.	5.
Highest Mark.	84	95	93	97	95
Lowest Mark.	20	55	65	60	60
No. Passing.	48	23	13	3	12
No. Failing.	6	31	41	51	42

That is to say for passage 2 the marks ranged from 55 - 95, 31 pupils would have failed and 23 would have passed.

The variety of standard of marking, therefore, leads to little hope that pupils will receive fair and adequate treatment from various markers.

Even the same teacher varies also in his estimations at different times. In the experiment quoted above the same passages were given out three months later in different order to the same teachers, and again great variety was found. For example, one teacher marked passage 3 and 5

Passage 3.) 90 in December and 70 in February.
Passage 5.) 65 " / " 95 " " .

And the imvestigation seems to point to the fact that even individual teachers were not consistently high or low markers.

The article finishes with certain conclusions:-

(1) "That teachers are not consistent in giving high or low grades."

(2) "That/

(2) "That teachers' marks are mere guesses, some good, some poor, some indifferent. Since marks are mere guesses, they are not sufficiently reliable to be used for promotion purposes."

(3) "The pupils have too much at stake for teachers to continue to use subjective and guess methods of rating."

Are there instruments at hand that will at least partially solve the problem of teacher's marks? A greater use of standard educational scales and tests for promotion purposes, a replacement of the essay type of examination by true-false, multiple answer, and completion tests would do much to eliminate charges of unfairness and partiality."

C.E. Hulten, Superintendent of Schools, Wisconsis, U.S.A. in Journal of Educational Research, June, 1925. --pp 49-55

Chapter X.

THE PERSONAL ELEMENT in TEACHERS' ESTIMATES

CAN IT BE ELIMINATED?

One has a good deal of sympathy with this view; but as has been shown there are not inconsiderable difficulties in adopting the new method.

What if one did manage to evolve a system of Examination which would test the work of the Term, and at the same time, eliminate the subjective personal element of the Teachers' marking? Would that not be something? If instead of that varying, changing, unreliable standard of teachers' marks one could devise a method that would give, through a series of years, a steady resultant free from violent variations, then one would be a long way on the road to solving what after all is one of the greatest difficulties in the estimation of pupils' progress in Secondary Schools.

And the writer claims that this can be done by methods about to be detailed.

But let us be quite clear what we are hoping to get. When a scientist weighs a cubic centimetre of iron on successive days, or after many months, he expects to get exactly the same answer, or he doubts the validity of the measuring scale. Children, however, are neither lumps of iron nor brass which give always an exact mathematical resultant when measured - they are subject to human variations. But one <u>does</u> expect that over a series of tests/

tests there should be a reasonable uniformity of result. If in six successive tests a child scores 89%, 32%, 75%, 93%. 41% and 57% one would have great fears that other potent factors were entering into the estimation.

A first class golfer playing off scratch over a course whose par figure is 75, will not do 75 every time he goes round the course; but over a series of rounds his average will approximate to that figure. In six rounds he may return 76, 74, 75, 83, 73, 75. His fourth round, 83, is much worse than usual - he has had an off day. However a glance over the scores proves that he is a first class player. His average score works out at 76, and put scientifically;

$$\text{Coefficient of variability} = \frac{\text{mean deviation} \times 100}{\text{average.}}$$

$$= \frac{\frac{14}{6} \times 100}{76}$$

$$= 3\%$$

To vary only 3 points in 100 is, of course, a very small degree of variability, and shows great consistency.

If in the Secondary School, achievement could be measured by some standard which would give sufficiently stable results, then one would be justified in accepting the/

the measuring standard as reliable.

Suppose a pupil were given during three years 6 half yearly tests of achievement and scored a final average of 70%. 74%, 70%, 75%, 72%, 75%, then one would be justified in saying that both the method and the standard of marking were extremely reliable.

It is proposed to give in the following pages the marks for all the pupils who finished their three years' course in June, 1926, with the co-efficient of variability calculated for each. A glance over the pages will show that the six half-yearly scores of M.L. quoted in the preceding paragraph are by no means exceptional, and that scores such as T.I's - 72%, 72%, 73%, 72%, 73%, and 76%, are possible over a period of 3 years.

Class 111a.

Term Marks

Qualifying Mark.		1st Year		2nd Year		3rd Year		Average	Mean Deviation.	Co-efficient of Variability (%)
		Dec 1923	June 1924	Dec 1924	June 1925	Dec. 1925	June 1926			
86	Allan, R.	75	61	65	62	67	71	67	3.8	5·8
92	Brodie, D.	70	63	65	63	67	71	67	2·6	3·2
	Brown, B.	67	60	56	49	55	57	57·3	4·3	7·5
82	Cameron, A.	64	55	58	56	52	abs.	57	2·6	4·6
85	Christie, A.	75	71	61	63	67	73	68·3	4·6	6·7
94	Cunningham, J.	77	72	73	70	71	69	72·1	1·8	2·5
88	Dunbar, J.	75	61	67	71	71	68	69	3·5	5·1
98	Elder, C.	84	82	78	82	80	-	82	1·5	1·8
81	Given, W.	72	63	66	64	60	63	65	3	4·6
81	Gourlay, R.	57	52	58	56	55	61	56·5	2	3·6
75	Gray, W.	67	62	61	66	55	51	62·3	4·7	7·5
90	Gray, J.	83	83	86	82	85	-	84	1·2	1·4
83	Gray, W.	73	61	60	53	55	60	60·3	4·3	7·1
83	Horner, J.	abs.	67	73	75	72	-	72	2·2	3.1
88	Irving. T.	72	72	73	73	72	76	73	1	1·4
87	Jack, A.	64	61	58	57	58	58	59·5	2·2	3·1
87	King, T.	66	58	60	59	57	58	60	2·3	3·7
76	Livingstone, M.	53	55	57	51	57	52	54	2·1	3·9
83	Morrison, J.	62	62	61	64	61	58	61·5	1·3	2·1
75	McGrain, E	59	58	abs.	60	55	abs.	58	1.5	2·6
84	McGregor, J.	66	68	64	66	58	60	62	3·6	5.8
	MacLennan, C.	72	70	68	61	63	62	66	4	6·1
80	McPherson, J.	68	63	65	65	61	71	65·8	2.3	3.5

Class 111b.

Term Marks

Qualifying Mark.		1st Year		2nd Year		3rd Year		Average	Mean Deviation	Co-efficient of Variability (%)
		Dec 1923	June 1924	Dec 1924	June 1925	Dec 1925	June 1926			
83	Beith, J.	71	60	65	67	65	62	65	2·6	4
86	Carmichael, E.	65	74	67	69	65	65	67·5	2·5	3·7
83	Charteris, V.	66	66	66	68	abs	64	66	·8	1·2
84	Conner, D.	65	63	64	68	63	65	64·3	1·3	2
91	Duncan, J.	78	75	74	78	72	80	75·3	2·5	3·3
94	Fraser, E.	73	73	73	75	72	73	73·1	·5	·6
88	Gray, R.	67	67	61	70	66	67	66·3	2	3
	Guthrie, I	62	65	61	62	61	57	61·3	1·5	2·45
71	Johnston, M.	77	76	abs	70	67	67	71·3	3·3	4·6
82	Kelly, F.	58	62	57	62	52	60	58·5	2·8	4·7
83	Knox, J.	73	67	69	77	72	73	72	2·5	3·5
87	Longden, M.	70	74	70	75	72	75	72·6	2	2·8
78	Miscampbell, R.	71	55	60	57	55	58	59·3	4	6·7
84	McIver, M.	72	72	72	74	69	-	72	1	1·4
86	McClune, M.	64	56	58	62	60	61	60·2	2·1	3·4
87	McGuffie, J.	58	56	53	53	53	59	55·3	2·3	4·1
84	Paterson, F.	abd.	58	64	67	65	69	64·8	2·5	3·9
78	Price, A.	64	57	59	61	57	61	69	2·1	3·5
90	Sinclair, J.	58	59	63	63	59	63	61	2·1	3·4
81	Steel, I.	65	58	62	58	51	60	59	3·3	5·6
89	Thomson, J.	69	68	70	70	66	67	68	1·3	1·9

Class 111c.

Term Marks

Qualifying Mark.			1st Year		2nd Year		3rd Year		Average	Mean Deviation	Co-efficient of Variability (%)
			Dec 1923	June 1924	Dec 1924	June 1925	Dec 1925	June 1926			
88	Clark,	A.	55	51	51	-	53	52	54	1·1	2·1
79	Frood,	A.	56	67	54	57	56	50	55	2	3·6
81	Graham,	D.	59	58	61	55	56	51	57	2·7	4·6
83	Maxwell,	D.	63	56	57	63	58	58	59	2·5	4·2
81	Michie,	A.	55	53	54	56	59	56	55.5	1·5	2·6
88	McAllister,	J.	64	50	52	55	50	56	54·5	3·7	6·8
83	McAlpine,	J.	56	44	56	55	47	46	51	5	9·8
82	Paul,	A.	71	60	66	68	60	64	65	3·5	5·4
79	Stewart,	D.	62	53	62	51	57	-	57	3·3	5·8
82	Todd,	R.	47	46	48	57	49	41	48	3·3	6·9
72	Browne,	W.	53	42	-	48	49	46	49	2·5	5·1
84	Ferguson,	J.	61	57	52	55	49	51	54·5	3·5	6·4
81	Ferguson,	C.	51	54	39	46	46	54	48·3	4·7	9·7
80	Giles,	A.	63	66	56	58	53	53	58	4	6·9
85	Goodwin,	C.	-	53	59	59	51	58	56	2·6	4·7
78	Hamilton,	I	54	52	55	54	51	55	53·5	1·5	2·8
75	Hamilton,	M	49	42	42	47	45	47	45·3	2·3	5·1
80	Laing,	E	51	63	51	51	49	51	52	3	5·8
76	McEwen,	C.	60	50	51	59	49	53	53·6	3·6	6·7
82	Paterson,	J.	61	54	57	59	44	56	55	4·1	7·5
90	Robertson,	C.	59	54	57	64	52	-	57·1	3	5·2
85	Wilson,	M.	46	44	46	52	46	-	47	2	4·2

Class 111d.

Term Marks

Qualifying Mark.			1st Year Dec 1923	1st Year June 1924	2nd Year Dec 1924	2nd Year June 1925	3rd Year Dec 1925	3rd Year June 1926	Average	Mean Deviation	Coefficient of Variability (%)
71	Anderson,	O.	57	58	50	57	49	58	55	3·5	6·4
	Ferrier,	J.	75	70	71	65	65	72	70	3	4·3
77	French,	A.	46	42	48	49	44	46	46	1·8	3·9
67	Gray,	R.	56	53	57	60	52	58	56	2·5	4·4
77	Love,	W.	52	51	52	51	47	-	50·8	1	2
72	Laws,	W.	60	55	53	50	48	-	54	3·5	6·5
68	McRitchie,	W.	51	47	50	53	51	47	51	1·8	3·5
76	McGregor,	J.	59	59	57	60	54	68	59·5	2·8	4·7
73	McLeod,	D.	50	50	49	53	45	50	50	1·5	3
75	Michie,	J.	59	47	55	56	50	49	52·8	3·8	7·2
	Morrison,	D.	68	66	60	60	48	54	59	5·8	9·7
80	Stevens,	J.	69	66	67	73	67	74	66	3·3	5
79	Thomson,	A	61	57	57	60	61	65	60	2·3	3·8
80	Yule,	A.	51	58	53	54	55	-	54	1·5	2·8
80	Anderson,	J.	34	37	51	54	47	50	45·5	6·5	14·2
86	Caldwell,	M.	58	55	59	58	58	-	57·6	·5	·8
75	Clark,	A.	58	60	56	58	54	59	57·5	1·5	2·6
78	Fowler,	L.	54	43	53	56	49	-	51	3 ·2	6·3
70	Gray,	A.	56	55	55	57	56	56	56	·5	·9
74	Linton,	J.	-	50	55	61	55	60	56	3	5·4
65	Manning,	M.	51	53	48	50	45	49	49·8	2	4
83	Merrilees,	M.	47	49	50	52	48	55	50	2·1	4·2
74	Strang,	R	58	-	52	56	52	51	54	3·1	3·9

Class IIIe.

Term Marks

Qualifying Mark			1st Year Dec 1923	1st Year June 1924	2nd Year Dec 1924	2nd Year June 1925	3rd Year Dec 1925	3rd Year June 1926	Average	Mean Deviation	Co-efficient of Variability (%)
73	Bertrand,	E.	50	55	52	50	52	56	52·5	2	3·8
76	Caldwell,	A.	58	55	53	53	54	57	55	1·7	3
77	Condie,	M.	62	45	61	62	65	69	61	5	8·2
68	Easton,	A.	43	50	47	51	46	-	47·3	2	4·2
65	Laws.	I	46	44	47	53	49	50	48	2·5	5·2
70	McCall,	M.	46	49	49	60	58	60	53	5·6	10·5
74	McKeown,	E.	46	51	50	55	47	-	50	2·2	4·4
77	McQuarrie,	B.	64	57	61	61	65	64	62	2·3	3·7
68	Over,	J.	54	50	50	53	42	-	50	2·5	5
84	Sparks,	C.	61	61	63	62	61	62	62	·6	1
73	Wilson,	A.	50	49	49	55	58	58	53	3·8	7·1
	Murray,	M.	61	56	49	52	58	56	55·3	3	5·4
76	Bowie,	R.	51	46	45	53	52	48	47·5	2·8	5·9
56	Cleland,	A.	64	58	53	55	57	63	58·3	3·3	5·7
76	Gillies,	J.	63	63	56	60	68	66	62·8	3	4·7
	McKenzie,	A.	59	55	53	48	54	53	53·6	2·1	3·9
76	Reid,	T.	63	60	54	54	58	58	58	2·5	4·3
	Sparks,	S.	66	62	63	59	61	67	63	2·3	3·6
79	Whyte,	W.	53	50	46	47	-	-	49	2·2	4·5

TERM EXAMINATIONS DEC. 1923 - JUNE. 1926.

A FEW OUTSTANDING RESULTS.

		Dec. 1923	June. 1924	Dec. 1924	June. 1925	Dec. 1925	June. 1926	Coeff. of Variability.
IIIa.	J.G	83	83	86	82	85	**	1·4
	J.L.	72	72	73	73	72	76	1·4
	C.E.	84	82	78	82	80	**	1·8
	J.M.	62	62	61	64	61	58	2·1
IIIb.	V.C.	66	66	66	68	abs.	64	1·2
	E.F.	73	73	73	75	72	73	·6
	D.C.	65	63	64	68	63	65	2·
	M.M.	72	72	72	74	69	**	1·4
	J.T.	69	68	70	70	66	67	1·9
IIIc.	A.C.	55	51	51	abs.	53	52	2·1
	E.L.	51	63	51	51	49	51	5·8
	I.H.	54	52	55	54	49	51	2·8
	A.M.	55	53	54	56	59	56	2·6
IIId.	A.F.	46	42	48	49	44	46	3·9
	M.C.	58	55	59	58	58	Left.	·8
	D.M.	50	50	49	53	45	50	3.
	A.G.	56	55	55	57	56	56	·9
IIIe.	C.S.	61	61	63	62	61	62	1.
	S.S.	66	62	63	59	61	67	3·6
	A.C.	58	55	53	53	54	57	3.
	B.M.	64	57	61	61	65	64	3·7

** Tried Medal Competition Examination Vice Term Examination.

SUMMARY OF PREVIOUS SIX PAGES.

COEFFICIENTS of VARIABILITY.

	111a	111b	111c	111d	111e	Total
Over 10	-	-	-	1	1	2
9--9·9	-	-	2	1	-	3
8--8·9	-	-	-	-	1	1
7--7·9	3	-	1	1	1	6
6--6.9	2	1	5	3	-	11
5--5.9	3	1	6	2	5	17
4--4·9	2	4	4	5	5	20
3--3·9	7	8	1	5	5	26
2--2.9	3	3	3	3	-	12
Less than 2.	3	4	-	2	1	10
	23	21	22	23	19	108

This gives an average coefficient of variability over all the 108 pupils of 4·55%

It must be evident therefore, that the results of the 6 Term Examinations during the years 1923-1926 have been extraordinarily steady and consistent, and the writer maintains that results such as these are only possible where the personal element in teachers' estimates has been largely eliminated.

Chapter XI.

THE METHOD EXPLAINED.

Now the question is "How has this been accomplished?

These are marks assigned by the teachers on work in every subject done during all the Terms.

They are achievement marks corrected by the ordinary Staff of a Secondary School, who have had no special training except ordinary experience, in the marking of papers. Many of these teachers are fresh from the Training Centre whilst others have been teaching for very long periods. The resultant figures were obtained after the pupils' papers had passed through many hands varying from Term to Term so that there was no possibility of any particular pupil's paper being marked by any individual teacher all through the Course (and it has already been shown that even if this had happened the marks would have probably been most unreliable and unstable.)

The Method Explained.

When a Term examination has been set and the papers written, there follow naturally the correction of the papers and the tabulation of the marks.

Take the following as a typical example:

(1) There are 12 sections of 1st year pupils (1a,b,c,d, etc.) with a total of 400 pupils.

(2) Each pupil in the Mathematics Examination has been given 10 Algebra/

10 Algebra, 10 Arithmetic and 8 Geometry questions.
(3) There are 14 members of the Mathematics Staff.

Procedure.

(1) Instead of each teacher being allocated all the work of a section, the examination questions are allocated as equally as possible by ballot among the staff so that each teacher will correct, right through all the sections the same questions.

For example, in this case each teacher would get 2 questions to mark right through all the 400 papers of the pupils. Teacher X, might draw Questions 1 and 2 of the Algebra Paper. Teacher Z might draw Questions 3 and 4 of the Geometry Paper and so on until all were allocated.

Now let us see what happens:- Teacher X marks 1 and 2 Algebra right through the 400 Algebra papers. Teacher Z marks 3 and 4 Geometry right through the 400 Geometry papers, and so on till all the questions of all the papers - Algebra, Geometry and Arithmetic have been corrected. This ensures that in the end all the papers have been, as far as humanly possible, marked on the same standard.

For, notwithstanding that there may be on the examin-:ation paper, marks assigned to each question, and notwith-:standing instructions to the teachers to aim at a certain standard/

standard of marking, one cannot eliminate personality from marking.

Teacher X is naturally a stern marker. He cuts off marks rigorously for every fault or error, while Z is naturally an easy marker, making sympathetic allowance for deficiencies.

But it matters not. All the 400 pupils experience both the benefit of Z's sympathy and the rigour of X's harshness.

In the end all the papers have equally shared in the fluctuating personality of the marking staff, and the result is equable and fair. How unfair if harsh X had marked all the papers of say, 1d, and gentle Z all the papers of 1g. There would have been no uniformity at all.

All the 2nd, 3rd, 4th, 5th and 6th year papers are dealt with, where-ever possible, on the same principle. Every subject, English, French, Latin, Science. History and Geography, is also parcelled out by lot to the Teaching Staff in the various Departments.

It matters not how many or how few teachers there may be in a Department, each teacher takes his/her allotted share of all the papers.

(ii) When all the marks are ready for compilation, the Principal/

Principal Teacher of the Subject gathers all these marks together.

Now mere marks in themselves mean nothing.

Marks have only a meaning when they are compared or contrasted with some definite standard.

Following the method adopted by all Standardised Tests, the average for all the pupils sitting the Test is then found.

If the instructions have been followed out to the letter by everyone, if the papers have been carefully marked by everyone, and if the pupils are a homogeneous normal group, then the average for each subject might work out at 50%.

(Note. The Scottish Education Department issue instructions that papers have to be marked on a standard whereby 50% should be given to a pupil who should just pass - scaling upwards and downwards from that.)

Scientific marking every one admits, is quite out of the question, for it is not to be expected that every group of pupils will be perfectly homogeneous. And yet in practice it is marvellous how, without much effort, the results work out for all practical purposes sufficiently near that mark to/

to be acceptable.

For example, in December, 1923, the average mark for all pupils in the 1st year (about 400 pupils) came out thus:-

Eng.	Hist.	Geog.	Maths.	French.	Art.	Science.	Mus.
50	49	52	55	54	53	54	50

Even should a subject work out an average of say 60% when all the others were showing approximately 50%, it would merely show that the examination was too easy in that subject. Similarly, if another subject showed an all-over average of 40%, when the others showed approximately 50%. it would indicate that the questions given in that subject were too difficult.

In such instances an adjustment can easily be made, by which marks can be lowered or raised so that the average will work out approximately to the desired standard.

(iii)The individual marks for each pupil in each subject, and the average mark for all the pupils in the same form, being now available, it is possible to determine the pupil's place and progress in each particular subject.

e.g. J.B. English 65/52 denotes that J.B. is doing 65% in English, whilst the average pupil of his year (or Form) is/

is doing 52%. In order to estimate the pupil's standing, he must be judged relatively to all his confreres who are in the same year.

J.B. might be in a very good section whose average score in English might be 67. To mark J.B. 65/67 would be unfair to the pupil and misleading to his parents who get his report card sent home. Or, on the other hand, J.B. might be in a section that was doing poor work in English with an average score for the section of 43%. To mark J.B. 65/43 is to flatter him. The only just way of indicating his score is by reference to the average mark made by all the pupils of the year. One is convinced that this is not always done in every Secondary School where there are several sections of the same year (or Form).

Similarly, and for the same reason, it is both unfair and misleading in any general report to give the pupil's order of merit in his own particular class or section - the last boy in 1a may be doing better work than the first of 1h.

Nevertheless, to the teacher or Headmaster who wishes to know whether a pupil is pulling his weight in the section to which he has been assigned, both the class average and the pupil's order of merit in his class afford valuable information; but a full discussion of this question must be deferred to the later chapter on Estimation of Progress in/

in the Secondary School.

One has now explained how the Term Examination marks detailed in the previous chapter have been obtained, and when one considers that over a series of examinations extending for 3 years, 108 pupils showed an average coefficient of variability less than 5%, then it seems to us that the scheme has worked out satisfactorily in practice. It seems to us also, that extremes in teachers' markings have cancelled one another and that a normal resul:tant has evolved itself.

If this is granted, then it seems further that a very great difficulty - in fact, the great difficulty in every assessment of achievement - viz, the personal element in teachers' estimations - has been in large measure eliminated.

Chapter X11.

"NATIONAL INTELLIGENCE TESTS"

done again by

SAME PUPILS

2 YEARS LATER

As the Session 1925-26 advanced, one began to look forward to the final term examination in June, 1926, for, at that time, data for the whole three years would be available, and it would then be possible to go back to the 1923 figures and find which of the three results in 1923 (Qualifying, Intelligence Test or Term Examinations) had proved to be the best forecast of the pupils' progress during the three years.

So that nothing might be neglected which might throw any light on the problem under consideration a second Intelligence Test was given in December, 1925. After think-:ing the matter over Dr. Boyd and I agreed that it would not be a bad idea to repeat the same Intelligence Tests ("The National", both Form A and Form B) as had been given in 1923. The 117 pupils who remained of the original pupils tested in the 1st. year were accordingly again subjected to the same Group Intelligence Test in December, 1925 exactly 2 years after the first test. The results are shown on page 90.

One had great difficulty in deciding what was the best procedure to follow in estimating the results. It is evident that the 117 pupils so tested were not a representa-:tive body. Quite half of them were the best of the pupils entering in August, 1923. The others had struggled on either from their own desire or from their parents' influence (and perhaps affluence.)

Any/

Any median that would be found would thus tend to be high. One had, of course, good medians for 1923 as the pupils were then a relatively unselected group.

The norms in the brochures issued by the U.S.A. National Research Council gave:-

	Washington.		Pittsburg.	
	A.	B.	A.	B.
Age 14.	132	126	130	130
" 15	122	119	123	121

For some reason or other pupils age 14, have reached the highest scores; and as the pupils under our consideration were mostly 14 or 15, the most satisfactory comparison would seem to be with the American 14 years old.

As has been said, however, our pupils were not altogether unselected, seeing that they had, so to speak, selected themselves. Consequently one expected higher medians than in the brochure which presumably gave figures for unselected pupils.

Another factor which might unduly raise the average mark was that the pupils were doing again Tests which they had already done two years before. The results as anticipated were high.

	Form A.	Form B.
Old Kilpatrick Area median.	156·8	145·6
Washington. "	132	126
Pittsburg. "	130	130

Details on the following sheets.

NATIONAL INTELLIGENCE TESTS.

3rd. Year Pupils - Dec. 1925.

	Form A. Median 156·8		Form B. Median 145·6	
185 - 189	I	1		
180 - 184	IIII	4		
175 - 179	𝍸 - I	6	I	1
170 - 174	𝍸 - 𝍸 - III	13	I	1
165 - 169	𝍸 - 𝍸 - 𝍸	15	III	3
160 - 164	𝍸 - 𝍸 - II	12	𝍸	5
155 - 159	𝍸 - 𝍸 - II	(12)	𝍸 - 𝍸 - 𝍸 - I	16
150 - 154	𝍸 - 𝍸 - I	11	𝍸 - 𝍸 - 𝍸 - I	16
145 - 149	𝍸 - IIII	9	𝍸 - 𝍸 - 𝍸 - IIII	(19)
140 - 144	𝍸 - 𝍸	10	𝍸 - 𝍸 - 𝍸 - III	18
135 - 139	𝍸 - II	7	𝍸 - 𝍸 - I	11
130 - 134	𝍸 - I	6	𝍸 - III	8
125 - 129	𝍸	5	𝍸 - III	8
120 - 124	𝍸	5	𝍸	5
115 - 119			II	2
110 - 114	I	1	II	2
105 - 109			I	1
100 - 104			I	1
95 - 99		N = 117		N = 117

54 pupils

56 pupils

$\frac{N}{2}$ = 58·5

$\frac{N}{2}$ = 58·5

Median $155 + \frac{4·5}{12} \times 5$

$155 + \frac{22·5}{12}$

$155 + 1·8$

$156·8$

Median = $145 + \frac{2·5}{19} \times 5$

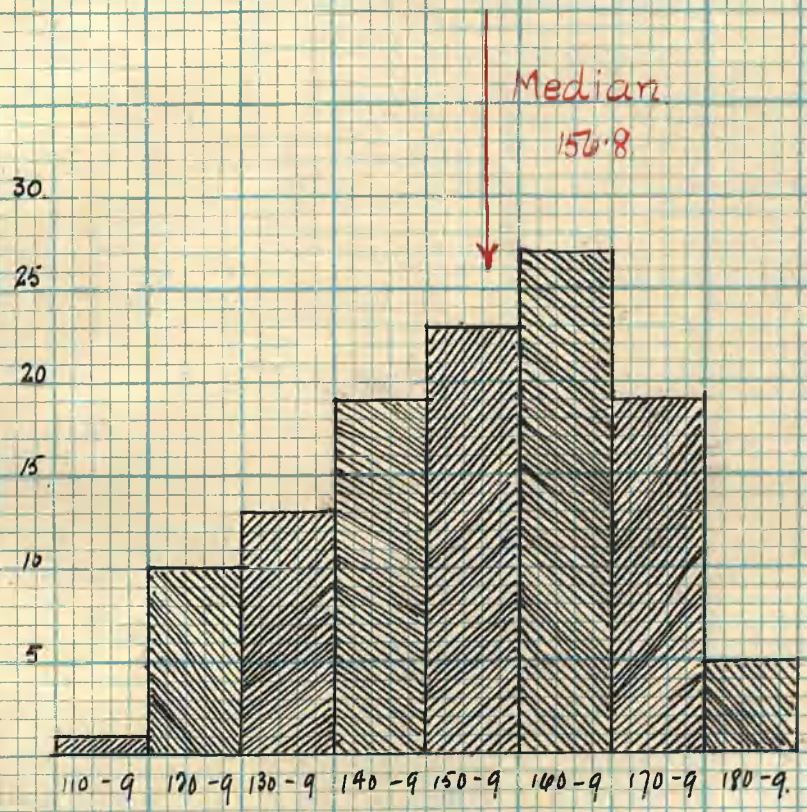
$= 145 + \frac{12·5}{19}$

$= 145·6$

National Intelligence Tests Dec. 1925.

117 Third Year Pupils Age 14-15.

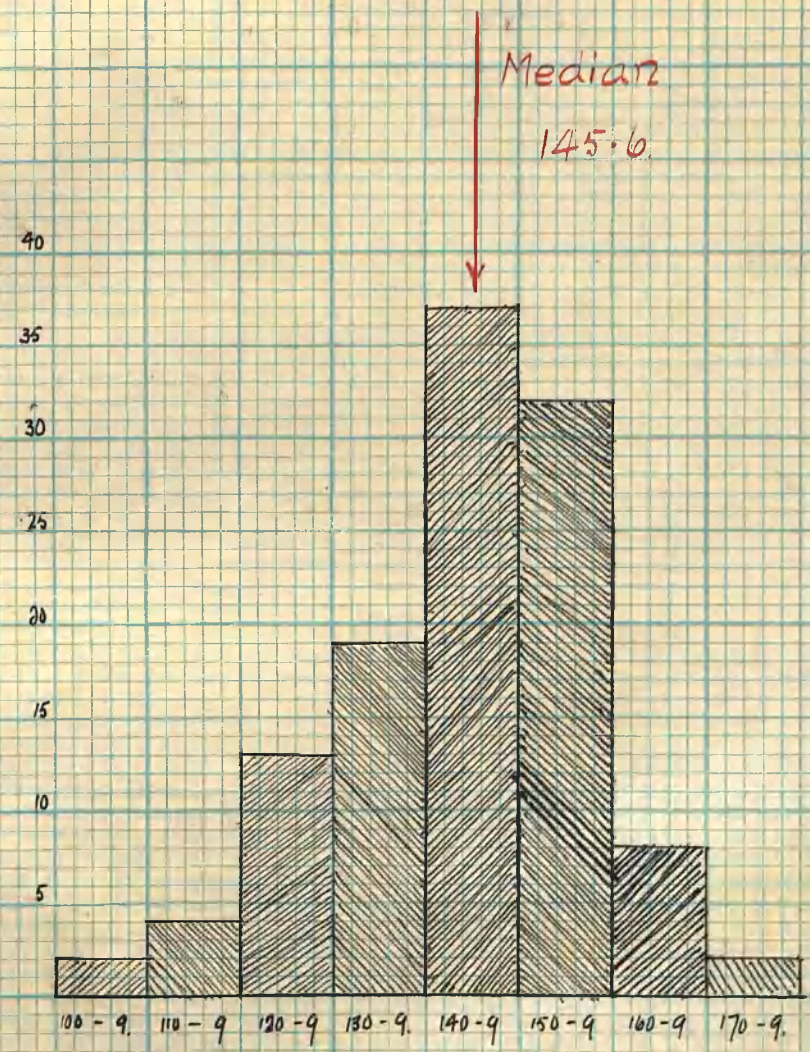
Form "A"



National Intelligence Tests Dec. 1925.

117 Third Year Pupils. Age 14-15.

Form "B"



As was to be expected the correlation between the 1923 and the 1925 marks was extremely high.
(·81) P.E. ± ·02.

The details of this are shown next page worked out as before on Thurstone's Correlation Sheet.
(Pearson Co-efficient.)

	120	125	130	135	140	145	150	155	160	165	170	175	180
	124	129	134	139	144	149	154	159	164	169	174	179	184
X	6	5	4	3	2	1	0	1	2	3	4	5	6
155 159										I			
150 154									I				
145 149							I			III			I
140 144							I		II		II		
135 139							IIII	I	I	II			
130 134								IIII	III	II			
125 129					I	I	II	IIII	II	II	I		
120 124				I	III	IIII	IIII	II	I	I			
115 119		I		II	IIII	III	IIII	I	II				
110 114		I	I	II	IIII	I		I					
105 109		I	II	III									
100 104	I			I	I								
95 99	III	I			II								
90 94	I			I									
85 89		I											
80 84													
75 79	I												
f	6	5	3	10	15	9	19	12	13	11	3	-	1
X	6	5	4	3	2	1	0	1	2	3	4	5	6
fx	36	25	12	30	30	9	0	12	26	33	12	0	6
fx^2	216	125	48	90	60	9	0	12	52	99	48	0	36

f	y	fy	fy^2	Σx −	Σx +	Σy −	Σy +	Σxy −	Σxy +	
1	8	8	64		3		3			24
1	7	7	49		2		2			14
5	6	30	180		15		15			90
5	5	25	125		12		12			60
8	4	32	128		9		9			36
9	3	27	81		16		16			48
13	2	26	52	3	18		15			30
18	1	18	18	13	7	6		6		
18	0	0	0	22	5	-	-			
10	1	10	10	24	2	22				22
6	2	12	24	22	0	22				44
3	3	9	27	11		11				33
6	4	24	96	27		27				108
2	5	10	50	9		9				45
1	6	6	36	5		5				30
0	7	0	0	0		0				0
1	8	8	64	6		6				48

$\bar{x}_{pos.} = 89$ $\bar{x}'_{pos.} = 110$ $\bar{x}''_{pos.} = 022$

$\Sigma x_{neg.} = 142$ $\Sigma y_{neg.} = 79$ $\Sigma xy_{neg.} = 6$

$\Sigma x = -53$ $\Sigma y = 94$ $\Sigma xy = 626$

$\Sigma x^2 = 795$ $\Sigma y^2 = 1004$ $N = 107$

$dx = \frac{\Sigma x}{N} = \frac{-53}{107}$ $dy = \frac{\Sigma y}{N} = \frac{94}{107}$

$dx = -.5$ $dx^2 = .25$ $dy = .88$ $dy^2 = .77$

$\sigma x^2 = \frac{\Sigma x^2}{N} - dx^2$ $\sigma y^2 = \frac{\Sigma y^2}{N} - dy^2$

$= \frac{795}{107} - .25$ $= \frac{1004}{107} - .77$

$= 7.43 - .25$ $= 9.38 - .77$

$\sigma x = 2.68$ $\sigma y = 2.90$

$$r = \frac{\frac{\Sigma xy}{N} - dx \cdot dy}{\sigma x \cdot \sigma y}$$

$$= \frac{\frac{626}{107} - (-.5)(.77)}{2.68 \times 2.9}$$

$$= \frac{6.235}{7.772}$$

$r = .81 \pm .02$

X-variable 1925. National Intell. Marks.

Y-variable 1923 National Intell. Marks.

Subjects

Computer checked by

One also wished in a general way to see how individual pupils reacted to the second Intelligence Test when compared with the first.

The seven-fold grouping was again considered to give results near enough what was desired for this purpose.

By taking the combined marks of Form A and Form B, dividing by 2, and arranging the pupils in 7 equal-mark groups as was done in 1923, the following table of comparison resulted:-

Group.	1925.		1923.(see also p.44.)
1.	167 - 177	1.	146 and over.
2.	156 - 166	2.	133 - 145
3.	145 - 155	3.	120 - 132
4.	134 - 144	4.	107 - 119
5.	123 - 133	5.	94 - 106
6.	112 - 122	6.	81 - 93
7.	101 - 111	7.	80 and under.

Here follow 5 pages of statistics showing 3 columns (1) Absolute agreement, (2) Agreement to one grade, (3) Disagreement by 2 or more grades.

Class 11la.

	Xmas, 1923 A	B		Xmas, 1925. A	B		Absolute Agreement	Agreement to one grade	Disagreement by 2 or more
Allan, Rob.	118	134	(3)	170	157	(2)		/	
Brodie, Dav.	155	141	(1)	184	-	(1)	/		
Brown, Bar.	135	131	(2)	163	150	(2)	/		
Cameron, Ang.	112	121	(4)	148	152	(3)		/	
Christie, Alec.	142	145	(2)	168	157	(2)	/		
Cunningham, J.	136	132	(2)	171	140	(2)	/		
Dunbar, Jas.	138	119	(3)	175	157	(2)		/	
Elder, Chas.	143	139	(2) almost (1)	173	-	(1)		/	
Given, Wm.	112	109	(4)	149	130	(4)	/		
Gourlay, Rob.	114	128	(3)	147	153	(3)	/		
Gray, Wm.	145	127	(2)	165	141	(3)		/	
Gray, Jas.	137	145	(2) almost (1)	174	173	(1)		/	
Gray, Wm.C.	125	124	(3)	172	155	(2)		/	
Horner, Jas.	130	116	(3)	156	152	(3)	/		
Irving, Thos.	137	141	(2)	148	165	(2)	/		
Jack, Alex.	137	121	(3)	160	150	(3)	/		
King, Thos.	153	141	(1)	161	142	(3)			/
Livingstone, M.	118	106	(4)	159	150	(3)		/	
Morrison, Jn.	133	120	(3)	173	162	(1)			/
McGrain, Ed.	123	121	(3)	150	141	(3)	/		
McGregor, Jn.	112	124	(5)	150	133	(4)		/	
MacLennan, C.	144	116	(3)	173	160	(1)			/
McPherson, Jn.	158	139	(1)	173	161	(1)	/		
							11	9	3

Class 111b.

	Xmas, 1923 A	B		Xmas, 1925. A.	B.		Absolute Agreement	Agreement to one grade	Disagreement by 2 or more
Beith, Jean.	130	129	(3)	168	125	(3)	/		
Carmichael, E.	127	129	(3)	178	161	(1)			/
Charteris, Vic.	115	125	(3)	164	158	(2)		/	
Conner, D.	149	140	(2)	176	157	(1)		/	
Duncan, J.	156	-	(1)	181	155	(1)	/		
Fraser, E.	122	)	(3)	174	149	(2)		/	
Gray, Rub.	145	146	(1)	183	158	(1)	/		
Guthrie, Ina.	116	114	(4)	156	146	(3)		/	
Johnston, Margt.	122	132	(3)	152	157	(3)	/		
Kelly, Fran.	118	117	(4)	167	158	(2)			/
Knox, Jes.	136	123	(3)	164	157	(2)		/	
Longden, Marj.	85	133	(4)	175	152	(2)			/
Miscampbell, R.	161	141	(1)	171	151	(2)		/	
McIver, Mar.	138	131	(2)	165	155	(2)	/		
McClune, Margt.	128	129	(3)	-	146	(3)	/		
McGuffie, J.	124	125	(3)	151	135	(4)		/	
Paterson, Fran.	142	138	(2)	171	152	(2)	/		
Price, Ann.	129	129	(3)	155	160	(2)		/	
Sinclair, J.	121	125	(3)	-	149	(3)	/		
Steel, Iso.	114	118	(4)	155	141	(3)		/	
Thomson, Jes.	130	127	(3)	167	150	(2)		/	
							8	10	3

Class 111c.

	Xmas, 1923 A.	B.		Xmas. 1925. A.	B.		Absolute Agreement	Agreement to one grade	Disagreement by 2 grades
Clark, Alec.	140	120	(3)	157	155	(2)		/	
Frood, Alec.	97	117	(4)	131	150	(4)	/		
Graham. Dav.	120	127	(3)	146	141	(4)		/	
Maxwell, Dav.	115	125	(3)	159	140	(3)	/		
Michie, Arth.	132	119	(3)	169	141	(3)	/		
McAllister, Jn.	140	137	(2)	-	152	(3)		/	
McAlpine, Jn.	122	126	(3)	139	145	(4)		/	
Paul, Arch.	129	130	(3)	171	152	(2)		/	
Stewart, Dav.	109	121	(4)	149	153	(3)		/	
Todd, Robt.	111	92	(5)	150	121	(4)		/	
Browne, Wm.	140	135	(2)	156	149	(3)		/	
Ferguson, Jean.	124	118	(3)	166	141	(3)	/		
Ferguson, Chris.	101	76	(6)	142	128	(4)			/
Giles, Ann.	114	118	(4)	142	115	(5)		/	
Goodwin, Cath.	118	113	(4)	160	145	(3)		/	
Hamilton, Ina.	117	112	(4)	162	141	(3)		/	
Hamilton, Margt.	115	107	(4)	152	122	(4)	/		
Laing, Edith,	70	84	(7)	126	114	(6)		/	
McEwen, Chris.	100	104	(5)	143	-	(4)		/	
Paterson, Jean.	-	122	(3)	156	141	(3)	/		
Robertson, Cath.	124	123	(3)	165	131	(3)	/		
Wilsonn Margt.	-	96	(6)	120	117	(6)	/		
Hamilton, Alex.	117	112	(4)	131	149	(4)	/		
							9	13	1

Class 111d.

		Xmas, 1923 A	B		Xmas, 1925. A	B		Absolute Agreement	Agreement to One grade	Disagreement by 2 or more
Anderson,	O.	127	115	(3)	165	148	(2)		/	
Ferrier,	Jas.	134	141	(2)	169	167	(1)		/	
Blakie,	Geo.	141	115	(3)	165	165	(2)		/	
French,	A.	118	113	(4)	139	150	(3)		/	
Gray,	Rod.	119	120	(4)	142	146	(4)	/		
Love,	Wm.	98	100	(5)	111	130	(6)		/	
Laws,	Wm.	109	116	(4)	141	121	(5)		/	
McRitchie,	Wm .	-	116	(4)	142	143	(4)	/		
McGregor,	Jn.	117	124	(3)	150	145	(3)	/		
McLeod,	D.	-	-	( )	146	126	( )	—	—	
Michie,	Jas.	121	115	(4)	144	148	(3)		/	
Morrison,	Dun.	131	142	( )	-	-	( )	—	—	
Stevens,	Jas.	98	122	(4)	142	141	(4)	/		
Thomson,	Alex.	130	105	(4)	172	148	(2)			/
Yule,	And.	111	108	(4)	-	140	(4)	/		
Anderson,	Jean.	84	87	(6)	126	-	(5)		/	
Caldwell,	Margt.	98	95	(5)	137	121	(5)	/		
Clark,	Agnes.	95	120	(4)	127	137	(5)		/	
Fowler,	Lil,	128	117	(3)	161	146	(3)	/		
Gray,	Ann.	137	123	(3)	165	149	(2)		/	
Linton,	Jean.	124	89	(5)	130	-	(5)	/		
Manning,	Margt.	109	111	(4)	124	131	(5)		/	
Merrilees,	Mary,	100	93	(5)	154	135	(3)			/
Strang,	Ruth.	75	107	(6)	132	112	(6)	/		
								9	11	2

Class IIIe.

		Xmas, 1923. A	B		Xmas. 1925. A	B		Absolute Agreement	Agreement to One grade	Disagreement by 2 or more
Bertrand,	Eliz.	122	119	(3)	-	168	(1)			/
Caldwell,	Agn.	129	103	(4)	-	138	(4)	/		
Condie,	Mar.	112	111	(4)	138	145	(4)	/		
Easton,	Agnes,	119	98	(5)	138	125	(5)	/		
Laws,	Isab.	107	105	(5)	146	127	(4)		/	
McCall,	Margt.	113	120	(4)	143	127	(4)	/		
McKeown,	Eliz.	136	106	(3)	-	141	(4)		/	
McQuarrie,	Bryce.	150	136	(2)	160	146	(3)		/	
Over,	Jes.	88	91	(6)	-	101	(7)		/	
Sparks,	Chris.	144	129	(2)	178	135	(2)	/		
Wilson,	Alice,	82	129	(3)	137	141	(4)		/	
Murray,	Margt.	120	108	(4)	155	139	(3)		/	
Bowie,	Rich.	89	111	(5)	127	120	(5)	/		
Cleland,	And.	85	113	(5)	138	143	(4)		/	
Gillies,	Jas.	140	135	(2)	165	136	(3)		/	
McKenzie,	Alex.	113	121	(4)	154	-	(3)		/	
Reid,	Thos.	109	120	(4)	146	137	(4)	/		
Sparks,	Stan,	109	101	(5)	142	133	(4)		/	
Whyte,	Wm.	131	134	(2)	166	-	(2)	/		
								8	10	1

NATIONAL INTELLIGENCE TESTS 1925

COMPARED WITH SAME TESTS 1923.

The summary of these results shows:-

	111a.	b.	c.	d.	e.	Totals.
Complete Agreement	11	8	9	9	8	44
Agreement to 1 grade.	9	10	13	11	10	53
Disagreement by 2 "	3	3	1	2	1	10
						107

That is to say out of 107 cases, 97 showed agreement, and 10 were out 2 grades. (Of these 10 all but one showed improvement upward by two grades in 1925.) These consistent results coupled with the correlation of ·81 seem to indicate that the U.S.A. National Committee of Research have evolved a set of tests that were reliable. Dr. Whipple writing in the Journal of Educational Research in June, 1921 said of the National Group Intelligence Tests: "I feel that the Committee has a right to feel a tinge of pride in what it has accomplished."

It would lead one far beyond the limits of this Thesis to enter into an adequate discussion about the value of Intelligence Tests. The various Journals of Educational Psychology and Research have for the past 20 years treated this question from every stand point. Prof. Freeman's recent book on "Mental Tests" [1], and the concise historical survey by Dr. Burt for the English Board of Education give complete resumes of the work done to date. It is hoped, however, in a later chapter, to discuss somewhat fully the most recent movement in Intelligence Testing - i.e. the attempt to find an "A.Q". (accomplishment Quotient.)

Meanwhile few will deny that Intelligence Tests fill to-day an important and indespensable role in the organisation of every school, and that those who fail to make use of them are depriving themselves of a potent and scientific adjunct to other means of estimating pupils' capacity.

Nor/

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(1) Prof. Freeman: "Mental Tests." Harrap. 1927.

Dr. Burt: Report of Consultative Committee(Introductio
Board of Education.

Nor can one within the necessary limits, enter into the wider academic discussion regarding the nature of "Intelligence". It will be readily granted that the teacher in the school who is to guide the educational car should know as much as possible about the mechanism of the engine.

It is true that after much reading he may not be able to decide upon the merits of the various rival schools of Psychology and their definitions of "Intelligence" He may agree to accept "Spearman's[1] Two-factor theory of Intelligence or side with Thorndike[2] who regards the mind "not as a functional unit; but rather as a multitude of functions," or again to accept with Terman[3] that "an individual is intelligent in proportion as he is able to carry on abstract thinking," or perhaps to follow the behaviourist definition of Intelligence by Wm. James:- "ability to adjust oneself successfully to a relatively novel situation." And soon. Inthe end the teacher will leave the final judgment to the expert, for, as Dr. Drever[4] points out:- "The understanding of the mind in the abstract may be supremely important for the human being as a human being; but it is a secondary consideration for the human being as a teacher."

---

(1) Spearman, C. The Nature of Intelligence and the Principles of Cognition. Macmillan, 1923

(2) Thorndike, E.L. Educational Psychology. pp 363-66 and in Symposium. Jour.Educ.Psy. 1921 p 124.

(3) Terman, L.M. "The Measurement of Intelligence" p 45. and in Symposium (above.)

(4) Drever, J. "The Psychology of Education." p 13.

Chapter XIII.

THE BEST FORECAST.

"QUALIFYING"

"INTELLIGENCE"

or

T E R M.

The completion of the Term examination in June, 1926 furnished a complete set of data for three years, 1923-26. 108 pupils had just finished at that date a three years' course, and one wished to know which of the three sets of marks (1) Qualifying, (2) Intelligence, (3) or Term given in 1923 gave the best forecast of the final results in 1926.(1)

In the first instance the correlations are here shown in detail. (4 pages).

(1) Correlation of Term Marks 1926 with Qualifying 1923.

(2) " " " " 1926 " National Intell. 1923.

(3) " " " " 1926 " Term Marks, 1923.

(4) " " " " 1926 " Term plus Intelligence, 1923

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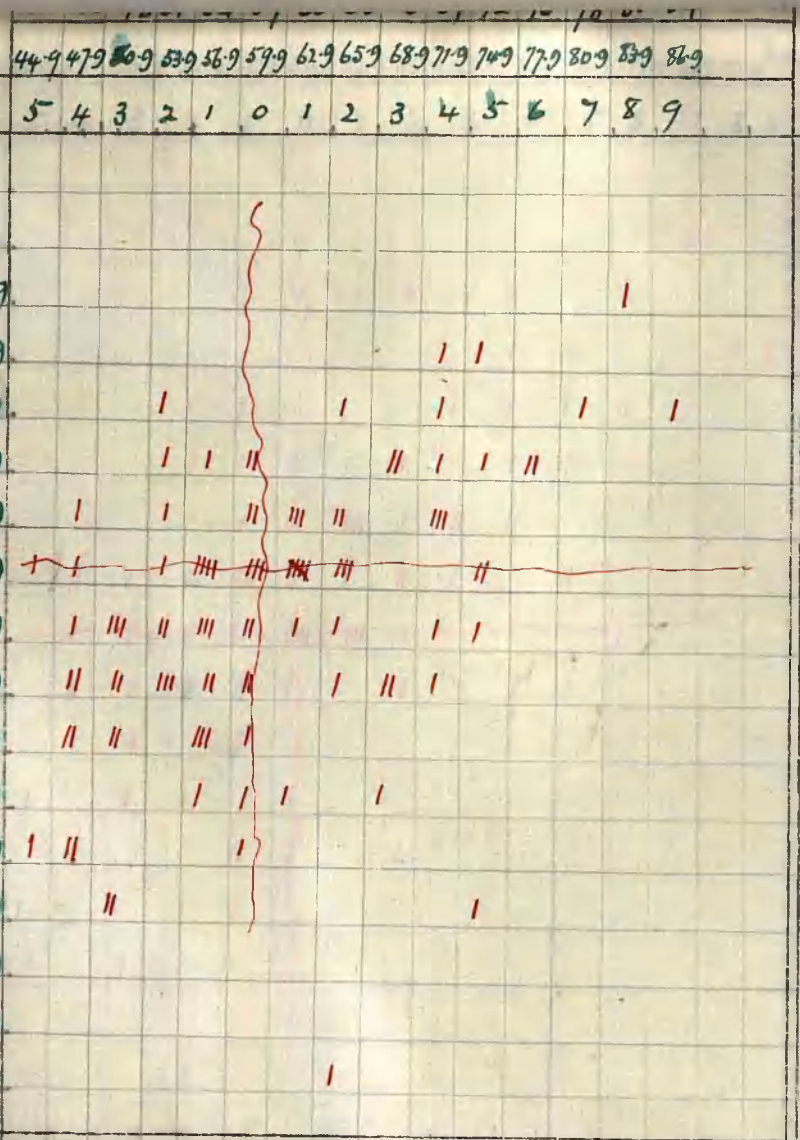
(1) Data of exact marks for all individuals filed with this Thesis.



f	2	9	9	9	14	14	10	9	5	8	6	2	1	1	1
X	5	4	3	2	1	0	1	2	3	4	5	6	7	8	9
fx	10	36	27	18	14	0	10	18	15	32	30	12	7	8	9
fx^2	50	144	81	36	14	0	10	36	45	128	150	72	49	64	81

f	y	fy	fy^2	Σx −	Σx +	Σy −	Σy +	Σxy −	Σxy +	
1	5	5	25		8		8			40
2	4	8	32		9		9			36
5	3	15	45	2	22		20			60
10	2	20	40	3	27		24			48
12	1	12	12	6	19		13			13
20	0	0	–	–	–	–	–	–	–	–
15	1	15	15	20	12	8				8
15	2	30	60	22	12	10				20
8	3	24	72	17		17				51
4	4	16	64	1	4		3	12		
4	5	20	100	13		13				65
3	6	18	108	6	5	1				6
0	7	–	–	–	–			–	–	–
0	8	–	–	–	–			–	–	–
1	9	9	81		2		2	18		

pos. 141 pos. 60 pos. 341

Σx neg. = 105 Σy neg. = 132 Σxy neg. = 30

$\Sigma x = 36$ $\Sigma y = -72$ $\Sigma xy = 317$

$\Sigma x^2 = 960$ $\Sigma y^2 = 654$ $N = 100$

$dx = \frac{\Sigma x}{N} = \frac{36}{100}$ $dy = \frac{\Sigma y}{N} = \frac{-72}{100}$

$dx = .36$ $dx^2 = .1296$ $dy = -.72$ $dy^2 = .5184$

$\sigma x^2 = \frac{\Sigma x^2}{N} - dx^2$ $\sigma y^2 = \frac{\Sigma y^2}{N} - dy^2$

$= \frac{960}{100} - .1296$ $= \frac{654}{100} - .5184$

$= 9.47$ $= 6.0216$

$\sigma x = 3.08$ $\sigma y = 2.45$

$$r = \frac{\frac{\Sigma xy}{N} - dx \cdot dy}{\sigma x \cdot \sigma y}$$

$$= \frac{\frac{317}{100} - (.36)(-.72)}{(3.08)(2.45)}$$

$$= \frac{3.4292}{7.016}$$

$r = .45 \pm .05$.

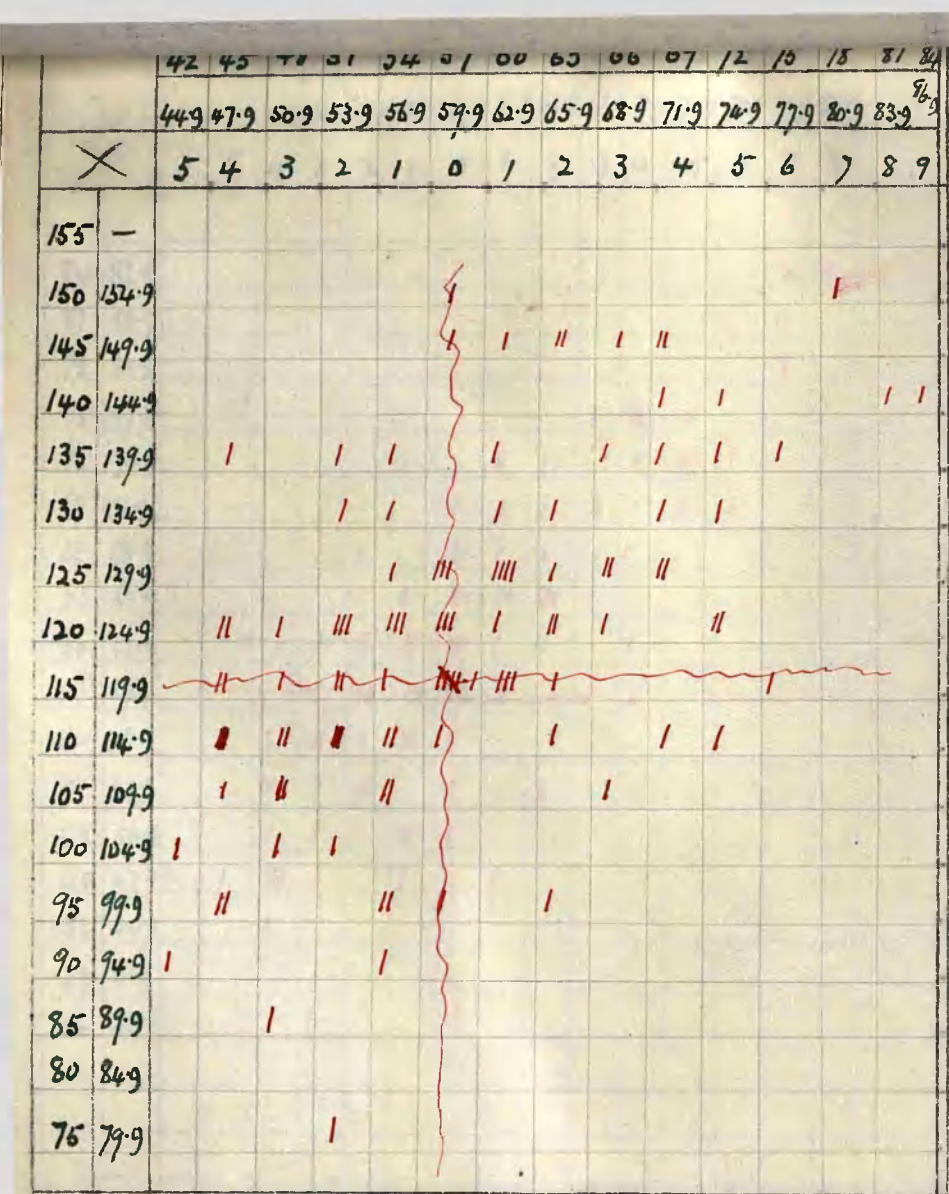
X-variable Final Term Exam" 1926

Y-variable Qualifying Exam" 1923.

Subjects

Computer K.J. checked D.A.R.

p 112.



	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84
	44.9	47.9	50.9	53.9	56.9	59.9	62.9	65.9	68.9	71.9	74.9	77.9	80.9	83.9	86.9
X	5	4	3	2	1	0	1	2	3	4	5	6	7	8	9
f	2	9	8	10	14	16	11	9	6	8	6	2	1	1	1
fx	10	36	24	20	14	–	11	18	18	32	30	12	7	8	9
fx^2	50	144	72	40	14	–	11	36	54	128	150	72	49	64	81

	f	y	fy	fy^2	Σx −	Σx +	Σy −	Σy +	Σxy −	Σxy +
155	–									
150	2	7	14	98		7		7		49
145	7	6	42	252		16		16		96
140	4	5	20	100		26		26		130
135	8	4	32	128	7	19		12		48
130	6	3	18	54	3	12		9		27
125	13	2	26	52	1	20		19		38
120	18	1	18	18	20	18	2		2	
115	17	0	0	0	16	11	–	–	–	–
110	10	1	10	10	14	11	3			3
105	6	2	12	24	12	3	9			18
100	3	3	9	27	10		10			30
95	6	4	24	96	10	2	8			32
90	2	5	10	50	6		6			30
85	1	6	6	36	3		3			18
80	0	7	–	–	–	–	–			–
75	1	8	8	64	2		2			16

pos. = 145 pos. = 110 pos. = 535

Σx neg. = 104 Σy neg. = 79 Σxy neg. = 2

$\Sigma x = 41$ $\Sigma y = 91$ $\Sigma xy = 532$

$\Sigma x^2 = 965$ $\Sigma y^2 = 1009$ $N = 104$

$dx = \frac{\Sigma x}{N} = \frac{41}{104}$ $dy = \frac{\Sigma y}{N} = \frac{91}{104}$

$dx = .4$ $dx^2 = .16$ $dy = .87$ $dy^2 = .76$

$\sigma x^2 = \frac{\Sigma x^2}{N} - dx^2$ $\sigma y^2 = \frac{\Sigma y^2}{N} - dy^2$

$= \frac{965}{104} - .16$ $= \frac{1009}{104} - .76$

$= 9.12$ $= 8.94$

$\sigma x = 3.02$ $\sigma y = 2.99$

$$r = \frac{\frac{\Sigma xy}{N} - dx \cdot dy}{\sigma x \cdot \sigma y}$$

$$= \frac{\frac{532}{104} - (.4)(.87)}{(3.02)(2.99)}$$

$$= \frac{4.752}{9.02}$$

$r = .52 \pm .053$

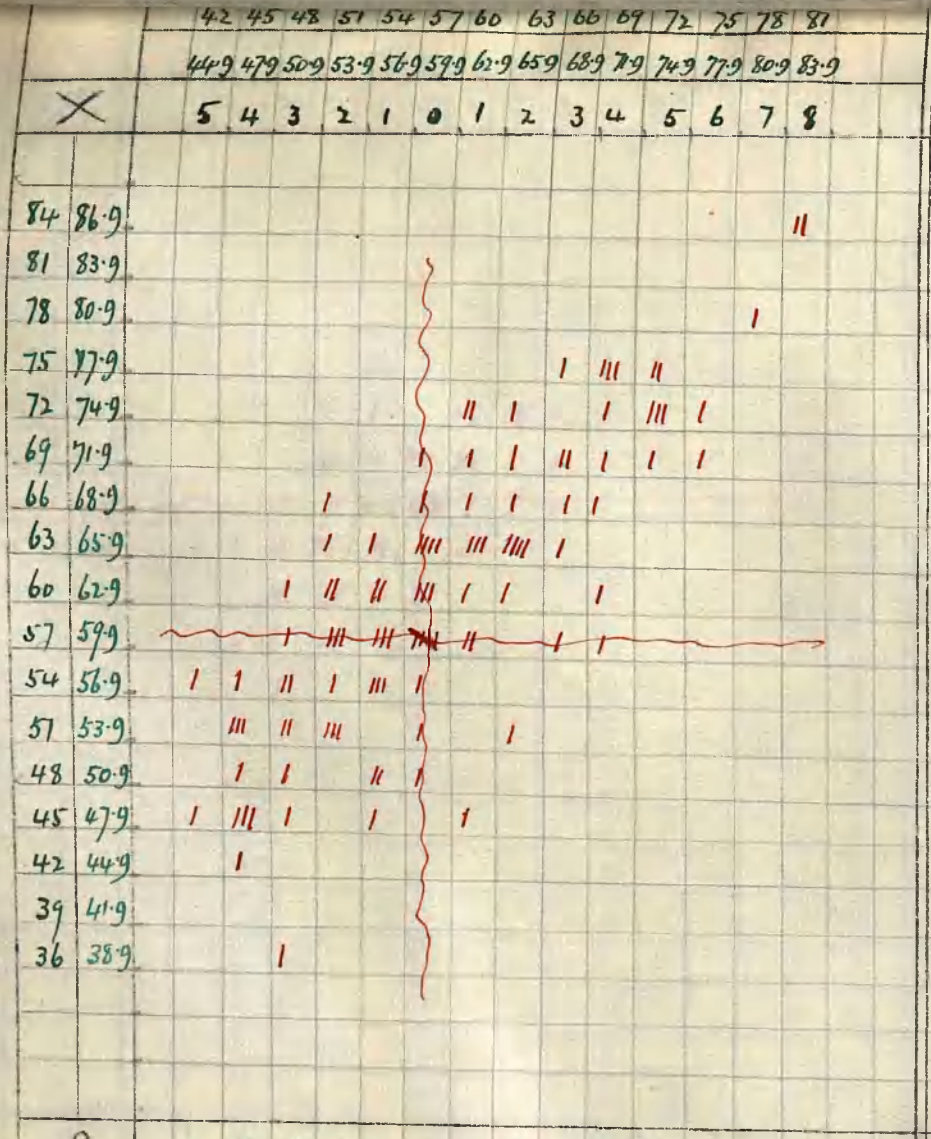
X-variable Final Term 1926

Y-variable National Intelligence Test 1923

Subjects

Computer M.M. Checked by D.A.R.

p112



f	2	9	9	11	12	17	11	9	6	8	6	2	1	2
X	5	4	3	2	1	0	1	2	3	4	5	6	7	8
fx	10	36	27	22	12	–	11	18	18	32	30	12	7	16
fx^2	50	144	81	44	12	–	11	36	54	128	150	72	49	128

f	y	fy	fy^2	Σx −	Σx +	Σy −	Σy +	Σxy −	Σxy +	
2	9	18	162		16		16			144
0	8	–	–		–	–	–			–
1	7	7	49		7		7			49
6	6	36	216		25		25			150
8	5	40	200		29		29			145
8	4	32	128		24		24			96
6	3	18	54	2	10		8			24
14	2	28	56	3	14		11			22
11	1	11	11	9	7	2			2	
16	0	–	–	–	–	–	–	–	–	–
9	1	9	9	20		20				20
10	2	20	40	24	2	22				44
5	3	15	45	9		9				27
7	4	28	112	21	1	20				80
1	5	5	25	4		4				20
0	6	–	–	–	–	–				–
1	7	7	49	3		3				21

$\Sigma x_{pos.} = 144$ $\Sigma y_{pos.} = 190$ $\Sigma xy_{pos.} = 842$

$\Sigma x_{neg.} = 107$ $\Sigma y_{neg.} = 84$ $\Sigma xy_{neg.} = 2$

$\Sigma x = 37$ $\Sigma y = 106$ $\Sigma xy = 840$

$\Sigma x^2 = 959$ $\Sigma y^2 = 1156$ $N = 105$

$dx = \frac{\Sigma x}{N} = \frac{37}{105}$ $dy = \frac{\Sigma y}{N} = \frac{106}{105}$

$dx = .35$ $dx^2 = .1225$ $dy = 1.01$ $dy^2 = 1.02$

$\sigma x^2 = \frac{\Sigma x^2}{N} - dx^2$ $\sigma y^2 = \frac{\Sigma y^2}{N} - dy^2$

$= \frac{959}{105} - .122$ $= \frac{1156}{105} - 1.02$

$= 9.008$ $= 9.989$

$\sigma x = 3.00$ $\sigma y = 3.16$

$$r = \frac{\frac{\Sigma xy}{N} - dx \cdot dy}{\sigma x \cdot \sigma y}$$

$$= \frac{\frac{840}{105} - (.35)(1.01)}{(3.00)(3.16)}$$

$$= \frac{7.6465}{9.48}$$

$r = .806 \pm .021.$

X-variable Final Term Exam^n 1926

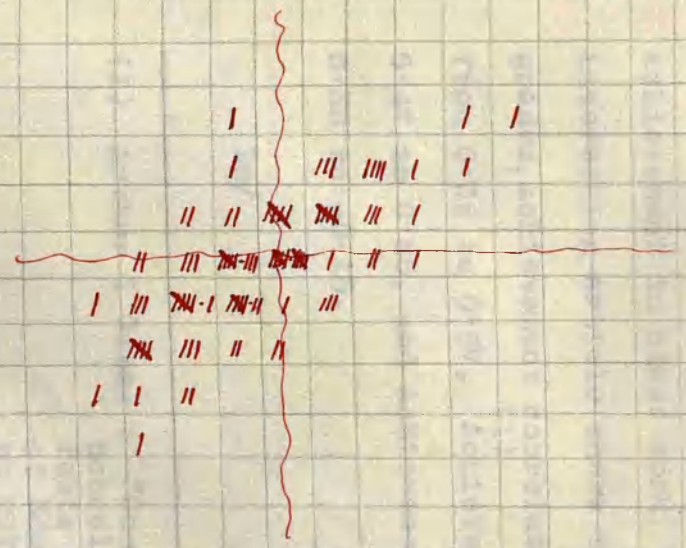
Y-variable First Term Exam^n 1923

Subjects

Computer checked by D.R.K.

	35	40	45	50	55	60	65	70	75	80	85	90
	39·9	44·9	49	54	59	64	69	74	79	84	89	
X		4	3	2	1	0	1	2	3	4	5	

85	89
80	84
75	79
70	74
65	69·9
60	64·9
55	59·9
50	54·9
45	49·9
40	44·9
35	39·9



f	2	12	16	21	18	12	9	3	2	1	
X	4	3	2	1	0	1	2	3	4	5	
fx	8	36	32	21	0	12	18	9	8	5	
fx^2	32	108	64	21	0	12	36	27	32	25	

f	y	fy	fy^2	Σx −	Σx +	Σy −	Σy +	Σxy −	Σxy +
3	3	9	27	1	9		8		24
10	2	20	40	1	18		17		34
18	1	18	18	6	14		5		5
24	0	0	0						–
21	1	21	21	32	3	29			29
12	2	24	48	23		23			46
4	3	12	36	11		11			33
1	4	4	16	3		3			12

Σx pos. = 52	Σy = 47 pos.	Σxy = 183 pos.
Σx = 97 neg.	Σy = 61 neg.	Σxy = 0 neg.
$\Sigma x = -45$	$\Sigma y = -14$	$\Sigma xy = 183$
$\Sigma x^2 = 357$	$\Sigma y^2 = 206$	$N = 96$

$dx = \frac{\Sigma x}{N} = \frac{-45}{96}$ $\quad dy = \frac{\Sigma y}{N} = \frac{-14}{96}$

$dx = -.468$ $\quad dx^2 = .217$ $\quad dy = -.146$ $\quad dy^2 = .021$

$\sigma x^2 = \frac{\Sigma x^2}{N} - dx^2$ $\quad \sigma y^2 = \frac{\Sigma y^2}{N} - dy^2$

$= \frac{357}{96} - .217$ $\quad = \frac{206}{96} - .021$

$= 3.72 - .217$ $\quad = 2.146 - .021$

$\sigma x = 1.87$ $\quad \sigma y = 1.46$

$$r = \frac{\frac{\Sigma xy}{N} - dx \cdot dy}{\sigma x \cdot \sigma y}$$

$$= \frac{\frac{183}{96} - (-.468)(-.146)}{(1.87)(1.46)}$$

$$= \frac{1.83}{2.73}$$

$r = .69 \pm .023$

X-variable Final Term Mark 1925

Y-variable 1st term + National

Subjects

Computer

N.C.

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Correlations on previous pages:-

(1) National Intelligence Tests with Term 1926.	·52 ± ·053
(2) Qualifying 1923 with Term 1926.	·45 ± ·05
(3) Term 1923 with Term 1926.	·81 ± ·021
(4) Term plus Intelligence 1923 with Term 1926	·69 ± ·023

One certainly did expect that there would be a fairly high correlation of the Term 1923 with the Term 1926 seeing that these were examinations of a similar kind held under similar conditions, and ·806 must be considered highly satisfactory. Similarly one did not expect too high a correlation between Intelligence Test and Term Examination since these were test of a different character - one to measure "Intelligence" and the other achievement in class work. Gates, in a long and interesting article shows that in the various school grades, achievement correlates with Mental Age (Stanford) from 0·36 to 0·67, (1) Achievement with Verbal Group Tests, 0·47 to 0·65, and Achievement with non-Verbal Group Tests, 0·30 to -0·15.

In/

---

(1) Arthur I Gates : "Correlations of Achievement in School Subjects with Intelligence Tests and other Variables." Journal of Educational Psychology. Vol.13. pp 277 - 85. 1922.

In general the correlation of Intelligence Tests with composite school achievement as shown in this (Gates) investigation is in the neighbourhood of 0·50. Our own correlation (·52) between "National" Intelligence Test and Term is therefore quite satisfactory. On the other hand one should expect a higher correlation than ·45 between Qualifying and Term seeing that these are both tests of achievement in school work.

Further, when one considers the marks of each pupil individually the above correlations are strikingly confirmed. Taking the figures of the seven-fold grouping given on page 78, as a convenient standard of comparison, and by scoring one point when there was exact agreement between the 1923 group mark and the 1926 group mark the following were the results:-

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Note: 5 pages of details are filed with this thesis.

S U M M A R Y.

Absolutely Correct Forecast 1923 - 1926.

	Qualg.	Intell.Test.	Term 1923.	No of Pupils
111a.	5	10	15	22
111b.	5	10	18	21
111c.	0	8	20	22
111d.	6	9	19	25
111e.	6	7	14	18
	22	44	86	108

The 1923 Term Examination forecasted correctly 86 out of 108 pupils. Of the 44 correctly forecasted by the Intelligence, the Term forecasted 38, so that 6 more fall to be added if the Intelligence 1923 is used as a supplement to Term 1923.

∴ Term and Intelligence 1923 forecasted 92 out of 108 pupils

Of the 22 cases correctly forecasted by the Qualifying.
20 were forecasted also by the Term.

∴ The Qualifying alone forecasted only 2 cases which were not diagnosed either by the Term or the Intelligence.

One wishes specially to emphasize the last remark - "The Qualifying alone forecasted only 2 cases which were not diagnosed either by the Term or the Intelligence Test." That is to say, so far as the ultimate placing of a pupil in a correct class or course was concerned, the Qualifying mark could be treated as negligible since the Term and the Intelligence Tests marks together provided all the reliable data necessary.

Of course it may be argued with some degree of justice, that it is not quite fair to judge Qualifying Marks or Intelligence Marks, with Term marks, that all the chances are in favour of Term Mark correlating highly with Term Mark. Whilst that is admitted in the attempt to correlate Intelligence Mark with Term Mark, where the tests are typically different, the same argument does not hold in the case of correlation of Qualifying with Term, which are both achievement tests. Besides, if it is admitted that an Intelligence Test which correlates with itself when given 3 years later to the high degree of •81, is reliable, then surely an achievement test which correlates •806 with itself 3 years later can also be considered reliable.

The/

Chapter XIV

SUMMARY of PART 1.

The main part of this Thesis is concerned with the refinement and amelioration of the methods of giving School Term Examinations. Already one important means of eliminating the personal element in teachers' marking has been explained, and later chapters will deal with other important points.

To sum up the whole argument to this point, one seems led to this conclusion.

(1) The Qualifying Examination.

The Qualifying Examination carried out under good conditions by a County Committee has, so far as providing a basis for the classification of pupils in a Secondary School is concerned, been shown to be unreliable. The final figures given in this investigation, that only 22 pupils out of 108 were correctly classified by the 1923 Qualifying Marks, seems to bear this out.

This/

This arose from various causes:-

(a) The standard of marking in the various schools was not at all uniform.

(b) Even the standard within the same school was not uniform.

(c) On the whole the marks gained at the Qualifying were too high, and, consequently,

(d) The limit of 75% which permitted pupils to enter the highest course in the Secondary School was too low.

The whole argument seems to have led to one con-:clusion, that the Qualifying Examination (if any) should be one merely to test fitness to proceed to the Secondary School.

Experts are agreed, and our whole investigation has endeavoured to prove, that it is impossible adequately to forecast a pupil's future progress in a Secondary School by marks gained for Primary work at the Qualifying Stage, however carefully the Qualifying Tests may be carried out.

(1) The children at 11+ are too immature;

(2) The primary curriculum being necessarily narrow, pupils may from intensive training and repetition, show results not commensurate with their native ability.

(3) There are difficulties of standardisation as between school and school, and

(4) there is the further difficulty of deciding how the various children will re-act to the less sheltered atmosphere of the Secondary School.

These/

These consideration all point to the conclusion that classification of pupils should be delayed until some time after entry into the Secondary School.

If the Qualifying Examination is thus to be merely a test of fitness to profit by Secondary work, it seems that pupils should be drafted as soon after 11 years as possible to the Secondary School, not so much that they may begin a full course immediately; but that for a Term at least, they may follow a modified general course. During this preparatory Term (or Terms) in the Secondary School, they would, whilst becoming acclimatised to their new surroundings, be under one regime and one supervision.

The argument that children would suffer from over pressure in the Primary Schools in order to,rush them for a Qualifying Test at 11+ would certainly be valid if present conditions were maintained. But one has the feeling that many things are being attempted in the Primary Schools that could quite well be left until a later stage. The amount of History, Geography and Grammar, for example, that is demanded from children at the Qualifying Stage is out of all prportion to their ability to grasp them. Grammar, except the easiest rudiments, is a difficult subject for children. History, unless in the simplest story form, is unsuitable, especially if information about laws, the growth of parliament, industrial revolution etc. is demanded. In Arithmetic the use of decimals could quite well be left over to the Secondary School, and so on. By easing the curriculum of the Primary School, and concentrating on minimum essentials, it should not be impossible to declare pupils at 11+ fit to profit by higher instruction and so get three good years from them under Secondary School conditions by the legal leaving age of 14.

If the Secondary School can offer courses suitable to the/

the varied capacity of the pupils, there is a certainty of substantial gain, for the tradition, the atmosphere, and the spirit of a good Secondary School are greater things then mere learning.

(11) The second main point in our argument which dealt with Intelligence Tests, seemed to suggest that as early as possible a Group Test should be set to all first year pupils entering the Secondary School. Given at the one time, and under the same conditions, such a test would form, if desired, the basis for any preliminary classification of pupils and would give valuable data to support the result of the first Term Examination.

(111) The third and most important point in our investigation proved that the Term Examination, carried out in the manner suggested, whereby the personal element in teachers' marking was practically eliminated, gave the very best fprecast of the future attainment of the pupil. No definite classification of the pupils should be attempted until there were available, the results of a Term Examination given under such conditions and supported by all the available data derived from Intelligence Tests, Teachers' opinions, and enquiry into Home circumstances.

PART 11.

Chapter XV.

PROGRESS in the SECONDARY SCHOOL.

SCHEME of 5 AVERAGES.

PART 11.

Pupils' Progress IN the Secondary School.

So far we have been dealing mainly with the problem of classification at the entrance to the Secondary School. Everyone will admit that if this has been well done there will be comparatively few mis-fits. Exceptional cases will certainly arise. It should not however be possible (as was experienced in 1923) to find the absolutely highest Intelligence Test marks being gained by a pupil in 1d, and pupils in the highest sections having Intelligence and Term Marks of the very lowest.(1)

Few cases such as these, should arise if the first classification has been based on the results of tests that have been proved to be reliable. But as the pupil makes his way through the Secondary School there are many influences at work which tend to modify this early classification, viz. the pupil's tendencies, interests, and industry, his good or bad health, the teachers who supervise his work, his home circumstances, and so on. In any final verdict on a pupil's progress, one must take/

		FormA.	Form B.	Total.
(1)	R.McC. 1d scored (N.I.T.)	171	160	331.
	J.G. 1a. " " (ultimate dux medallist)	137	145	282

R.McC was advanced immediately one whole year into 11d, and whilst other pupils are still at school in 5th.year (1928) he gained his Group Leaving Certificate in 1927, and is now at Glasgow University.

take cognizance of these and other points. But the first essential in watching and tracing pupils' progress is that there should be a system of careful recording. Mere reading of marks etc. is not sufficient. One must be able easily to interpret the meaning of marks. To say that J.B. has scored 67% in English and 84% in Mathematics means nothing until one knows how the examination has been conducted, how the questions have been corrected, the average mark of all the pupils taking the examination, the average mark of the pupil in J.B's particular class, his previous standing at the last test, and so on.

Various recording devices are on the market. Some pin their faith to a card index system where each pupil's record is written up and filed away. Others use simply the Record Card Booklet sent home periodically for signature to the parent.

The writer has evolved simple Recording Class Sheets whereon may be entered data which will show at a glance the pupil's standing and progress. The blanks used in practice are of foolscap size capable of holding the 30 or 40 names of a class. (educed replicas, in illustratio n are used here to suit the quarto size of paper - see p 129.

After/

After a Term Examination the names, in order of merit, of the pupils in each class are entered on a blank. Then one enters in the following order -

(1) The pupil's mark in every subject.

(2) The average Form mark.

(3) The average class mark.

No.2 "The Average Form Mark." gives the average mark in every subject calculated over all the pupils in the same form (i.e. year or grade). This enables one to place the pupil immediately in each subject in comparison with all the pupils at the same stage as himself.

e.g. J.B. English 65% Form Average 52%
∴ J.B. 65/52 is clearly above average in English.

No.3. "The Average Class Mark." is the average mark in each subject of the class or section. In a large school where there may be ten or twelve sections of a 1st or 2nd. year, intensive grading may be possible, and it is desired to know whether a pupil is holding his own in the section to which he has been allocated. If J.B. is in 1a of which the class average in English is 67, then J.B. English 65/67 shows that J.B. is slightly below the average of his class. If he is in 1h whose average in English is 43 then J.B. English 65/43 shows that he is grouped with inferior pupils for English. If his other subjects are equally high above the 1h level then it is time he were promoted to a higher section.

In addition to the separate marks for each subject, and the Form and Class average thereof the following columns are also shown.

(4) The pupil's average % mark over all his subjects.

(5) Composite Form Average. (Final average of all the form averages.)

(6) Composite class average. (Final average of all the class averages.)

No.4. This gives the pupil's final rating over all his subjects and these were the marks quoted in Chapter X.

No.5. "Composite Form Average." - this is the average of all the Form averages, and may be reckoned as the final average % over all the Subjects which the average pupil in all the Form can do over all the subjects. An attempt is made in practice to have this work out at 50% or as near it as possible, so that marks may from Term to Term be standardised.
If. J.B. is doing 61% over all his subjects and the composite Form Average is 50% then J.B. is doing very well over all. If J.B's final average dropped below 50% then he would not be up to the average boy of his year.

No.6. "Composite Class Average." e this gives the final % mark of the average boy in each section. If 1a's Composite Class Average was 65, then J.B. in 1a who scored all over 61 was below the average boy in his class although well over average boy of the whole form.

	Pupil's Average.	Com.Form Aver.	Com.Class Aver
J.B.	61	50	65

Therefore J.B. is clearly not quite pulling the weight of the class he is in, although well above Form Average.

This/

This scheme of tabulation showing 5 averages,

(a) Form average in each subject,
(b) Class average do do
(c) Pupil's final average over all the subjects.
(d) Composite Form Average do do
(e) Composite Class Average do do

makes it possible for one to place the pupil in every subject and over all the subjects, not only in his own class, but in relation to every pupil in the whole year.

(7) Attendances.

In addition, a column showing the number of absences in the term is given. The reason for this is almost self-evident. A pupil who has been irregular, or absent for a long period, cannot hope to have an attainment equal to what might have been expected, had the attendance been good.

Attendances lost during the first year of the Secondary School Course are particularly vital, because it is during that period that the foundations of all the subjects are being laid, and if these are not sound, the super-structure has every chance of being imperfect.

Over-leaf are given reduced replicas of the class sheets used.

First/Second Term Examination Report Date _____

Class _____

Registrar _____

Poss. Attendances in Term _____

PUPIL'S NAME	ENGLISH	HISTORY	GEOGRAPHY	MATHEMATICS	FRENCH OR GREEK	LATIN OR GERMAN	ART	SCIENCE	NEEDLEWORK	TECHNICAL SUBJECTS	COMMERCIAL SUBJECTS	DOMESTIC SUBJECTS	MUSIC	TOTAL MARKS	PUPIL'S AVER.%	POSITION IN CLASS	No. OF ABSENCES	PREVIOUS TERM MARK
See pages 126, 127.																		
Numbers refer to paragraphs on pp 126, 127.	(1)														(4)		(7)	
Class Avg. % each subject: (3)														Composite Class Aver. (6)				
Form Aver. % each subject (2)														Composite Form Aver. (5)				

In order to illustrate the working of the scheme a selection is made from the class sheets of the highest boys' class, 1a, consisting of 34 pupils. The first 4 names in order of merit, the middle and the last 4 are here given.

Marks that are below class average are underlined, marks below form average are encircled ○
The 1st Term results in December 1923 are given on page 131 and the June 1924 results of the same pupils on page 132.

.....

First/~~Second~~ Term Examination Report Date Dec. 1923

Class 1a.

Registrar D.H.

Highest pupils. Poss. Attendances in Term 166

Middle "

Lowest "

Plus one absent in hospital.

PUPIL'S NAME	ENGLISH	HISTORY	GEOGRAPHY	MATHEMATICS	FRENCH OR ~~GERMAN~~	LATIN OR ~~GERMAN~~	ART	SCIENCE	NEEDLEWORK	TECHNICAL SUBJECTS	COMMERCIAL SUBJECTS	DOMESTIC SUBJECTS	MUSIC	TOTAL MARKS	PUPIL'S AVER%	POSITION IN CLASS	No. OF ABSENCES	PREVIOUS TERM'S MARK (Qualifying mark.)
lder, Chas.	81	84	88	93	91	95	53	97	-	-	-	-	79	761	84·6	1	10	98
ray, Jas.	76	79	91	91	94	96	58	88	-	-	-	-	80	753	83·6	2	0	90
unningham, Jos.	71	68	84	80	86	87	69	87	-	-	-	-	64	695	77·2	3	0	94
cBride, Jas.	75	68	81	80	62	61	60	80	-	-	-	-	58	684	76	4	8	92
oper, And.	70	66	65	86	63	42	62	72	-	-	-	-	64	590	65·5	14	0	82
lark, Alex.	68	47	67	77	81	87	54	61	-	-	-	-	46	588	65·4	15	4	88
cAllister, Jn.	63	67	74	79	77	52	47	73	-	-	-	-	45	577	64·1	16	4	88
art, Alex.	70	71	69	71	59	54	53	58	-	-	-	-	68	573	63·7	17	4	84
odd, Rob.	54	42	44	73	43	6	59	66	-	-	-	-	41	428	47·5	30	12	82
cGlynn, Dav.	56	49	51	59	20	23	61	42	-	-	-	-	46	407	45·1	31	0	78
elsh, Fred.	68	46	62	70	39	23	42	21	-	-	-	-	25	396	44	32	0	81
yth, Wm.	51	29	56	50	22	4	44	37	-	-	-	-	35	328	36·4	33	11	82
orner, Jas.	58	47	76	abs	abs	51	54	abs	-	-	-	-	abs			abs	60	83
Class Avg. % each subject	64	54	70.8	76	63	50	57·7	60					53·6	Composite Class Aver.				62·4
Form Aver. % each subject	50	49	52	55	54	59	53	54					50	Composite Form Aver.				52

( ) Less than Form Average.

" " " Class "

~~First~~/Second Term Examination Report Date June 1924

Class 1a.

Registrar D.H.

Same 12 pupils as previous page.

Poss. Attendances in Term 20₈

PUPIL'S NAME	ENGLISH	HISTORY	GEOGRAPHY	MATHEMATICS	FRENCH OR ~~GREEK~~	LATIN OR ~~GERMAN~~	ART	SCIENCE	NEEDLEWORK	TECHNICAL SUBJECTS	COMMERCIAL SUBJECTS	DOMESTIC SUBJECTS	MUSIC	TOTAL MARKS	PUPIL'S AVER.%	POSITION IN CLASS	No. OF ABSENCES	PREVIOUS TERM MARK
											Result.							
ray, Jas.	64	76	86	98	95	92	59	90			IIa.		87	747	83	1 (2)	4	83
lder, Chas.	74	80	66	100	88	90	52	90			IIa		95	735	82	2 (1)	20	84
unningham, Jos.	70	70	74	87	71	71	71	80			IIa		53	647	72	3 (3)	0	77
rner, Jas.	61	50	88	84	68	89	54	59			IIa		45	599	67	6 (36)	101	abs.
Bride, Jas.	56	(32)	62	96	51	62	61	79			IIa		67	566	63	9 (4)	15	76
ooper, And.	(48)	54	60	77	(30)	53	62	72			IIc		52	508	56	19 (14)	2	65.5
art, Alec.	(43)	62	72	61	(26)	(37)	56	60			IIc		51	468	52	23 (14)	13	63.7
lark, Alex.	63	(16)	58	66	60	54	52	(49)			IIa		(42)	460	51	24 (13)	36	65.4
cAllister, Jn.	62	(40)	66	54	46	(48)	(47)	(45)			IIc		(42)	450	(50)	26 (16)	51	64.1
odd, Robt.	58	(32)	(38)	67	(20)	(33)	57	69			IIc		(43)	417	(46)	28 (30)	12	47.5
olsh, Fr.	(40)	(24)	(34)	61	(26)	(35)	54	(50)			IId		(32)	357	(40)	33 (32)	0	44
cGlynn, Dav.	(43)	(30)	(48)	(46)	(3)	(19)	58	(50)			IIe		(47)	344	(38)	34 (31)	14	45
yth, Wm.	53	(36)	(34)	59	(4)	(5)	(46)	(45)			IIe		abs	282	(31)	35 (32)	33	36
Class Avg. % each subject	57	46	60	74	45	52	58	63					54	Composite Class Aver.				56.6
Form Aver. % each subject	50	52	54	52	45	54	54	52					48	Composite Form Aver.				51

( ) Less than Form Average

(" " Class "

In June the final reckoning for the year takes place, although changes of course may, in exceptional cases be made after the December Term. With the two Term sheets before one, it is possible to have a stock-taking of all the pupils' work during the year.

The experienced eye travels first to the pupil's final average percentage, then to the Compositive Form Average. This gives the pupil's rating in comparison with the average pupil of the year and determines largely whether he is good or bad at his work.

Thereafter one looks along the detailed series of figures, and particular note is made of how the pupil is doing in the major subjects:- English, Mathematics and Language.

Next one takes into account how he compares with the other pupils in his class, whether he is holding his own in the class, or should be drafted into another.

Consideration then is given to the attendances and to any points that have become known regarding the home circumstances.

If the first classification of the pupils has been made/

made on sound data, decisions can be reached easily; but when, as happened in 1923, the Qualifying Marks prove unreliable then anomalies arise in almost every class, and pupils have to be transferred to other courses.

As an illustration of what happens let us follow in detail the cases cited on pages 131 and 132. These were all pupils with Qualifying Marks of 80 and over, who had secured admission to the highest class, 1a. Elder, who came clearly as the best boy at the Qualifying with 98%, lost first place in June to Gray, and never again regained it during all the three years 1923-26. Perhaps his 30 absences in the critical first year accounted for this. Cunningham is a good steady third although not so clever as the other two.

In June, a new star appeared on the horizon, James Horner.(1) Notwithstanding 161 absences, through an operation in hospital, this boy, endowed with great natural genius, with few home amenities, threw out a challenge to the leaders, which almost succeeded in the 3rd. year. But the initial handicap was too great. Perhaps McBride's 23 absences made him drop from 4th. in December to 9th. in June.

One had no difficulty in deciding that these five should go forward to 11a the highest section of the second year/

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(1) ~~See further about J. Horner in Chap XIX. "The Home".~~

year.

Decision regarding the middle four, Cooper, Clark, McAllister, Hart, was rather difficult. All four did better than Form and Class Average in December, but all were lower than Class Average in June. Cooper and Hart, weak in both English and Language were clearly unfit to continue a double language course, so they had to go down to 11c, a one language section of the second year. Clark, absent 51 times, was still doing well in Languages, so a further chance in 11a was given him. (In the 3rd year he went out into a one language course.) McAllister, below Form Average in 5 subjects in June was clearly not good enough to go on to 11a and so 11c became also his destination.

Regarding the last 4, Todd, McGlynn, Welsh and Smyth, one really wondered if the Qualifying Marks of 82, 78, 81, and 82 were not in the nature of a joke. Their records of attendance were quite good, Welsh's being perfect. But a glance over their line of failure in practically every subject, at both Term Examinations, convinced one that their abilities were poor. If there had been failure in one, or even two subjects, the teacher might have been to blame; but failure in every subject was proof that they were clearly in the wrong class.

Owing/

Chapter XVI.

THE ACCOMPLISHMENT QUOTIENT. (A.Q.)

, In the previous chapter, pupils were advanced or retarded according to their marks on the Class Record Sheets. But if marks alone are to determine progress then one is assuming at least two things:-

(1) That the pupil has all the time been working to capacity, and

(2) That he has had from his various teachers the best opportunity to develop his native intelligence, i.e. that the teachers also have been working to capacity.

The solution of both of these questions is fundamental to the estimation of pupils' progress. Recent investigations in America have sought to establish a ratio between the pupil's capacity and his achievement, called the Accomplishment Quotient, and it is proposed to examine this procedure in detail. The other question of teachers' rating will then be considered in the succeeding chapter.

The Accomplishment Quotient, or A.Q. is one of the most recent acquisitions of the educational psychologist and school organiser. It is the latest recruit to the army of quotients already in use, e.g. I.Q., E.Q., C.I., etc. The Accomplishment Quotient is to be considered as the "degree to which a pupil's actual progress has attained to his potential progress by the best possible measure of both."(1

or/

(1(Toops & Symond: "What shall we expect of the A.Q? in Jour. of Educ. Psy. Vol.13. Dec. 1922 - and Vol.XIV. Jan. 1923.

or as a simple measure of comparing a pupil's achieve-:ment age with his mental age (learning capacity.). In its statistical derivation it is quite as abstract a concept as "π" or "r".

The formula is thus:-

$$A.Q. = \frac{E.Q.}{I.Q.} = \frac{\frac{E.A.}{C.A.}}{\frac{M.A.}{C.A.}} = \frac{E.A.}{M.A.}$$

where

A.Q. = accomplishment or achievement quotient.

E.Q. = educational quotient.

I.Q. = intelligence quotient.

E.A. = educational age.

C.A. = chronological age.

M.A. = mental age.

The earliest proposed use of the A.Q. was made by Buckingham and Munroe (1) in connection with their Illinois Examination. These authors call the measure of relative achievement the "Achievement Quotient", or A.Q, and find it/

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(1)B.R. Buckingham and W.S. Munroe: Univ. of Illinois Bulletin. Vol.19. 1921.

it by dividing the achievement age by the mental age. To them an A.Q. of 1·00 means "that the pupil has achieved exactly as well as the average of the pupils of his mental age."

, The most elaborate use of such a quotient however has been made by Franzen.(1) He first finds the subject ratios of the various individual school subjects. These are the ratios between the subject ages and the mental ages. The average of these subject ratios he calls "accomplishment ratio." (Acc.R.) "The accomplishment ratio, then is the same as Buckingham & Munroe's achievement quotient."(2) Franzen, however, interprets the A.Q. differently from Buckingahm and Munroe. To Franzen an A.Q. of 1·00 indicates not average pupil's accomplishment; but optimum accomplishment, "what a pupil is able to do under the best conditions." According to Franzen therefore, there cannot theoretically be an A.Q./

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(1) R.H. Franzen: "Teachers' College Record" Vol.21. Nov. 1920.
and "Conservation of Talent". World Book Co. 1922.

(2) F.N. Freeman. "Mental Tests." p 286.

A.Q. greater than 1·00. "An A.Q less than 1.00 means that the pupil is doing school work which is less than normal for his mentality."

On the other hand to Buckingham and Munroe an A.Q. of, say, 130 is possible. To them, an A.Q. of 130 means that the pupil has achieved 30% more than the average of the pupils of his mental age.

A third A.Q. procedure is suggested by Pintner.(1) Pintner transmutes the educational test and mental test scores into index values 0 — 100 for a given age:- average ability = 50. His measure is a <u>difference</u>, not a <u>quotient</u>. Difference = Educational index - mental index. This measure is "The difference between a pupil's native capacity and his actual accomplishment."(2)

It is evident therefore that even among the originators, there is a great difference of opinion in regard to the meaning to be attached to the A.Q; and already many critics(e.g. Dr. Otis.) are forward to point/

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(1) Pintner & Marshall: "A Combined Mental Educational Survey." Jour. of Educ. Psy. Vol.12. Jan.1921. pp 32-43.

(2) See P and M. p.37.

point out the ultimate chaos in resultant phraseology if an effort is not made soon to unify procedure.

Even as matters stand, the teachers of the City Normal School, Rochester, N.Y. have tried out the method and have given it unqualified approval.(1) "We believe that the Accomplishment Quotient is the fairest and the most valuable measure." In their procedure, they used the following tests:-

Mental:- National Intelligence Tests A and B.

Educational:- Reading (Thorndike, McCall)
Arithmetic (Woody)
Problems (Buckingham Problem Scale)
Spelling (Ayres; Munroe.)

They transformed "National" scores into a table of Mental Ages (by means of given norms and a division of their own). Educational scores were also transformed into educational ages. As the test originators gave only grade norms, the Rochester teachers made age tables of their own.

> "We realise that the method we have used has its defects; that it is at best only a makeshift; that it is as accurate as it could now be made, and until test constructors furnish us with age norms it is the best method for interpreting scores."

This/

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(1) Stebbins & Pechstein: "Quotients I.E. and A." Jour. of Educ. Psy. Oct.1922. pp.385 - 398.

This last paragraph is illuminating. Here we have a group of teachers, thoroughly imbued with the desire to give the A.Q. procedure a fair trial, with the best standardised scales at their disposal, forced to sit down and make out age tables of their own, admitted to be at the best only a makeshift.

The question one asks oneself in Scotland is whether it is possible, even with the age and grade norms given in the various handbooks of directions, satisfactorily to transmute scores made (e.g. in the National Intelligence Tests) into mental ages for Scottish pupils.

The Manual of Directions (National Intelligence Tests) page 27 says:-

> "With respect to these norms, examiners should understand that the averages obtained may be expected to vary with region, community, school and class as well as with race, grade and age."

If, as one is advised to do, one attempted to make up a mental age table from one's own investigation, there would be no guarantee that it would be consistently accurate for all ages. At the very outset an extremely difficult problem would confront one, for on pp 38 and 39 of this Thesis, it was shown that in the "National Intelligence Tests both A and B, pupils of both 12 and 13 years made exactly the same median scores.

Form A. 115·3. Form B. 113·2

But/

But granted that one could get age tables for the Mental Tests, how is one, unless again by making an arbitrary table for oneself, to transmute Term Test Scores into Educational Age Table. And the whole A.Q. procedure depends on accurate Mental Age Tables, and Achievement Age Tables. But even were age tables for Intelligence and Achievement tests available there are grave defects, theoretical and statistical, underlying the whole A.Q. technique.

The A.Q. precedure rests not on one quotient; but on a series of quotients, not one of which has been proved conclusively to be valid. And if even one numerator or one denominator of any of the included quotients is invalid then much more invalid will be the resultant A.Q.

For example the I.Q. of the Stanford Revision seems to be the only I.Q. that meets with almost universal acceptance.(1)

But/

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(1)
Terman: Measurement of Intelligence. Chap.Vll.

Rugg & Colloton: Constancy of the Stanford-Binet I.Q as shown by Re-Tests. Jour.of Educ.Psy. 1921. pp 315-22.

L.S. Rugg: do do do do Jour.of Educ.Psy. 1925. pp 341-43.

S.C. Garrison: Additional Re-Tests of above. Jour.of.Educ.Psy. 1922. pp 307 -13.

But when I.Q's are calculated from other Mental Tests then acute divergence has been shown to exist.

Miss Gertrude Rand reports (1) that the equivalent to the Stanford-Binet I.Q of 90 for a 7 year old would be

86 on the Burt Revision.
70 " " Porteous Maze.
80 " " Pintner Patterson Performance Scale.
81 " " Pictorial Completion.

that

113 on Binet I.Q
113 " Terman Group Test
123 " Miller
119 " Haggerty,
111 " Otis.

Further, that these relative quotients are not constant at other ages.

Since then I.Q. values above and below 100 have such different meanings for different tests, there is lttle wonder that Gates should have found a wide range of I.Qs for an individual when tested by different group tests, and that he says a pupil "classified as average by one test was by another a genius."

There/

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(1) Gertrude Rand: "A Discussion of the Quotient Method of Specifying Test Results." Journal of Eudcational Psychology. 1925. pp 599.

There is also the further criticism of dividing one unit by another which has not been shown logically or empirically to be the equivalent of that unit. We do not divide months by years, grains by ounces or centi-:metres by inches. "Why them" as Miss Rand says "should we divide E.Qs by I.Qs or E.As by M.As without proof of their equivalence at other points than at the median." and so, to quote her further, "it may not be amiss to add one more paper in protest against the method."

One more point:- Burt[1] says "Individuals vary distinctly more in intelligence than they do in educational ability."

If then $A.Q = \frac{E.Q}{I.Q}$

and if E.Q be a smaller unit than I.Q, say σ E.Q = 10, and σ I.Q = 15

Case (1) then a child 1σ above median $\frac{110}{115}$ = 96 A.Q.

(2) " " 2σ " " $\frac{120}{130}$ = 92 A.Q.

(3) " " 1σ below " $\frac{90}{85}$ = 106 A.Q.

(4) " " 2σ " " $\frac{80}{70}$ = 114 A.Q.

It is evident therefore that this quotient method tends to give brighter pupils a low A.Q and vice versa.[2]

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(1) C. Burt. "Mental & Scholastic Tests. p 158.

(2) See article Jour.of Educ. Research. Vo.IX 1924. p.291 "In 100 cases only 3 pupils whose I.Q were above 100 made higher A.Qs, and only 3 whose I.Qs were below 100 made lower A.Qs.

All the recent literature on the Accomplishment Quotient is full of warnings about the unreliability of this method of measurement. (1) Chapman, in an intricate mathematical investigation says:-

> "The general idea (i.e. to measure "intelligence" and school achievement") is so attractive, and the results if true, so useful, that schoolmen have been captivated by the simplicity of a definite figure which promised to give such valuable information with regard to the pupil and the school. Provided sufficiently accurate differential instruments are available, no one doubts that the procedure is most useful; but in the absence of such instruments, I have been much shocked by the rigid manner in which the differences in intelligence level and school level have been interpreted. It seems advisable to issue certain caveats which are the result of an examination of its logical and statistical basis."

Prof. Kelley, of Stanford University (2), author of "Statistical Method" (Macmillan, 1923) etc. dismissed the subject in the following sentence:-

> "There has been a resort in recent years to an appraisal of scholastic success and promise by means of the Accomplishment Quotient. A child's pedagogical age determined in a very fallible way (by class marks or scores in a school test) is divided by his mental age, likewise determined by fallible means(a group or individual intelligence test), and this quotient is taken as the ratio of what the child accomplishes to what he would have accomplished/

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(1) J.Crosby Chapman, Yale University.

"The Unreliability of the Difference between Intelligence and Educational Ratings." Journal of Educ. Psy. Vol.XIII. pp 103.

(2) Truman L. Kelley: Journal of Educ. Psy. Vol.XIV. page 321.

accomplished had he put forward just average effort.
.....

It is obvious that two intrinsically disparate traits, if measured in a very unreliable manner, will not permit of reliable judgment."

And if anyone still has an opinion that the A.Q. is of some value, the two long articles by Toops and Symonds on "What shall we expect of the A.Q?"(1) must bring conviction that, as they say - "the A.Q. has solved nothing."

A few paragraphs may be cited. "The question of the equivalence of scores or tests constructed by different research workers is also in a state of flux."
"There is really no true equivalence of two test scores."(2)
"Without true equivalence of different mental and educational scales we cannot expect identity of interpretation of A.Qs secured by different workers using different mental tests, educational tests, or both."

"The I.Q was devised primarily to suit the Stanford Revision. Consequently I.Q procedure is not, in strict scientific usage, applicable to other than the Stanford Scale.

If the A.Q procedure is to have a monopoly on Stanford's I.Q it necessarily must have a monopoly on Stanford's M.As for it will be seen that the C.As cancel out in equation.

$$A.Q = \frac{E.Q}{I.Q.} = \frac{\frac{E.A}{C.A}}{\frac{M.A}{C.A}} = \frac{E.A.}{M.A.}$$

leaving /

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(1) Journal of Educ. Research. Vol.XIII. Dec. 1922 and Vol.VIV Jan. 1923.

(2) Thorndike: "On Finding Equivalent Scores on Tests of Intelligence." - Journ. of App.Psy. Vol.6. 1922. pp 29-33.

leaving only 2 simple variables E.A., and M.A. We need but one of these to be invalidated in order to have the whole fractional equation invalidated."

"And whose E.Q shall be considered as standard? Not only does this point to an inadequacy of the A.Q. procedure; but of the I.Q. and the E.Q procedures as well."

This question of the Accomplishment Quotient has been treated at considerable length not only because of its fundamental importance generally on educational statistical work; but because of its special bearing on this Thesis. From the expert evidence quoted, it will be readily granted that with the material presently available, the A.Q. procedure is not only statistically unsound; but theoretically impossible.

"The prospect of being able to bring the accomplishment of every individual into exact harmony with his potential achievement is a pleasing one to contemplate; but it probably cannot be done with anything like the exactness which is implied in using our present measures in the manner which has been indicated." (1)

Although the A.Q. procedure has been found to be impracticable yet the question of whether a pupil is working to capacity is so vital to any estimation of progress that some practical working solution is necessary. This will be given in the final chapter after one has discussed the question of Rating Teachers' Ability which will throw some additional light on the problem.

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(1) Prof. ~~Terman~~ Freeman : "Mental Tests" (Harrap.) page 288.

Chapter XV11.

RATING of TEACHERS' TEACHING ABILITY.

There is one very important point however, that has not yet been investigated, which must demand our attention for a little.

So far one has taken into account only/ the variations in the pupils' marks. But it is well known how much the teacher counts in the achievement of a class. Not so very many years ago, all the blame for failure was put upon the teacher. But clearly as in the case of Alfred Welsh (see pages 131-132) who had a perfect attendance all year, and who qualified with the excellent mark of 81%, it is quite improbable that his complete failure in English, History, Geography, French, Latin, and Physics could all be accounted for by poor teaching. He was getting the same tuition, day after day, as Gray and Elder who could make well over 80% in every subject, while he could, over all, just make 40%.

On the other hand there is just the danger of swinging to the opposite extreme and of putting all the blame for failure upon the pupil.

Generalities are rarely right. To blame a teacher for every failure is as wrong as to praise him/her for every/

every success. There are some pupils who fail with the best teachers, just as there are pupils who will do well in spite of the teacher however poor.

But the evaluation of the teacher is a vital problem in the organisation of a school. In justice to everyone concerned, the estimation of the teacher's worth should not rest merely on personal opinion, but an attempt should be made to settle the matter on an objective basis.

It is a truism to say that one teacher will get on well with some classes and fail with others; But some teachers will succeed with <u>every</u> class they get, while others will fail to get the best out of <u>any</u> class they take in hand. It is not only a matter of training and scholarship - it is pre-eminently a matter of personality, and character. There is that indefinable something about certain individuals which commands the respect and con-:fidence of the pupils, and makes them effective teachers.

We are slowly but surely coming to the idea that sympathy must rule in the class-room. Those of us who have families at school realise how our sons and daughters work for/

for those whom they love and respect. For those whom they fear, work is certainly done, but not overflowingly done.

Success in teaching is found in that inspiration which conveys itself to the pupils and animates them with the overwhelming impulse to higher and better work. And work done by the pupils under this personal inspiration is bound to show itself in the results achieved.

No one suggests that all good results at examinations are the out-come of good teaching. There were in the old days excellent results in certain schools that were got by methods little short of criminal. But the problem remains. The Head of a school must exercise discrimination in the selection of his Staff for certain classes, which too often is left to haphazard chance. And the whole course of a pupil's success may depend on the choice made.

The literature on this important subject of teacher rating is singularly meagre; but the following short summary of one article may be taken as typical.

In the 1922 Volume of the Journal of Educational Research(1) there is given in detail a scheme whereby the teachers/

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(1) Qualities related to Success in School Teaching." F.B. Knight, State University of Iowa. Journal of Educational Research. 1922. pp 207 seq.

teachers in 3 School systems in Massachusetts were rated. The basic technique was to correlate ascertainable facts concerning the teachers with the degree of success they were obtaining in actual class-room work.

The modus operandi briefly was:-

(1) Mutual ratings. Every teacher in the group rated every other teacher for such qualities as

(a) general teaching ability.
(b) skill in discipline.
(c) excellence of professional preparation, and
(d) ability to handle situations.

(11) Ratings by superior officers.

(111) Ratings by pupils.

Twenty of the most dependable pupils in each school rated their teachers.

The finding of the first part of the article runs thus:-

> "The High Correlations between the rating of teachers, supervisors and students made it clear that an order of merit of individuals composing the teaching staffs had been fairly attained."

With/

With this criterion of teaching success, objective data concerning the teachers were correlated.

Correlations were worked out between ability to teach and (1) Handwriting, (2) Age, (3) Experience, (4) Professional Study during service, (5) Mental tests, and (6) Normal school standing, all with little success.

And the article finishes thus:-

> "The findings of this study lead one to wonder how much better than chance the selective skill of the average superintendent is. As far as I know we have on record no correlation between how well a superintendent thought teachers would do and what they actually did. In other words, the correlation between successful candidating and successful performance is unknown."

Not very helpful this!
And yet it is essential to have, if possible, a somewhat scientific means of estimating teachers' ability.

Not only the parents of the children but the children themselves are vitally concerned with the quality of the teaching given.

But everyone agrees that teaching (successful or unsuccessful) is largely a question of the personality of the teacher. And personality is the most elusive thing on earth, very difficult to measure.

Yet one must admit that if a teacher is a success, there must be results and evidence of success. One measures a pupil's success largely by the progress he makes in his studies, and it is surely not unjust to judge a successful teacher as one whose pupils make consistently the best progress.

But there is a danger here. The greatest progress is not always made by the pupils who earn the highest marks. One knows in the bad old days what perfection was often attained by callous and brutal teachers unworthy of the name. But the newer methods in school work where fear is being gradually eliminated, lead one definitely to say that progress depends largely on inspiration.

Now one is conscious of the tremendous strain and tax on/

on vital resources it is for any teacher to inspire certain classes. Ten times more energy, ten times more thought, ten times more vitality may be poured out on a class which shows but poor results at the end of the year, than on another class of picked pupils who go bounding forward carrying the teacher with them in their impetuous eagerness.

But it is here, I think, that our class sheets with their 5 averages are going to smooth out difficulties and solve this vexed question at least in part.

Chapter XVIII.

RATING OF TEACHERS by CLASS CAPACITY CONSTANT.

My thesis is, that if classes are graded even fairly well, each class containing pupils of approximately equal ability, there is <u>in every subject</u> a <u>constant class capacity</u>.

In a class composed of pupils of more than average class ability the class average <u>in every subject</u> should under suitable guidance (and that is the teacher's duty) show a class average higher than the general average.

Individuals may differ widely from one another in their excellence in various subjects; e.g. J.B. may be good at English, excellent in Mathematics, and rather poor in Latin, while A.R. may be excellent in Latin and poor in Mathematics; but <u>taken all over</u> the class ought in each subject to have a high average.

Similarly, another class may, <u>in every subject</u> be expected to attain only a low average, And this is exactly what has been found to happen. To illustrate this point the Form and Class Averages of three classes are given.

Class 11b, 192[illegible]/

	Eng.	Hist.	Geog.	Maths.	French.	Phys.	Chem.
Class 11b. 1924.							
Class Average.	65	49	61	70	71	63	58
Form Average.	55	52	53	55	55	55	50
	10 up;	3 down;	8 up;	15 up;	16 up;	8 up;	8 up;
Class 11g. 1924							
Class Average.	45	55	36	44	42	44	36
Form Average.	55	52	53	55	55	55	50
	10 down;	3 up;	17 down;	11 down;	13 dn;	11 dn.	14 down;
Class 1h. 1924.							
Class Average.	50	52	51	37	43	51	54
Form Average.	50	52	54	52	45	54	54
	sq.	sq.	3 down;	15 down;	2 down;	3 dn.	sq.

It will be noticed that of these classes taken at randon, in every subject,

11b. with one exception scored very much higher than Average.

11g. " " " " " " lower " "

1h. " " " was practically square with Average.

Now this is interesting and has an important bearing on our investigation.

In/

In Class 11b,	Composite	Class Average	=	61
	"	Form "	=	54
In Class 11g,	"	Class "	=	43
	"	Form "	=	54
In Class 1h,	"	Class "	=	49
	"	Form "	=	51

Therefore, in each subject,

Class 11b. should pull approximately 7% above Form Average.

" 11g, " " " 11% below " "

" 1h. " " " 2% " " "

For short one might call 11b, a (+7) class, i.e. it shows a class capacity above the average of +7. Similarly for 11g, the class rating would be (−11) and for 1h, (− 2) .

If then one takes the English teachers of these three classes:- 11b, 65/55 (+7) , making 10% above average, one can congratulate the teacher that the class is working to capacity and perhaps a little better. The English teacher of 11g (-11) may be depressed to think that her class has only attained an average of 45/55, (−11) and yet when you point out to her that her class has done actually/

actually more than the class capacity warranted, you shake her by the hand and congratulate her on the very good result, for though 20% less than 11b, the result is quite as meritorious.

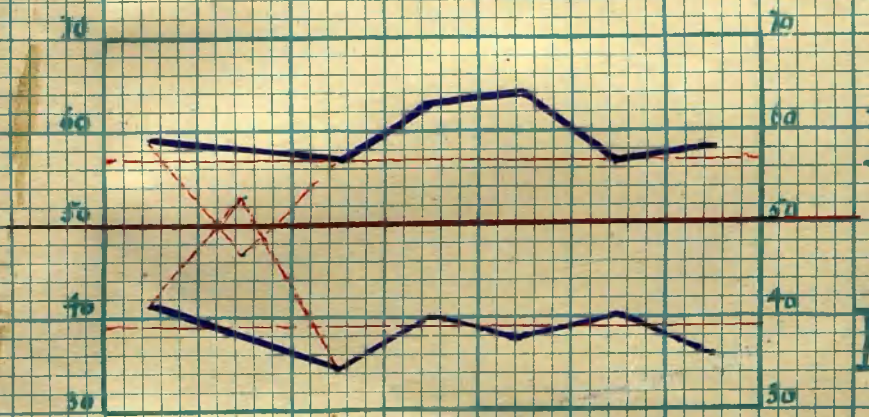
Similarly 1h's English Teacher could also feel satisfied that a good Term's work had been accomplished as her class scored 50/50 when the class quotient was (-2).

On the following page, 141, are shown graphs of Class Capacity for classes 11b and 11g. In order to give a common standard, the Form averages are scaled to 50.

It will be seen that (with one exception, History) all the subjects of class 11b are well above the 50 line, giving a class rating of +7, whilst all the subjects (again with the exception of history) of class 11g are well below the 50 line (rating -11). The exceptional cases which, in these classes, by chance both happen to be history, will be discussed fully on page 162.

Graphs of Class Capacity

	English	Hist.	Geog.	Maths	French	Phys.	Chem.
Class IIb	53/50	47/50	57/50	63/50	64/50	57/50	58/50



	English	Hist.	Geog.	Maths	French	Phys.	Chem.
Class IIg	41/50	53/50	34/50	40/50	38/50	40/50	36/50

On the other hand, it is perfectly clear from the graph that the History in both classes is far out from the normal class capacity. In 11b, whose class rating is (+7) the history showed (-3) and in 11g, whose class rating is (-11) his tory showed (+3).

Now this proves that with a constant class capacity, the variation must lie with the teacher, who in one case (11b) did not get the class to work to capacity and in the other got more out of the class than was to be expected.

In a Secondary School a teacher may have charge of 4 or 5 or more classes for a particular subject, and if it is found that a teacher pulls all his/her classes above the average class capacity he/she is pulling more than his/her weight in the School and must be a good teacher.

On the other hand a teacher who consistently fails to extract the full working capacity out of a class is not pulling his/her weight and must be written down as a failure. No personal prejudice of the headmaster or of anyone need enter into the question. The figures stand there revealed every Term.

No one wishes to judge absolutely by hard and fast marks/

marks for any particular class; but the following are authentic cases taken from a recent Term Examination.

Teacher.1. 5 Classes. Mathematics and Science.
The class capacity mark is given in red.

	Class.1.	2	3	4	5
Class rating.	(-2)	(-2)	(-5)	(-5)	(+1)
" average.	19	8·4	22	33	29
Form "	50	38	47	49	52

Here is a teacher with five classes in Mathematics and Science showing results all far below what one might expect.

Class 1. 31% below average with a (-2) class
2. 30% " " " " (-2) "
3. 25% " " " " (-5) "
4. 18% " " " " (-5) "
5. 23% " " " " (+1) "

Results such as these clearly indicate that there is something wrong. Even the (+1) class showed in this particular teacher's subject 23% below the average. If the classes had pulled anything like their weight, or if one or even two classes had failed to do themselves justice, one could not say anything; but for all the classes entrusted to this teacher's care to fall so seriously below class capacity is proof that the teacher is quite incompetent./

incompetent.

Teacher ii. 5 Classes. French.

	Class 1.	2.	3.	4.	5.
Class rating.	(+7)	(-1)	(+6)	(-1)	(+7)
" average.	80	78	76	53	83
Form "	59	68	64	56	62

On the other hand here is Teacher ii. Every class but one shows marks high above what one expects from the rating ability of the class.

Class 1. 21% above average with a (+7) class.
2. 10% " " " " (-1) class.
3. 12% " " " " (+6) "
4. -3 below " " " (-1) "
5. 21% above " " " (+7) "

Clearly this teacher is extremely competent, and when one understands that these excellent results were produced largely by inspiration, such a thing as corporal punish-:ment being unknown, then the teacher's rating can never be in doubt.

Teacher iii. 5 classes. English.

	Class 1.	2.	3.	4.	5.
Class rating.	Square	(+2)	(-1)	(+2)	Square
" average.	51	44	35	64	57
Form "	58	60	60	63	63

Teacher iii/

Teacher 111's classes show the following results:

Class 1.	7%	below	average	with	a	square class.
2.	16%	"	"	"	"	(+2) "
3.	25%	"	"	"	"	(-1) "
4.	1%	above	"	"	"	(+2) "
5.	6%	below	"	"	"	square "

One would not say these results were altogether bad, but when one understands that the teacher was a beginner, many of the results might be due to inexperience. Still the teacher can see how he is doing and can rate himself accordingly.

If consistently good or consistently poor records are made from year to year the teachers can see from the various averages,(which are at every one's disposal), how they are inspiring their classes, to produce to capacity, and consequently they are able to judge for themselves how their own capacity as a teacher stands.

It is not a question of a teacher getting a good or a bad class, for, with the above system, full allowance is made for a class which shows a capacity above or below normal.

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See also Latin Class and Form Averages 50/59 page 131.

Chapter XIX.

How to get "ACCOMPLISHMENT" Commensurate with "CAPACITY"

The discussion of Teachers' Rating by Class Constant Capacity has cleared the way for the final consideration of whether the pupil is working to Capacity or not. The Accomplishment Quotient procedure which proved to be unsound (stated as a quotient) has nevertheless underlying it the germ for a practical solution. If one has for each pupil a reliable Intelligence Mark (such as the "National" which correlated with itself ·81 - see p. 101), if also there are available term marks in which one has confidence (in this investigation term correlated with term ·806 - see p. 116), and if no allowances fall to be made regarding defective teaching, then it should be quite possible (without calculating an exact ratio), to prove to a pupil that whilst he has an "Intelligence" above normal, he is giving "achievement" less than normal.

Even should the day come when it may be possible to evolve a sound A.Q. that would not end the matter. For whilst one might know that J.B's A.Q. was ·9, and R.M's ·4, one would still have to find the cause why J.B. was working almost to full capacity and R.M. was not.

This is the crux of the whole question. If only a few pupils are found to be working far below capacity, individual enquiry into the health and the home circumstance of the pupil will probably furnish an explanation. But

if/

if many pupils are discovered to be working much below capacity, then it is probable that the fault lies within the school itself, and that the organisation requires to be overhauled.

If the pupil has capacity, there must be opportunities offered him to progress, although one must try and avoid the danger of two rapid advancement, whereby he may be classified with pupils so much older than himself that socially and physically he may be deprived of many excellent influences which can only be had by associating with one's chronological compeers.

On the other hand, the question of retardation is a most difficult one. Nothing so takes the heart out of a pupil as having to repeat a class. Owing to long absence from school the pupil himself may agree that this is the only solution, and, in this case of acquiescence by the pupil, little harm, and perhaps great good may result. But it is almost axiomatic in school administration that a pupil should be kept moving as long as he is growing mentally. There is always something he can learn.

One agrees with Dr. Drever (1) :----

"From

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(1) Drever:- Psychology of Education. p.41.

> "From first to last, in the work of the school, it is interest that counts. Tendencies count more in life than capacities, and recognition of this is the first principle of the teacher's art."

Very many pupils leave school early, not from force of circumstances; but from loss of interest and of encouragement. The solution seems to lie along the lines of differential curricula and of differential rates of progress. The Secondary School, as has already been said (see p. 66) should be able to offer parallel courses, varied in content and degree, so that every pupil should be able to find a place suitable to his interests and to his capacity.

It is largely a question of ideal class sectioning. The school must as far as possible meet the needs of the individual not mould the individual to any particular school pattern. This is a very difficult problem, especially is a large school, and yet in a large school, probably the best solution will ultimately be found, for there it may be possible to have as many courses and sections as there are well defined groups of pupils.

One other difficulty in class sectioning must be met. Spearman's theory that there is a fundamental intelligence factor "g" running through all the specific factors, seems to imply that a pupil good at one subject will probably/

probably be good at all. Whilst there are very many pupils in our schools who bear out this theory, there are just as many who do not. J.B. may be excellent in Mathematics and Science, fair in English and absolutely poor in French and Latin, and R.M. may be exactly the reverse, yet both their needs must be catered for. Last year the writer adopted a system of class sectioning which has been found in practice to meet those difficulties and yet work admirably. One example will suffice.

There were 80 pupils in the 4th. year. Instead of dividing them rigidly into three sections - (a), (b) and (c), they were for every subject considered a fluid group. Three teachers were put on at the same time for each subject and the pupils at each successive period arranged themselves into 3 different groups, High, Medium and Low.

	Period 1.	Period 2.	Period 3.	Period 4.	etc Period 5
	English.	French.	Maths.	Latin.	Science etc
HIGH	R.M.	R.M.	J.B.		J.B.
MEDIUM.	J.B.			R.M.	R.M.
LOW.		J.B.	R.M.	J.B.	

Pupils J.B. and R.M. etc. entered successfully the section for which they had capacity. In this way each pupil found his place according to his need.

There/

There was also this advantage that the pupils had every encouragement to do their best. No pupil in any subject found himself discou raged by being out of his depth. Every pupil worked hard, knowing that if they improved there was a stage higher to which they might go, and those in the higher sections worked hard, lest they might be put down.

Besides, if the school offers a variety of parallel curricula subjects, e.g. Professional subjects, Technical subjects, Commercial subjects, Art, Music, etc. the interest of the pupil is maintained, seeing that he may follow a course of his own choice, suitable to his ability and valuable towards his future career. It may be argued that all this is possible only in large Secondary Schools. This is not quite true for to one's knowledge there are Secondary Schools with just over 200 post qualifying pupils offering successfully at least four parallel courses as suggested. A selected curriculum and accurate placement sectioning to suit the individual seem to provide the best avenues for the pupil to make and maintain progress towards self-realisation and self-completion.

If then the focus of all school organisation is to be the individual pupil, his needs, his tendencies and varied capacity, one must aim at better and still better sectioning./

sectioning/

And how shall we secure that? The answer in the past has been, by the use of Intelligence Tests. But Intelligence Tests which test General Intelligence give little or no guidance to specific subject ability. In the long run the best educational results will be obtained by sectioning with regard to each separate educational process, as measured by a scale of specific application to that educational process. This points to a possible discard of the "general" scales and the adoption of specific scales.

Till then one must use what is available. By the refinement of school methods both of examination and of recording, by careful and intensive sectioning, by offering courses suitable to pupil's capacity one may not unreasonably hope that ability to make school marks might be quite synonymous with "intelligence" or at least with school intelligence.

Chapter XX.

"THE HOME".

However perfect the organisation of the school may be, however reliable may be the methods of testing the pupils and of recording results, there will always arise cases that cannot be explained by the ordinary school system.

In dealing with human beings, one can never altogether omit the personal factor. The pupil may have high "intelligence", he may have been diligent and attentive, he may have had every opportunity, he may have had the best of teachers, and yet his accomplishment may be most disappointing. A survey of all his school data may give no clue to what is at the root of the matter. In cases such as these, solution, if any, will probably be found either within the pupil himself or in his home circumstances. The pupil may be suffering from temperamental or emotional debility, or perhaps from some incipient disease. Whatever the reason, it is advisable to get into immediate touch with the parents, who from their intimate knowledge of the pupil, can often produce evidence that will help to solve the difficulty.

> In county schools it is easy for the Headmaster to get into personal contact with every parent whose children are at school. In large towns this is not so easy. But it is worth doing. For some years now the writer has set aside one fixed night per week when parents may consult him in school from 7 - 9 p.m. Besides the advantage of having a "rapport" between parents and teacher, there has grown up a spirit of co-operation between the home and the school which has/

has been of inestimable value.

But the most valuable result has been that many difficult problems which otherwise would have been left unexplained have been solved after a personal interview. ~~Three~~ Two typical cases may briefly be cited.

C.M. until the end of the 3rd. year was the most intellectual boy in the school.
In the 4th year he did only average work, and in the 5th year so badly that he failed in the Leaving Certificate Examination. No external evidence afforded an explanation. His health seemed good- he played in the football team every week. Warnings seemed of no avail. The teachers said he had come to the end of his development. His mother on being sent for, offered little help except to say that he seemed very lifeless at home, and sometimes at night had a cough. A medical examination, finally suggested, revealed tuberculosis, large cavities in the lungs, and the pupil is now in a sanatorium.

M.A. a girl of 16 years of age in the 4th year dropped suddenly from well up in her class to almost the last. Neither absence, nor defective teaching, nor apparent ill health could explain the phenomenon. An interview with the mother revealed the following:- The father, wounded in the war, and suffering from shell shock had become deranged in mind. While he was in a Mental Institution, the mother received a pension for herself and three children. Suddenly Departmental economy sent the man home quite unfit for work. The pension ceased, and in addition to financial troubles, the sight of her father at home so re-acted on the oldest girl that work became quite impossible.
Without a personal interview her lapse at school would have been left unexplained. With grants from the Education Authority and the Haig Fund, with a house procured from the Municipal Scheme, matters were soon adjusted and M.A. is again doing well.

Instances such as these could be multiplied ad infinitum-

they/

they are typical of every school in the county and are quoted merely to show that cases do arise where school records are not sufficient to estimate pupils' progress unless these are supplemented by data derived from personal interview with parents.

Chapter XXI.

CONCLUSION.

He who would estimate the "Progress of Pupils in Secondary Schools" must have a wide and comprehensive view of the whole question. No single examination mark, or series of marks will alone suffice, unless in the final judgment due allowance has been made for other elements which re-act on one another.

In every estimate of a pupil's progress one must consider, in addition to the child's own capabilities and efforts, his health, the influence of the home and the rating of the teacher.

The organisation of the school must, by suitable sectioning, permit the pupil to "find" himself, must offer him, through varied curricula, scope fully to develop his talents, tastes and tendencies. He must have his powers attested by methods that have been proved to be equable and just, and the teacher must also take his share in the development of the child's ability.

All these things cannot be properly visualised and determined unless the details are tabulated in systematic form. It is claimed for the Class Record Sheets which have been explained in this Thesis, that they present a bird's eye view of the child's progress.

The system of marking Term examinations whereby the personal/

personal element in Teachers' marking is largely eliminated, the method of five averages which show the pupil's relative place not only to others in his own class but to all pthers in the same form, the method of rating the teacher by class capacity constant, and the other points elucidated regarding the value of Intelligence Tests, of wide curricula, of fluid sectioning and of personal contact with the home provide a volume of data which cannot fail to give a true estimate of "Pupils" Progress in Secondary Schools."

B I B L I O G R A P H Y.

Undernoted are the references in order as they are mentioned in this Thesis.

Owing to the practical nature of the Subject, references to many books on psychology (e.g. by Thouless, McDougall, Dewey, Freud, Downey, Shand and others) that were read in relation to the matter could not legitimately find a place.

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