WJS STACKROOM
THESIS
6 HOUR LOAN

41

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AN INVESTIGATION OF THE INCREASE OF INFORMATION
AND THE DEVELOPMENT OF REASONING IN GEOGRAPHICAL
PERSPECTIVE.

A Thesis in EDUCATION presented
for the Degree of Master of Arts.

By

Walter B. O. Brown

1933

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Introduction.

ROMANCE IN GEOGRAPHY.

"When I was but thirteen or so
I went into a golden land,
Chimborazo, Cotapaxi
Took me by the hand." (1)

I N T R O D U C T I O N .

Of the -----the curricula of our secondary schools are loaded, none can be so readily tinted with romantic colours, or so easily illustrated by adventurous tales, and withal be so successfully employed in developing general reasoning ability, as can geography. If Popocatepetl and his brother mountains, and some other of those alluring names from atlases, would only lead the minds of some of our scholars to "take the Golden Road to Samarkand" (2), teachers of geography might be forgiven, if they were seen to smile, when a pupil was heard to murmur the 'unpardonable sin', "I dimly heard the master's voice." (3) The bored expression, familiar accompaniment to "towns and products geography", should find no place in the class room today. Before a map of the world what imaginings should stir the mind. The islands of the Pacific, palm dotted, coral ringed; the impenetrable jungles of Africa and South America, threaded by mighty rivers; the curious rites and fantastic

1. W. J. Turner: "Romance"
2. James Elroy Flecker: "Bassan",
3. W. J. Turner: op. cit.

Introduction.

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(2) Compare James Fairgrieve: "Geography in School", Ch. II.

(3) H.J. Fleure, "An Introduction to Geography", p. 67.

2.

festivals of the Far East; the lure of Everest, and the call of the great white spaces to scientist and explorer; the ploughing steamer carrying homeward the wanderer, the flashlight signal from the masthead, "All ready to land you!", as the leviathan airship of the future finishes its journey.

There is, there always will be, a romantic approach to the study of geography. A pupil may not remember that Turkestan is north-east of Persia, but can he forget that,

"For thirty days the caravan trailed on
behind the merchant's foal,
Through Persia and through Turkestan, the
city of Irkutsk their goal"? (1)

Too long this subject has been regarded as uninteresting, as divorced from life, as a cram subject, or as a soft option for examinees. In the past, the geography lesson has consisted too often in memorizing a large body of disconnected facts about towns, and rivers, and products, and such like minutiae remote from the interests of daily life. (2) There is an urgent need to-day "to develop a scheme of geographical education that shall include and go beyond the study of places and features by enumeration, beyond the discussion of physical features and economic products, deep into the questions of social life and tradition, land tenure and agriculture, and social, artistic, and religious expression of peoples in varying environments" (3) The "stuff" of geography is part and parcel of man's physical wants,

(1) V. Sackville-West : "Mirage"

(2) Compare James Fairgrieve : "Geography in School", Ch. II.

(3) H.J. Fleure, "An Introduction to Geography", p. 67.

and no less of his spiritual aspirations. As Dewey puts it:-

"Nature is the medium of social occurrences. It furnishes original stimuli; it supplies obstacles and resources. Civilization is the progressive mastery of its varied energies." (1)

The writer holds no brief for the inclusion of geography in the course of school studies purely on the grounds that it can be filled with an imaginative appeal. This, however, is not the place for a dissertation on the pros and cons of the case for the inclusion of geography in a secondary school curriculum. (2)

But the results of this work have raised a doubt concerning the effectiveness of present methods of geographical instruction. Nobody can doubt the fact that adolescents do show a marked interest in the peoples, customs, and sights of foreign countries. Such a statement hardly requires confirmation. If it did, it is readily found in the interest evidenced in the appearance of foreigners in national dress in our streets, the presence of a foreign vessel at the wharves, the relish with which such illustrated magazines as "The National Geographic Magazine" are devoured, nor would the management of the local cinemas include two or three travel gazettes in an evening programme, unless they met with a very considerable measure of support from not only children but also adults. The teacher of geography has a responsibility to

- (1) J. Dewey: "Democracy and Education", p. 247.
- (2) Vide, The Board of Education Report: "The Education of the Adolescent" p. 204, for a concise statement dealing with the point.

(1) Kilpatrick, p. 71: "Education for a Changing Civilization."

direct these interests so that they develop into a spirit of sympathy with, and tolerance of, the outlook of other nations. He can do this with a display of increasing interest on the part of the pupils by attacking the study of home and foreign countries through an appeal to the love of romance and adventure. Especially is a broad sympathy necessary in a community isolated from the major currents of world affairs as we are in New Zealand. Some lines from the pen of Professor W.H. Kilpatrick might have been written specially of New Zealand:-

"As men and their affairs become more and more interrelated, each individual with other individuals, one group with other groups, one nation with other nations, there is a corresponding demand for an outlook adequate to take care of this far-flung, growing connectedness. Nothing less than world-mindedness will suffice - the ability to see social problems on the scale on which they exist. The demand seems especially great in this country. Our physical remoteness from the rest of the world is so great and our satisfied complacency often so impervious that we have not yet adequately sensed the situation." (1)

"World-Mindedness."

Before any degree of "world-mindedness" can be attained by the nations within the British Empire, there must be a preliminary empire-mindedness. Yet we find diametrically opposed opinions voiced by responsible associations within its national units. An issue of "The Evening Post", Wellington, towards the end of July of this year contained two articles very much to the point here. The first related to a marketing plan for farm products put into active operation in British cities on June 12th.

(1) Kilpatrick, p. 71: "Education for a Changing Civilization."

With the approval and assistance of the Ministry for Agriculture, the whole-hearted support of railway companies, the appointment of a proficient agent and superintendent, the public and farmer were both to be protected, "the former from inferior meat, and the farmer in his price." The underlying principle of the plan was stated to be :- "That the British farmer shall have a greater share of his home market." Furthermore,-

"England and all other countries by sheer force of scientific progress coupled with the deplorable failure of a selfish commercial system, must move quickly for self-defence behind the laws of true national welfare or economic nationalism." (1)

It was not stated in what way economic nationalism was to overcome "the failure of a selfish commercial system." The second article ran that:-

"strong opposition to any quota restrictions on the exports of New Zealand's primary products to the United Kingdom was expressed at a meeting of the Associated Chambers of Commerce yesterday."

In the text of a statement issued subsequently by the executive of the Associated Chambers, the following sentence occurred:-

"The quota system is the latest and most wicked example of economic nationalism (2) that the world has yet had, and it is heading us for disaster Unless we can get an international outlook with regard to economics, we are not going to get anywhere with regard to restrictions generally."

Although the New Zealand body has apparently developed a commendable degree of "world-mindedness", its true mind seems better

(1) Italics are the writer's.

(2) Italics are the writer's.

(1) "The British Journal of Educational Psychology," Vol. II, p. 348

expressed in a sentence from a resolution, cabled by the same meeting to the Prime Minister, the Right Hon. G.W. Forbes, who was then in London attending the Economic Conference. The Association "urges on the Government and on all concerned that New Zealand should offer its utmost reciprocity to Great Britain in order to preserve free entry into the United Kingdom of New Zealand's products." Economic nationalism on the part of the British farmers is of no use to the world in general and to New Zealand in particular, but New Zealand is quite ready to bargain by using the same principle in the formulation of reciprocal trading treaties. Such declared selfishness on the one hand, and smug pharisaism on the other might be less in evidence if in the secondary schools of all countries geography was taught with a broad, sympathetic view of the interdependence of the peoples of the globe.

Mr E.J. G. Bradford recently had published in "The British Journal of Educational Psychology", Vol. II, 1932, an article which concluded that :-

"There is a slow and meagre development of geographical perspective during four years of schooling " (secondary). (1)

If that be the case, such deplorable expressions of public opinion as indicated above are not to be unexpected, while the real interest in, and sympathies with foreign peoples certainly to be found in more youthful minds can only have been stultified and finally atrophied by our present methods of teaching geography.

(1) "The British Journal of Educational Psychology," Vol.II, p.348

The following thesis is an investigation of the same problem of "geographical perspective", or, as one might say, world-mindedness. Its results will serve to show to what extent the present school generation of New Zealanders is realising the fact that :-

"If the world is to go forward rather than backward, the strong nations must remember that the more a nation can promote the progress and especially the contentment of other nations, the more it is doing for itself and for the whole world." (1)

(1) Huntington and Cushing: "Principles of Human Geography", p. 407.

SECTION II.

A Survey of the Problem.Aims and Purposes.

The problem which this thesis has attempted to solve, arose out of the perusal of an investigation undertaken by H.J.B. Bradford, entitled "The Measurement of Perspective in the Geographical Training of Secondary School Pupils", and reported in "The British Journal of Educational Psychology", Vol. 2, 1932. A brief description of the English test will make clearer the aims of this supplementary investigation.

In the first place, it is necessary to define the term "perspective" as used by Bradford. He writes:-

"The locality Q is appreciated in proper 'perspective' when a knowledge of its location will fix its position on the scale of gradations of any of the phenomena, the world distribution of which has been studied. The relative importance or the relative position in perspective of two localities Q and R will depend upon their both being placed accurately on the scale of gradation of the phenomena under consideration. To view things in geographical perspective is to perceive them against a world background of phenomena distributed in gradations. The world relationship gives them geographical significance." (1)

The aim of Bradford's test was to estimate what progress in four years of secondary training had been achieved by pupils in grading various phenomena -- rainfall, population, temperature -- in a world gradation scale. Briefly, the conclusion reached was that, "There is a slow and meagre development of geographical

(1) Op. cit., p. 334.

SECTION II.

A Survey of the Problem.

1. Aims and Purposes.

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(1) Op. cit., p. 334.

perspective during four years of schooling" -- a conclusion as startling as unexpected, and one worthy of some further investigation. The purpose of this thesis, at the outset, was to discover if such a conclusion was applicable to New Zealand children. Upon closer investigation, however, the writer concluded that Bradford's tests were in reality examining two factors, geographical information and logical reasoning. From this decision developed the line of thought eventually pursued in this work. If perspective showed no development in four years of secondary school training, it might be possible to discover which of its constituent factors showed most clearly this lack of development. Tests were framed keeping, as far as possible, these two factors separate. The phrase, 'as far as possible' is used advisedly, since it was found almost impossible to frame a sufficient number of tests with only these factors present. Particularly was this the case with the reasoning tests which obviously presumed a basis of information. For example it was considered information to know where to look for Cardigan Bay on a map of the world (Test 1), but to decide whether shadows lay ahead or behind an individual facing north in the southern hemisphere (Test 5) obviously presumed at least knowing the position of the sun in relation to the individual, followed by a sequence of reasoning processes to arrive at a conclusion.

In addition to presenting the tests formulated by the

writer, it was necessary to present also those arranged by Bradford. A result in New Zealand different from that obtained in England would materially influence the conclusions to be drawn from the writer's tests. Hence, in the schools examined, both batteries of tests were submitted. Thus the aims of this research are, in brief:-

1. To analyse Bradford's tests, and to appraise their value as a scientific instrument for measuring the growth of geographical perspective.
 2. To apply Bradford's battery of tests to groups of New Zealand children in corresponding school grades, with the addition of the two upper primary standards, to determine therefrom the degree of similarity existing between the results of English and New Zealand children.
 3. To compile and to apply, in the same New Zealand classes, two series of geographical tests in order to determine the growth and rate of growth of "information" and "reasoning", the two components of geographical perspective.
 4. To draw from the results obtained, any other conclusions which are relevant to the teaching of geography.
2. The Term "Perspective."

Before developing the particular nature of the thesis at further length, it will be well to see what justification there is for the use of the term "perspective", and also what grounds there are for assuming that perspective is built up of a certain measure of information acquired, and of logical reasoning ability developed.

Bradford regards the phenomena of the world, facts

- (1) James Fairgrieve: "Geography in School", p. 13
- (2) "Harrow Lectures on Education", p. 143

of temperature, precipitation, population, latitude and so on, as being distributed in gradations over the surface of the globe. There are limits to both ends of the gradations. Population, for example, will vary from nil to the population of the largest town or country; latitude is definitely fixed between 0 and 90 degrees. Nobody will disagree with this viewpoint, which is simply one of systematizing the information which it is necessary for a pupil to acquire in order to possess a measure of geographical knowledge. The current definitions of sciences are all couched in terms of systematized knowledge. Fairgrieve, on this point, says:-

"We cannot understand much geography until we begin to see some order in the arrangement of things." (1)

And furthermore, cartographical gradations in colour, more or less standardised now, are familiar to any user of an atlas. Perspective simply means the ability to place objects or facts in a certain recognized relationship to one another. The

necessity of being able to arrange geographical data in such a way is stressed by various writers. In his address, "Geography in Higher Education," Professor Roxby declares:-

"The rapidly increasing interdependence and intersensitive-ness of the different regions of our planet have made a synthetic view of the world and the place of each part in the total scheme an essential factor in human progress" (2).

Speaking of history and geography Dewey says:-

(1) James Fairgrieve: "Geography in School ", p. 13

(2) "Harrow Lectures on Education", p. 148

(3) "The British Journal of Educational Psychology". Vol. III, pt. II, p. 183.

"With every increase of ability to place our doings in their time and space connections our doings gain in significant content" (2). logical in the narrower sense."

In "An Introduction to Geography", his compendious survey of the distributions of phenomena and regions, Professor Fleure states that,- "The difference of opinion expressed here

"The evolutionary description of a region is thus one of the chief objects of geographical work, and one which is of a synthetic character, calling for personal knowledge and a highly developed sense of perspective and balance"(3).

Elsewhere he writes that:-

"the gradations between intense and sparse production are important" (4) of syllogistic argument as a result

in the distribution of certain economic cultural products.

Thus, from the point of view of philosopher as well as of geographer, the value of perspective in geography is declared.

To realize the importance of perspective in geographical knowledge, would give teachers a unifying principle with which to link together phenomena as they occur in different regions.

3. The Components of Perspective. the possibility of inferring

The same unanimity of opinion does not appear to exist as regards the division of perspective into the two factors of information and reasoning. While this thesis was being compiled, the 1933, June, issue of "The British Journal of Educational Psychology" came to hand. In it appeared an article by Dr. H. Eggink, (5) of Amsterdam, which criticized

(2) "Democracy and Education", page 244.

(3) Op. cit., page 11.

(4) Ibid, page 24.

(5) "The British Journal of Educational Psychology", Vol. III, pt. II, p. 183.

the view expressed by Bradford that, "Geographical relationships can hardly be regarded as logical in the narrower sense."

The first conclusion reached by Eggink is that, "To understand and apply geographical phenomena, logical thinking is undoubtedly required." The difference of opinion expressed here seems to the writer to hinge on the interpretation given by Bradford to the expression "logical in the narrower sense." What is meant by the term "narrower"? On page 333, Volume 11, 1932, of the same journal, Bradford follows the quotation given above by an example of syllogistic argument as a result of which, given a locality X, latitude 16° S and 6° W, it is shown to be impossible to draw accurate conclusions as to its summer and winter temperatures. If then by "narrower" is meant syllogistic form, doubtless all will agree with Bradford that geography is not logical in the narrower sense. But is a geographical problem ever formulated in which only two premises are stated without the possibility of inferring others? It is thought not. In that case "narrower" in the sense of syllogistic reasoning is beside the point. Can geography then be logical in a wider sense? Here one is upon ground, safer and more agreed upon. Eggink declares that geographical material undoubtedly requires logical thinking. Bradford himself in concluding his reply to his critic says:-

(1) Huntington and Cushing:- "Principles of Human Geography", p. 49.
 (2) C. Spearman:- "The Nature of 'Intelligence' and the Principles of Cognition", p. 63.

"An orderly reference to distributions is the very essence of geographical exposition, and pupils should be trained in such reference, which is logical in the wider sense of that term."

Let us analyse a specific problem; for example, one which, taken from an independent source, forms the basis of a question in Test 7, viz., "How is it that an account of the last shots in the Great War was published in the morning papers of San Francisco, although the firing did not stop till 11 a.m. of that day?" (1) We have two given statements: (a) War finished in France at 11 a.m.; (b) The news of such appeared in the San Francisco morning papers. The problem is to discover the relationship existing between these two "characters" or "fundaments". In other words, we are dealing with Spearman's second law of cognition:- "The mentally presenting of any two or more characters tends to evoke immediately a knowing of relation between them" (2). Observe that, although only two items are given, knowledge of a number of other factors is taken for granted, and for that reason they must be considered as given. Such "given" factors would be:- the position of San Francisco to the west of France; the rotation of the earth from west to east and the consequent appearance of the sun earlier in the east with the result that San Francisco time is behind that of France; the estimated distance apart

(1) Huntington and Cushing:- "Principles of Human Geography", p. 49.

(2) C. Spearman:- "The Nature of 'Intelligence' and the Principles of Cognition", p. 63.

(3) "Democracy and Education" page 224.

(4) Op. cit., Volume 11, page 332.

of the two places and its relation to the extent of difference in time dependent thereon. All these factors are involved, and a sifting, and selection, and rejection process is conducted among them to arrive at the relation and conclusion. The discovery of the relation is undoubtedly by a logical process. Speaking of the assurance attending science, Dewey says,-

"It is a rational assurance,- logical warranty. The ideal of scientific organisation is, therefore, that every conception shall be of such a kind as to follow from others and to lead to others" (3).

Reasoning in this typical problem follows a step by step process and is, therefore, logical. Consider the concluding steps in reaching the answer to the given problem:

Step 1 - news would require to be in San Francisco at, say, 5 a.m.

Step 2, necessary difference in time, six hours.

Step 3, longitudinal difference for one hour, 15° ;

Step 4, longitudinal difference for 6 hours, 90 degrees.

Step 5, San Francisco is at least 90° west of France.

Step 6, News will arrive in San Francisco 11 - 6 hours = 5 a.m. and, therefore, in time.

In such a step-wise progression, there is a demand for logical procedure, and in face of it the writer cannot see how Bradford can claim that relationships in geography are "purely associative or contingent." (4).

Bradford's position leads him to emphasize information at the expense of reasoning. He writes in his reply to

(3) "Democracy and Education" page 224.

(4) Op. cit., Volume 11, page 332.

Eggink:- importance to that given to memorized information,

"I have maintained that memorized information is the necessary basis for a true perspective To know how much rain falls in a locality is of first importance, to be able to expose the relevant factors is of secondary importance" (1).

Of what interest is it to a boy simply to know that Montevideo gets ten, twenty, fifty, or more inches of rain per annum? Surely if he knows the relevant factors controlling the rainfall of Montevideo, the information will be more interesting and more valuable to him, and he will be able to estimate the rainfall sufficiently accurately to declare the same results as by knowing the actual precipitation. And, further, the more accurate his knowledge of relevant factors becomes, the more accurate and the more "meaningful" to him will his results be. In so minimising the value of reason, Bradford would appear to lay himself open to a charge of inconsistency. In an article published in 1925, dealing with the weakness in critical ability shown by school children in solving arithmetical problems, the same investigator writes:-

"The present weakness arises from the exalting of the god of Number at the expense of the greater deity of Thought. 'To apply the principles of rational thought' is a formula that will include the whole aim of education on the intellectual side" (2).

In teaching geography the writer would most certainly claim a place for such "principles of rational thought" at least

(1) Op. cit., Vol. III, p. 185

(2) E.J.G. Bradford; "Suggestion, Reasoning, and Arithmetic", The Forum of Education, p. 10, Vol. 3, 1925.

(5) James Fairgrieve: "Geography in School", p. 62.

equal in importance to that given to memorized information, and in the upper forms would give reason precedence. It would seem that the old problem of information and knowledge remains unscotched. (3). How easily can the teacher present a veneer of information to be compulsorily memorized and yet how little true "meaning", in the Deweyian sense, is attached to it. A retentive memory and a glib tongue would appear in such a case to be the 'sine qua non' of geographical perspective. Be it far from the writer to underrate the value of memorized facts. There are numerous cases in which the acquisition of information is a necessary step to acquiring knowledge; but such information must grow out of understood relationships, and not be "purveyed in chunks simply as information to be retained for its own sake" (4).

4. Temporal Perspective.

Neither Bradford nor Eggink has mentioned anything other than the spatial content of perspective. Although the temporal element in perspective is popularly considered the prerogative of history, it must be remembered that, "things are now largely because they have grown to be what they are, and any geography which omits the importance of the past is sadly maimed " (5).

Temporal gradations are especially important in

(3) Compare Edmond Holmes: "What is and What Might Be", pp. 53-59.

(4) J. Dewey: op. cit., p. 244

(5) James Fairgrieve: "Geography in School", p. 62.

understanding the culture of a people as dependent upon environment: the growth of city life, the demarcation of national boundaries, the development of an industrial or an agricultural order - all such give a "time" perspective to geography. As Fleure so descriptively emphasizes it:-

"If we confine our attention to the present time, to the infinitely thin screen between the past and the future, we have merely static descriptions, always out of date, because the screen moves inexorably on" (1.)

5. Summary.

To summarize the position adopted in this chapter, it may be said that geographical perspective consists of two factors, information and reasoning, mutually dependent upon one another for the growth of geographical knowledge.

Perspective, temporal and spatial, is the geographical method for systematizing information for presentation to pupils.

The aim of this thesis is to discover if the paucity of development in perspective among secondary school pupils, noted by Bradford, can be laid to the charge of the meagre development of either or both factors, information and reasoning.

to suit their local application, given in brackets, are appended.

(1) op. cit., p. 10.

SECTION III.THE COMPARATIVE APPROACH TO THE PROBLEM.THE ORIGINAL TESTS. A BRIEF CRITICAL REVIEW.

In order to measure the growth of perspective, Bradford devised three series of tests. The first test, A, measures the growth of geographical vocabulary; the second, B, is subdivided into three sections, viz., B 1, B 2, B 3, which aim at measuring the development of perspective of distance, population, and location, respectively. The final series, C, is also divided into three sections which test a knowledge of perspective of temperature and rainfall. The original series were afterwards revised and curtailed in order to allow of application in the space of one hour. The character of the tests, however, remained unaltered. It is with the revised series that this thesis is concerned.

The revised tests with certain alterations made to suit their local application, given in brackets, are appended.

TEST B.TEST A.

Each of the following groups of three words is to be used in making one sentence. Number your sentences as the groups of words are numbered, and write the sentences on the separate sheet of paper provided.

The word "and" must not be used in any sentence.

For example:-

(a) Soil. Crops. Pasture.

The soil of this part is better suited to pasture than to the growing of crops.

(b) Forests. Evaporation. Temperature.

The temperature is so high that the resulting evaporation renders the growth of forests impossible.

1. Warehouse.	Dock.	Products.
2. Tide.	Port.	Trade.
3. Routes.	Railway centre.	Continental.
4. Grasslands.	Limestone.	Porous.
5. Minerals.	Climate.	Output.
6. Hinterland.	Communications.	Population.
7. Exports.	Maritime.	Civilized.
8. Industrial.	Waterpower.	Commodities.
9. Rocks.	Drainage.	Impervious.
10. Environment.	Sevannah.	Pastoral.

TEST B.

1. What is the shortest distance from the town in which you live to each of the following places? Imagine you could fly direct by aeroplane. Do not give the distance in miles, but just put the figure (1) after the nearest; figure (2) after the next, and so on; figure (10) will come after the place which is farthest away. Make a guess at those about which you are not certain.

Capetown () Jerusalem () Vancouver ()
 Cape Horn () Montreal () Tasmania ()
 Gibraltar () Berlin () Pekin ()
 Ceylon ()

2. The names of ten towns are given below, place the figure (1) against the largest, i.e., the one with most people living in it, the figure (2) against the next largest, and so on; figure (10) will be put against the smallest. Make a guess at those about which you are not certain.

Genoa () Chicago () Colombo ()
 Paris () Melbourne () Winnipeg ()
 Buenos Aires) () Suez () Capetown ()
 Dover ()

3. The latitude and longitude of ten places are given below. Write down against each, first the continent and second the country in which you think the place is situated, e.g., 7 S. 110 E. Asia. Java.

Lat. <u>in degrees</u>	Long.	Continent.	Country.
55 N.	7 W.		
40 N.	90 W.		
5 S.	25 E.		
55 N.	75 E.		
37 N.	127 E.		
15 S.	50 W.		
23 N.	90 E.		
20 N.	100 W.		
30 S.	120 E.		
20 N.	5 W.		

TEST C.

1. After the following names of places put a figure in to show which have the warmer and which have the cooler summers. The place which has the greatest average temperature for the hottest summer month will be placed first, a number (1) will be placed after its name; figure (2) will be placed after the next hottest, and so on; figure (10) will be placed against the coolest. Make a guess at those about which you are not certain. All these places are near the coast, or not far inland.

Bergen (Norway)	(	)
Paris	(	)
Walfisch Bay (S.W. Africa)	(	)
Mouth of Congo R.	(	)
Capetown	(	)
Freetown (Sierra Leone)	(	)
Mogador (W. Morocco)	(	)
Christchurch	(	)
Oporto (Portugal)	(	)
Cape Frio (Portuguese W.)	(	)
Africa	)	

2. In a similar way put the following places in order according to the average amount of rain which each has in the year. Place the figure (1) after the place which has the most; the figure (2) after the one with the next heaviest rainfall; and figure (10) after that which has least rainfall. Make a guess about those about which you are not certain.

Napier	(	)	Buenos Aires	(	)
Capetown	(	)	Bombay	(	)
Cairo	(	)	Madrid	(	)
Winnipeg	(	)	Bergen	(	)
Singapore	(	)	Tokio	(	)

3. The following places A.B.C. etc. are all near the sea coast on the west of their respective continents. You are given the latitude of each place. Put a figure (1) opposite the place which you think will have the hottest summer; figure (2) against the next and so on to (10) the coolest. Make a guess at those about which you are not certain.

A. 34 S.	(	)	B. 60 N.	(	)	C. 22½ S.	(	)	D. 54 N.	(	)
E. 31½ N.	(	)	F. 1 S.	(	)	G. 8½ N.	(	)	H. 18 S.	(	)
I. 41 N.	(	)	J. 48½ N.	(	)						

This thesis aims at discovering the degree of development of factors which are regarded as components of the more comprehensive term "perspective". This aspect will be approached in subsequent chapters. A knowledge of the extent to which Bradford's battery of tests has served to elucidate the problem of growth in geographical perspective, is of major importance if a comparison between the results of both investigations is to be made. A review of this phase will serve, not only to present the writer's opinion on that problem, but also will illustrate the development in his mind of the second section of this thesis.

TEST A.

This is purely a matter "of the manipulation of the geographical vocabulary" and is not a measure of perspective as defined by Bradford. Its value in a study, whose object is stated to be that "of searching for information that is fundamental to the development of an adequate perspective" (1), is to widen the meaning of the term "perspective". If the ability to manipulate a geographical vocabulary is a part of geographical

(1) Op. cit., Vol. III: p.185.

perspective, the term clearly means something more than the ability to classify various geographical phenomena according to certain gradations. Which "perspective", for example, is involved in framing a sentence containing the following words:-

"Routes. Railway centre. Continental" ?

Perspective would appear to be better understood as the ability to realise the relations existing between all aspects of geographical information.

The inclusion of a vocabulary test indicates that "knowledge" of the meaning of geographical terms is a component of geographical perspective.

While marking the pupils' answers in this question, one serious objection to including the results in such a study as this revealed itself.

This does not infer a contradiction of what has just been stated. The criticism is levelled not at the inclusion of a vocabulary test, but at one framed as this one was. The marking scheme declared that, "No marks were given for a sentence which included the word 'and' or its equivalent." What is one to take as the meaning of "equivalent" ? One case will be its omission where it should be, resulting in two simple sentences lacking any or

writer would say that this test is beyond the scope

without the correct punctuation, e.g., "Chicago is an important railway centre with many routes to it, it also has a continental climate." This type of construction was common in the standards, and was also found in Form III. There is also the type of sentence typified by the following:-

"From the railway centre at Paris the passengers are carried from west to east by the trans-continental railways; from there they are transported by different routes to wherever they wish to go."

In some cases this would be punctuated by a pupil with the use of a full-stop, others would write "and". Finally, there is the use of an alternative connective for "and", for example:-

"Good communications with a reasonable population, together with a good hinterland, are necessary for a good harbour."

The test in such cases is a test in English, a test in the ability to construct a sentence without using the word "and". In this the lower forms are obviously at a great disadvantage. The ability to construct satisfactory complex sentences being conspicuously absent from many junior forms. From being a test of geographical perspective, the test has become largely one of sentence construction.

To summarize the foregoing argument, the writer would say that this test is beyond the scope

of Bradford's definition of perspective. Of the two alternatives offered, the exclusion of the test from an inquiry into geographical perspective or the widening of the definition, the latter is preferred. Finally, a test in a form such as that of Test A. depends, for a successful answer, not only upon knowledge of geographical terms, but also upon ability in sentence construction. 5-6 weeks.

SECTION B.

TEST B 1.

A factor which influences the result is the acuity of the visual imagery possessed by the pupils. Acute visual imagery may or may not be

an advantage owing to the greater familiarity of

the pupils with a map on Mercator's projection than

with the globe. The problem of visual imagery can be overcome by adopting some such method as was used in the first of the tests devised by the writer, viz., the use of a blank map. Furthermore, the value of perspective of distance in this unpractical manner of shortest distances would appear to be questionable. Surely, a perspective of distance is of use only in

so far as it relates to the time taken to arrive at a given spot. The distance from London to Peking

the acquisition of geographical perspective. On

by the shortest route is less than that from London to Capetown. Yet the time taken for the transit of mails between these cities indicates the uselessness for practical purposes of "shortest distance" perspective.

London to Capetown	21 days
London to Pekin, via Canada	27-28 days
London to Pekin, via Suez	5-6 weeks.

To avoid misleading conceptions a test aiming at a measurement of the perspective of distance should be couched in terms of the time taken to arrive at the given points by the customary means of travel.

TEST B 2.

A test of the relative population of a series of towns involves an appreciation of so many factors, that for the school pupils it is simply a question of whether he has been told the population of the towns and memorized them or not. Can the reader declare the order of Moscow, Canton, and Montevideo in terms of population, and if he can what has he gained thereby?

Bradford stresses the value of memory in the acquisition of geographical perspective. On

what principles would a world perspective of population be based ? Would he begin with memorizing the order of the largest towns of the world, gradually adding more with each successive year of schooling ? Such a method would have no place for the inclusion of the comparatively small towns of New Zealand. If on the other hand, a list were compiled of the major towns of each country dealt with, many of the important towns of the larger countries would have to be omitted to keep the list within a reasonable compass. From a school-pupil the most that can be expected, in the writer's experience, is a perspective of towns within one country or group of contiguous countries. A world perspective is an acquisition accompanying the integration of concepts from unnumbered sources spread over many years. It may be possessed by a much travelled or widely read adult; it is an accomplishment in a school-pupil, desirable but unexpected. (2).

TEST B 3.

A criticism offered in the case of B 1, applies in this test also, viz., that the possessor of acute visual imagery gains in this case, a marked advantage over him without it.

(1) Op. cit., Vol. III, p. 183

(2) Op. cit., p. 203.

TEST 2.1. The development of a perspective of location in terms of latitude and longitude is of vital importance, however, for understanding even the most fundamental geographical phenomena of any region. For this reason the writer considers this test the most valuable in the section. This is not, however, in agreement with the opinion expressed by Dr Eggink in his criticism:-

pupil "In our schools, therefore, we only refer to latitude and longitude, in order to teach the pupils to handle the index at the back of the atlas" (1).

(2) A knowledge of latitude. Without being drawn into a discussion of the point, from interrelation of these factors the summer temperatures had to be determined. a quotation from "The Education of the Adolescent" may be cited as suggesting other uses for latitude and longitude:-

TEST 2.2. "It is quite easy for the children to see that latitude and longitude combined give the precise situation of any place; that latitude enables them to find the angle of incidence of the sun's rays at midday in different parts of the world, and also assists in judging distances; and that longitude is specially useful in estimating the hour of the day in different countries" (2).

as rather serious." SECTION C.

know how. Whereas Section B appeared to the writer to be mainly a test of geographical information, aided or not as the case might be by visual imagery, Section C appeared, broadly speaking, rather as a test of geographical reasoning. Either the teachers have

(1) Op. cit., Vol. III, p. 183

(2) Op. cit., p. 208.

TEST C 1.

In this test, for example, the factors given were:-

(1) All towns are near the coast.

(2) All towns are in the Atlantic basin.

This might or might not be realised, but was true, with exception of "Christchurch" for New Zealand

pupils. The factors tested were:-

(1) A knowledge of winds and ocean currents.

(2) A knowledge of latitude.

From interrelation of these factors the summer temperatures had to be determined.

that an adequate appreciation of their effects is

TEST C 2.

As an enquiry into perspective in terms of rainfall, this test returned uniformly poor results in both investigations. Bradford declares that "lack of perspective in this particular must be considered as rather serious." If as Bradford declares: "To know how much rain falls in a given locality is of first importance, to be able to expose the relevant factors is of secondary importance" one can understand that a serious weakness is indicated. One of two things must be at fault. Either the teachers have

failed to tell the pupils the rainfall, or their memories have failed to retain the information so pushed in. On what basis would one select the rainfalls so to be memorized? On the size and importance of the town or on a selection from the various types of rainfall distribution? The second would appear the only chance of keeping the list within reasonable bounds, yet what a meaningless task to set before a child. If on the other hand "the relevant factors" are of primary importance, is the result so deplorable? In the writer's opinion it is not. The relevant factors are so many, as Dr Eggink has pointed out, that an adequate appreciation of their effects is beyond the ability of more experienced students than those found in a secondary school. The Director of Meteorological Services, New Zealand,⁽¹⁾ declared, when the Test was placed before him, that the best he could do would be to group together those towns with a large rainfall, those with a medium, and those with little precipitation. No one doubts the value of a knowledge of precipitation in framing a conception of the environment of a locality, although knowledge of the amount of rainfall is of little use without knowing the complementary factor of the type of rainfall:-

(2) Kidson: "Climate". N.Z. Year Book, 1933, p.18.

(1). Dr.E.Kidson, O.B.E., D.Sc., F.N.Z. Inst.

"The distribution of the precipitation throughout the year is little less important than its total amount, the effect of rainfall in winter, for example, being very different from that in summer" (2).

The area covered by the towns given would appear to be far too extensive to expect reasonably good results.

TEST C 3.

This test is not unlike C 1 as both aim at testing knowledge of summer temperatures, but in the first case the issue is affected by the presence of possible associations. The position on the globe, of the Congo River, other than that it is in a hot region, may be but vaguely known, and yet, per medium of stories, there may be a general impression of high temperatures. A perspective based on such grounds is an arbitrary one without any solid and rational foundation. In Test C 3, such associational influences are absent and to that extent it is considered that data in terms of latitude, and the writer would add, longitude, are more suited to test perspective than is the presentation of actual names.

A query immediately rises when only latitude is given as in C 3. One is given the latitude of the (2) Kidson: "Climate". N.Z. Year Book, 1933, p.18.

location plus the fact that it is on the west of a continent. This must presuppose that, for example, the summer temperature for $22\frac{1}{2}^{\circ}\text{S.}$ is the same on the west coast of South America, as on the west of Africa or the west of Australia; or that in 60°N. latitude the west of North America has the same summer temperature as the west of Europe. One might even reasonably infer from this question that, given the latitude, the coast, and the temperature, one could definitely declare the temperature for the east or west coast of other continents in that latitude to be the same. Reference to any standard isothermic map, as, for example, Figures 6 & 7, Köppen's "Die Klimate der Erde," shows that, although there are general resemblances in the course of isotherms across the Pacific, Atlantic and Indian Oceans, there are marked discrepancies from the thesis enunciated above. Particularly is this so in the Northern Hemisphere. To further test the validity of such a principle, the writer obtained the temperatures of the four hottest consecutive months, which might be fairly estimated as a measure of "the hottest summer", of places in the given latitudes on the west of the several continents. It was not in all cases possible to get records from towns situated

35.
TABLE 1.
SUMMER TEMPERATURES OF 34. IN THE GIVEN LATITUDES
OF TEST 83. (in order of temperature).

Location	Test	Actual	Continent	Absolute Temp. of 4 hottest months.
Derby	B.	18.10	Australia	1214.0
Onslow	B.	17.10	Australia	1202.4
Freetown	B.	8.30	Africa	1186.8 (x)
Sao Thome	B.	8.29	Africa	1179.0
Perth	A.	31.57	Australia	1177.9
Mossamedes	A.	31.57	Africa	1177.9
Taona	B.	18.10	S. America	1173.0
Mogador	B.	33.33	Africa	1173.0
Capetown	A.	33.33	Africa	1173.0
Iquique	B.	41.10	America	1173.0
Oporto	B.	41.10	Europe	1173.0
Walfisch B.	B.	41.10	Africa	1173.0
San Diego	B.	31.30	N. America	1168.5
Valparaiso	B.	31.30	S. America	1168.5
Hamburg	B.	54.15	Europe	1159.4
Paris	B.	54.15	Europe	1158.4
Victoria	B.	54.15	N. America	1150.5
Bergen	B.	60.50	Europe	1149.9
Prince Rupert	B.	54.15	N. America	1142.2
Dillingham	B.	60.50	N. America	1132.9

exactly on the same parallel of latitude, but the locations taken were the nearest obtainable and never more distant from the exact spot than where a reasonably good pupil might expect the given latitude to be. The results of his enquiry are given below. The temperatures were taken from the monthly records given in the latest (1932) publication of "Réseau Mondial" (1), except where otherwise stated. The figures given in Table 1 are the normal temperatures calculated over a ten year period. Measurements are in absolute units which may be converted into Fahrenheit by the following formula:-

$$A = C + 273^{\circ}$$

$$C = (F - 32) \frac{5}{9},$$

where A = Absolute, C = Centigrade, and F = Fahrenheit temperatures.

Temperatures from Réseau Mondial are the means of the mean maximum and mean minimum readings).

- (p) No comparisons available for this latitude.
- (x) 4 times the highest monthly temperature from Köppen op.cit.p.302
- (p) 4 times the highest monthly temperature from Köppen op.cit.p.305
- (.) 4 times the highest monthly temperature from Köppen op.cit.p.324
- (X) 4 times the highest monthly temperature from Köppen op.cit.p.306

(1) "Réseau Mondial", 1932. His Majesty's Stationery Office, London.

TABLE 1.

SUMMER TEMPERATURES OF TOWNS IN THE GIVEN LATITUDES
OF TEST C3, (in order of temperature).

Location	Test letter.	Given Lat.	Actual Lat.	Continent (W. coast)	Absolute Temp. of 4 hottest months.
Derby	H.	18 S.	17.18 S.	Australia	1214.6
Onslow	C.	22.30 S.	21.43 S.	Australia	1208.4
Freetown	G.	8.30 N.	8.29 N.	Africa	1202.4 (ø)
Sao Thomé	F.	1. S	0.20 N.	Africa	1196.8 (ø)(x)
Perth	A.	34. S.	31.57 S.	Australia	1179.0
Mossamedes	H.	18. S.	15.12 S.	Africa	1179.0
Tacna	H.	18. S.	18. S.	S. America	1177.9
Mogador	E.	31.30 N.	31.30 N.	Africa	1173.2 (ø)
Capetown	A.	34. S.	33.56 S.	Africa	1173.0
Iquique	C.	22.30 S.	20.12 S.	S. America	1172.3
Oporto	I.	41. N.	41.10 N.	Europe	1170.4 (.)
Walfisch Bay	C.	22.30 S.	22.52 S.	Africa	1169.6 (x)
San Deigo	E.	31.30 N.	32.43 N.	N. America	1168.5
Valparaiso	A.	34. S.	33.1 S.	S. America	1161.7
Hamburg	D.	54. N.	53.33 N.	Europe	1159.4
Paris	J.	48.30 N.	48.49 N.	Europe	1158.4
Victoria	J.	48.30 N.	48.24 N.	N. America	1150.5
Bergen	B.	60° N.	60.20 N.	Europe	1149.9
Prince Rupert }	D.	54 N.	54.18 N.	N. America	1142.2
Dillingham	B.	60 N.	59 N.	N. America	1132.9

Temperatures from "Réseau Mondial" are the means of the mean maximum and mean minimum readings).

- (ø) No comparisons available for this latitude.
- (x) 4 times the highest monthly temperature from Köppen op.cit.p.302
- (ø) 4 times the highest monthly temperature from Köppen op.cit.p.305
- (.) 4 times the highest monthly temperature from Köppen op.cit.p.324
- (X) 4 times the highest monthly temperature from Köppen op.cit.p.306

according to the continent from which one chose one's temperature reading. In the scoring of the New Zealand tests a key compiled on a basis of the average temperatures of all coasts was

If the thesis, that the Western Coasts of continents had the same temperatures, was sound, the same test letter in column 2 would occur together in groups of two or three according to the number of towns taken for the particular latitude. In only one case does this happen, viz., J, Paris, and Victoria, latitude $48\frac{1}{2}^{\circ}$ N. The Australian west coast latitudes are relatively hotter than those of other continents, while the African and European Coasts are slightly warmer than corresponding latitudes on the American Coast. This latter fact has curiously affected the test in some respects. For example, 34° S. (Capetown) has a warmer summer than 20° S. (Iquique). Another and more unexpected fact is that Hamburg, latitude $53\frac{1}{2}^{\circ}$ N. is a shade warmer than Paris $48\frac{1}{2}^{\circ}$ N. An example or two of these variations expressed in degrees Fahrenheit are here given:-

1. APPLICATION.

Onslow, Lat. 22° S.:	84° F.
Iquique, Lat. 20° S.:	68° F.
Capetown, Lat. 34° S.:	70° F.
Valparaiso, Lat. 33° S.:	63° F.
Hamburg, Lat. 54° N.:	62° F.
Prince Rupert)	Lat. 54° N.:
	55° F.

Granted these are some of the outstanding differences, but it is just these which falsify the principle involved. In the scoring of this question various answers could be correct according to the continent from which one chose one's temperature reading. In the scoring of the New Zealand tests a key compiled on a basis of the average temperatures of all coasts was

used. Add to these difficulties the further one that there is only a small margin of difference between the temperatures of some of the latitudes given, for example, A 1171.2, and E 1170.8, the difference between which, reduced to degrees Fahrenheit, is only .18 degrees in the mean monthly summer temperature, and this test becomes incapable of declaring the presence or otherwise of perspective.

To summarise these statements it may be said that in order to determine a perspective of temperature the data given must include longitude as well as latitude, and that such data are preferable to stating the names of towns, if extraneous factors not constantly applicable as a basis for determining perspective are to be excluded.

THE APPLICATION OF BRADFORD'S TESTS IN NEW ZEALAND.

1. APPLICATION.

Writing of his application of this series, Bradford says that:-

"The second series of tests was applied to classes in three (secondary) schools, a girls' school and two mixed schools. The pupils tested in these three schools numbered 406." (1).

The field of survey in this investigation is somewhat similar. The tests were applied in four Wellington schools: a private girls' school having a primary and secondary department, a

(1) Op. cit., p. 335.

similar boys' school, and two public (State) schools, one a mixed secondary High School, and the other a boys' High School with an attached intermediate department. The pupils tested numbered 496, of which 352 were in the secondary departments of the above schools and 144 in the final and penultimate grades of the primary departments of three of them. The fourth year pupils together with a minority of the third would be candidates this year for the University Entrance Examination. The small group of fifth year pupils were failures from last year's examination who were sitting again this year. In the original survey it is noted that the schools were not entirely filled with scholars who had gained a free place. This was also true of the schools tested here, although the percentage who had so failed to pass the required examination was virtually negligible.

It will be noticed that this investigation included within its scope pupils in the two standards preceding the secondary grade. This was done in view of the nature of the original results which indicated very little growth of geographical perspective in four years of secondary school education. An investigation of the extent of the difference of geographical perspective possessed by the pupils of the upper standards and those of the lower forms was considered to be an enquiry of value in connection with the problem.

York was replaced by Christchurch since, as the

Bradford's tests were submitted "in toto" except for four alterations: the directions for Test B 1 (distance) were left unaltered so that the town of reference became not London but Wellington. This alteration was made so that the test would, as far as possible, remain of equal difficulty in both enquiries. It was realised at too late a stage that in order to gain equality of difficulty the regularity of the gradation in perspective had been sacrificed. In Test B 3 (location) a change was imperative since the required continent and country for latitude 20 N, longitude 155 W. was given in the key as "Australasia, Oceania, Pacific," and "Hawaii, Friendly Islands, Samoa" (2), respectively. No New Zealand teacher would recognise the existence of such continents, nor would an appreciable number be found who would admit New Zealand as a country in the Continent of Australasia, as was required in answer to one of the questions in the first series. Quite apart from the geographical worthlessness of the term "Australasia," New Zealand's national pride rebels against the loss of its separate identity involved in the use of the above term. In place of the given location, 37 N., 127 E was used. This is approximately the corresponding position in the Eastern Hemisphere and was chosen in order to maintain the gradation in the series given by the former location. The third alteration was made in Test C 1 (temperature), York was replaced by Christchurch since, as the

(2) op. cit. p. 338.

climatic factors influencing the summer temperature of both were approximately similar, equality of difficulty would be preserved for both investigations. For the same reason Napier replaced London in Test B 2 (rainfall). In both cases the position taken in the answer by the New Zealand town was identical with that of the town replaced.

With the minor changes noted above, the tests were submitted to the New Zealand children under normal school conditions and governed by the same restrictions as to time and explanations as were followed in the English presentation. The children tested comprised a vertical section through the selected schools, there being a mixture of a and b forms with an occasional c grade form. There is, however, a large disparity between the number of boys and girls - 355 as against 141. Nevertheless, the results are essentially group results based on the number of years during which geography has been studied. Sex differences are outside of the scope of the present work. It is to be noted also that the New Zealand children were tested either at the end of the first or beginning of the second term. They had, therefore, approximately six months of the year group in which they were placed still ahead of them. Bradford mentions that in the case of the first series of Tests, "The schools were tested within a month of the completion of the school year." He does not say whether the

same is true or not of the schools tested with the revised series.

In order to provide as far as possible for uniformity in the presentation of the tests, the following instructions were typed and forwarded to all schools in which the tests were being submitted.

INSTRUCTIONS TO THOSE PRESENTING TESTS. FIRST SERIES.

1. Before the test begins give out for each pupil:-
 - (a) 1 copy each of tests A, B, C, turned face downwards on the desks.
 - (b) 1 sheet of writing paper.
 - (c) 1 paper clip.
2. Before turning up Test A, tell the pupils that the tests are an attempt to discover how their geographical knowledge increases year by year. Hence it is expected that they will not be able to answer all the questions. All that is wanted is their best effort. As the tests are strictly timed, the pupils must cease when time is called.
3. Pupils are to write on all sheets the following particulars:-
 - (a) Form or Standard.
 - (b) Age in years and months.
 - (c) A code number. This number is to be used in all subsequent tests. It will assist the investigator if the numbers are continued serially throughout the school.
4. Pupils turn up Test A. The tester reads aloud the instructions, the examples, and the questions; answers any queries. (Sentences may be done in any order.) The same procedure is followed in the subsequent tests.

5. TEST TIMES.

Test	A	20 minutes
"	B1	5 "
"	B2	5 "
"	B3	10 "
"	C1	5 "
"	C2	5 "
"	C3	5 "

All times are exclusive of the time taken by the tester in reading the question aloud. Half a minute before the time has elapsed, the tester repeats the instruction to make a guess at those which have not been filled in.

6. Collection of papers. Each pupil will clip together at the top left hand corner all his or her papers, arranging papers in order of tests. Please collect papers by forms.

Note:- Tests B1, B2, C1, 2, 3, reserve the brackets for final numbers. Trial numbers may be written outside the brackets and when finished with crossed out.

2. SCORING THE TESTS.

TEST A. - VOCABULARY.

Marks were allotted from 0 to 3 for each sentence, according to Bradford's scheme. A difficulty was experienced here in that although examples of sentences marked 'two' and 'one' were given, no examples were given of sentences on the limit marks. Furthermore, although the relative proportions of sentences marked positively were stated, no indication of the number of sentences marked 'nought' was given. To these factors, and to the difficulty of interpreting the term "equivalent" as outlined in a previous section (1), is attributed the great disparity between the two investigations in the relative proportions of 'threes,' 'twos' and 'ones' recorded. The comparative marking in the two investigations, the English investigation being reckoned as for the same total, is as follows:-

(a)		(b)	
ENGLISH INVESTIGATION.		N.Z. INVESTIGATION.	
619	ones	449	ones
932	twos	449	twos
696	threes	1347	threes
<u>2247</u>		<u>2245</u>	

N.B. The results (b) are for those years tested

(1) Ante pp. 24, 25.

N.B. Continued.

in common with (a), and hence exclude results from the last two years of the primary grade.

Calculated on the total number of marks gained, the difference between the two tests is shown to be:-

(a) 5388, (b) 4571,

a difference in favour of the English investigation of 817. As the number of papers marked in the N.Z. Secondary schools was three hundred and fifty-two, the difference per paper is approximately two marks out of a total of thirty for the question. This would represent an increase of about seven per cent. per paper. However, as the results given below indicate a smaller positive margin than this for the first and second years, while in the third and fourth years the New Zealand are higher than the English, it would appear that the number of questions marked 'nought' in the original investigation, must have been considerably higher, particularly in the last two years. The number so marked by the writer in the four secondary groups totalled 567.

TEST B. 1.- DISTANCE.

As this was altered so that the distance was reckoned as from Wellington instead of London, it will only be necessary to give the key used. The order of distance from Wellington was reckoned as follows:-

Tasmania (1)	Cape Horn (2)	Ceylon (3)
Pekin (4)	Capetown (5)	Vancouver (6)
Montreal (7)	Jerusalem (8)	Berlin (9)
Gibraltar (10).		

TEST B. 2. - POPULATION.

In this, and all subsequent tests, it was not definitely stated whether the order of towns or locations, as set out in Bradford's results, was the order on which the question was marked or not. If it were, the writer disagreed with his results in Tests B 2 and C 3. In each case the authorities used in the formulation of the writer's keys are given with the key.

Key - B 2.

Chicago (1) Paris (2) Buenos Aires (3)
 Melbourne (4) Genoa (5) Colombo (6)
 Winnipeg (7) Capetown (8) Dover (9)
 Suez (10)

SOURCES OF INFORMATION:- Whitaker's Calendar, 1933.
 The Statesman's Year Book, 1932.

With the exception of Suez (1927) and Chicago (1928) the populations are those recorded as for 1931.

The populations of the towns above with the difference between each successive population is as follows:-

Population.		Differences.	
(1)	3,157,000		
(2)	2,871,039	285,961	
(3)	2,195,200	675,839	
(4)	1,030,750	1,164,450	
(5)	626,917	403,833	
(6)	287,729	339,188	
(7)	218,785	68,944	
(8)	150,914	67,871	
(9)	41,097	109,817	
(10)	39,166	1,931	

To measure geographical perspective it is desirable that the populations "should be graded in equal quantitative steps," (1). In some tests, such steps might be impossible of attainment, but in a world-wide test of population there are sufficient well known towns to allow of a test being framed with more evenly graded steps than occurs above.

TEST B 3. LOCATION.

Attention has already been drawn to the undesirability of using the term, "Australasia." (2) Its occurrence in the answer for the location of 30.S, 120.E, viz, Continent: Australasia; Country: Western Australia, caused great confusion. No less than eleven combinations of the terms

- (1) Op. cit., p. 339
 (2) Ante p.39.

Australasia, Australia, Western Australia, New Zealand, Asia and Tasmania were recorded in which the candidates gained one or more marks, together with a number of answers involving other Australian States, which failed to score. These combinations were spread over sixty-seven papers which would represent at least half of the papers that attempted an answer. The confusion was due, firstly, to the fact that the individual States of the Australian Commonwealth are not recognised as separate countries; and, secondly, to the infrequent use of the term "Australasia", as the name of a continent. The test was scored according to Bradford's scheme, except for the alteration 37 N. 127 E which was scored as under:-

Location	Continent	Country.
	1 mark	2 marks.
37N. 127E.	Asia	Korea
		Manchuria Japan China (S.China disallowed).

TEST C 1. - SUMMER TEMPERATURES.

The correct order of towns in this test in this test was as given by Bradford Vol.2, p. 343, viz:-

Freetown (1)	Congo (2)	Cape Frio (3)
Mogador (4)	Oporto (5)	Capetown (6)
Paris (7)	Walfisch Bay (8)	Christchurch (9)
Bergen (10)		

Authority:- "Réseau Mondial" 1932.

The gradations in this test were noticeably regular. Cape Frio would be more correctly located as in British South West Africa and not Portuguese West Africa.

TEST C 2. RAINFALL.

The marking scheme agreed with the order set out in Table V., Vol. II., p. 344, viz.,

Singapore (1)	Bombay (2)	Bergen (3)
Tokio (4)	Buenos Aires (5)	Napier (6)
Capetown (7)	Winnipeg (8)	Madrid (9)
Cairo (10)		

Authority:- "Réseau Mondial" 1932.

The data on which the above key was compiled are given below. Accompanying the given data are the gradations between each successive step.

Order	Location	Rainfall Millimetres per annum	Temperature-Degrees Absolute. (Total)	Gradations in Millimetres.
(1)		2415		
(2)		1793	1202.4	622
(3)		1730	1195.2	63
(4)		1522	1191.5	208
(5)		945	1183.4	577
(6)		901	1171.2	44
(7)		636	1170.8	265
(8)		513	1170.4 (2)	123
(9)		414	1155.9	99
(10)		19.6	1150.8	394.4

Reduced to inches, these gradations vary from 24.5 inches to 1.7 inches, an unsatisfactory range. In three cases the variation between successive towns is so small as to depend on mere chance for correct placing.

TEST C 3. TEMPERATURE.

The marking scheme for this test was compiled from the average of temperatures for the four hottest months of towns in the given latitudes, on the western side, of all continents for which records were available. Such a key agrees with the order given in Table VI of Bradford's work with one exception. If the table is his marking scheme, the writer's research leads him to disagree with position 'one' given to Lat. $31\frac{1}{2}$ N. This location in this enquiry occupies a position sixth

in order of temperature. A further correct scheme could have been formulated without departing from the given data if towns were selected individually from the west coasts of various continents, a fact which can be noticed from the temperature records given in an earlier reference to this test (1). These are weaknesses which seriously reduce the value of the results obtained.

The marking scheme used by the writer with the gradations occurring between the successive steps of the table was as follows:-

Order	Location	Temperature-Degrees Absolute. (Total of four hottest months.)	Gradations.
1	G	1202.4	
2	F	1195.2	7.2
3	H	1191.5	3.7
4	C	1183.4	8.1
5	A	1171.2	12.2
6	E	1170.8	.4
7	I	1170.4 (2)	.4
8	J	1155.9	14.5
9	D	1150.8	5.1
10	B	1136.4	14.4

Authorities:- "Réseau Mondial", 1932;
"Die Klimate der Erde", Köppen.

The same criticism, as was made above, is repeated here: that the differences shown in the table above are, in some cases, so small - and they are the sum of differences for four months - as to reduce materially the value of the test as a scientific measure of perspective.

C. STATISTICAL TREATMENT OF DATA:

The scheme used by Bradford for scoring the results obtained has been adopted "in toto" by the writer. For a full explanation of the

- (1) Ante p. 35, Table I.
(2) 4 times hottest month.

method, the reader is referred to pp. 339 - 41 and appendices 1 and 2 of "The Measurement of Perspective," E.J.G. Bradford, British Journal of Educational Psychology, Vol.2, 1932. The following quotations will summarise the method.

"In order to be able conveniently to compare the distribution of ranks awarded by one group of pupils with the distribution of ranks awarded by other groups, these distributions have been expressed as single coefficients, by means of two formulae."

"The knowledge or relative accuracy of ranking by the group, as a group, can be obtained by comparing the distribution expected on the basis of pure chance, . . . with that actually obtained . . . Thus,

$$K = 1 - \frac{A.D.X}{A.D.C.}$$

where K is the coefficient of knowledge or accuracy of marking: A.D.X is the average deviation of ranking calculated from the correct ranks: A.D.C. is the average deviation of frequencies due to chance . . . "

"A measure of general geographical perspective is given by the average of all the values of K. The perspective in regard to any one distributed geographical phenomenon is measured by the average K obtained from the test relevant to that phenomenon."

"The probable error of K is given by the following formula:-

$$P.E. = \frac{.45}{\sqrt{n}}$$

TEST A. VOCABULARY.

Investigation.	Primary.		Secondary.				
	Std.V.	Std.VI	1st year	2nd year	3rd year	4th year	5th year
England			30.0	42.3	39.5	47.6	
New Zealand	16.1	25.1	29.4	39.7	55.7	68.0	68.1

D. The Results from the New Zealand Investigation and the corresponding English Results.

TABLE II.

THE NUMBER AND AVERAGE AGE OF PUPILS
IN THE YEAR GROUPS OF THE ENGLISH
AND NEW ZEALAND INVESTIGATIONS.

	Investigation.	Primary.		Secondary.				
		Std.V	Std.VI	1st year	2nd year	3rd year	4th year	5th year
Numbers.	England			66	99	126	115	
	New Zealand	61	68	137	99	46	48	7
Ages.	England	-	-	13	14	15	16	
	New Zealand	12 y. 1 m.	12 y. 10 m.	14y. 1m.	14y. 11m.	15y. 11m.	16y. 9m.	17yrs 1 mth

The numbers given in Table II for the English Investigation are compiled from Table IX of Bradford's research.

The scores in the following tables are percentage marks in the case of Tests A. and B3, and, in the case of the other tests, K expressed as a percentage. The results of the English investigation are given as the average of the scores for the year groups as given in Table IX of Bradford's research.

TABLE III.

TEST A. VOCABULARY.

Investigation.	Primary.		Secondary.				
	Std.V	Std.VI	1st year	2nd year	3rd year	4th year	5th year
England			30.0	42.3	39.5	47.6	
New Zealand	16.1	25.1	29.4	39.7	55.7	68.0	68.1

TABLE IV.

TEST B 1 - DISTANCE.

	No. of Pupils.	Year.	Value of K.			Year.	Value of K.	
			Eng.	N.Z.			Eng.	N.Z.
Tasmania	65	St.V		81.5	Vancouver	St.V		14.5
	69	St.VI		100		St.VI		5.5
	137	1		97.2		1	21	51.5
	104	2		96.4		2	25	26.9
	47	3		99.6		3	28	11.5
	48	4	84	95.4		4	32	34.2
	7	5		100		5		42.9
Cape Horn		St.V		27.2	Montreal	St.V		28.8
		St.VI		52.2		St.VI		32.9
		1	53	42.8		1		44.8
		2	53	37.6		2		45.2
		3	49	51.7		3		54.3
		4	50	66.8		4	46	58.0
		5		49.8		5		63.0
Ceylon		St.V		38.5	Jerusalem	St.V		42.9
		St.VI		33.1		St.VI		61.7
		1		58.3		1		56.7
		2		54.4		2		61.5
		3		45.1		3		52.6
		4	60	54.3		4	50	51.6
		5		67.7		5		67.7
Pekin		St.V		-16.2	Berlin	St.V		41.0
		St.VI		-30.4		St.VI		64.7
		1	34	12.7		1		66.1
		2	34	28.8		2		56.6
		3	28	18.8		3		70.7
		4	35	30.8		4	95	73.5
		5		41.8		5		73.0
Capetown		St.V		8.3	Gibraltar	St.V		17.9
		St.VI		25.2		St.VI		33.3
		1	20	32.3		1		42.6
		2	35	38.5		2		42.9
		3	32	38.7		3		40.4
		4	35	50.8		4	82	46.3
		5		77.1		5		61.9

TEST B 2 - POPULATION.

51.
TABLE V.

	No. of pup- ils	Year.	50(a). Value of K. Eng. S.Z.		Year	Value of K. Eng. S.Z.
Footnote to Table IV.						
Chicago	68	St. V	62.4	Colombo	St. V	12.4
N.B.	138	1	80.5	1	18	34.2
	47	3	81.8	3	4	24.3
	7	5	90.5	5		42.9
Paris		St. V	70.6	St. V		31.2
		St. VI	75.7	St. VI		1.4
		1	79.6	1	3	0.2
		2	76.6	2	0	6.9
		3	77.6	3	3	18.1
		4	76.2	4	4	23.7
		5	84.6	5		25.9
Buenos Aires		St. V	12.2	Cape Town	St. V	28.4
		St. VI	14.5	St. VI		40.6
		1	22.9	1		28.7
		2	2.7	2		17.9
		3	36.2	3		30.0
		4	43.2	4		21.3
		5	53.9	5		30.9
Melbourne		St. V	25.4	Dover	St. V	28.9
		St. VI	39.9	St. VI		47.5
		1	32.3	1		61.0
		2	55.8	2		57.0
		3	55.9	3		53.4
		4	40.0	4		58.9
		5	31.3	5		76.8
Genoa		St. V	3.5	Suez	St. V	51.6
		St. VI	3.2	St. VI		60.7
		1	2.6	1		73.1
		2	7.2	2		68.9
		3	13.2	3		72.6
		4	11.2	4	40	55.1
		5	37.1	5		74.6

51.
TABLE V.

TEST B 2 - POPULATION.

	No. of pup- ils	Year.	Value of K. Eng. N.Z.			Year	Value of K. Eng. N.Z.	
Chicago	68 69 138 103 47 50 7	St. V St. VI 1 2 3 4 5		62.4 74.9 80.5 74.3 81.6 79.1 90.5	Colombo	St. V St. VI 1 2 3 4 5	12.4 28.7 34.2 24.3 24.3 22.4 42.9	18 8 4 0
Paris		St. V St. VI 1 2 3 4 5		70.6 75.7 79.6 76.6 77.6 76.2 84.6	Winnipeg	St. V St. VI 1 2 3 4 5	31.2 - 1.4 0.2 6.9 18.1 23.7 25.9	3 0 3 4
Buenos) Aires)		St. V St. VI 1 2 3 4 5		12.2 14.5 22.9 3.7 36.2 43.2 53.9	Capetown	St. V St. VI 1 2 3 4 5	28.4 40.6 28.7 17.9 30.0 21.3 30.9	
Melbourne		St. V St. VI 1 2 3 4 5		25.4 39.9 31.3 55.8 55.9 40.0 31.3	Dover	St. V St. VI 1 2 3 4 5	28.9 47.5 61.0 57.0 53.4 58.9 76.8	
Genoa		St. V St. VI 1 2 3 4 5		- 3.5 3.2 - 2.6 7.2 - 13.2 11.2 37.1	Suez	St. V St. VI 1 2 3 4 5	51.6 60.7 73.1 68.9 72.6 55.1 74.6	40

TABLE VI.

TEST B 3 - LOCATION.

Investigation	Primary		Secondary				
	Std. V	Std. VI	1st year	2nd year	3rd year	4th year	5th year
England			14.0	20.8	22.0	25.4	
New Zealand	2.4	8.7	13.2	16.4	24.2	34.2	43.3

TABLE VII.

TEST C 1 - TEMPERATURE.

	No. of Pupils.	Year.	Value of K.			Year.	Value of K.	
			Eng.	N.Z.			Eng.	N.Z.
Freetown	67	Std. V		-14.8	Capetown	Std. V		10.4
	70	Std. VI		- 2.9		Std. VI		13.7
	141	1	63	15.7		1	26	27.1
	104	2	68	14.1		2	33	34.6
	46	3	57	32.4		3	30	38.3
	50	4	55	30.7		4	35	41.6
	7	5		61.9		5		48.6
Mouth of Congo R.		Std. V		41.5	Paris	Std. V		18.2
		Std. VI		58.7		Std. VI		37.6
		1	71	60.7		1	66	28.6
		2	68	65.7		2	65	34.1
		3	74	70.0		3	65	46.1
		4	75	68.6		4	71	48.1
		5		57.5		5		47.1

x Christchurch was substituted for York. Both occupy the same relative position in the table.

xx Napier replaces London in the original test. Both occupy the same relative position in the table.

(.) 29 is the score for London.

TABLE VII. (Ctd).

TEST C 1 - TEMPERATURE.

	Year.	Value of K.			Year.	Value of K.	
		Eng.	N.Z.			Eng.	N.Z.
Cape Frio	St. V		50.9	Walfisch Bay	St. V		-47.3
	St. VI		60.4		St. VI		-46.1
	1	64	49.4		1	-44	-26.5
	2	66	57.2		2	-34	-42.1
	3	67	69.8		3	-42	-23.4
	4	72	46.5		4	-33	-26.5
	5		67.7		5		-15.2
Mogador	St. V		12.7	^x Christchurch	St. V	YORK	60.5
	St. VI		35.4		St. VI		70.7
	1	44	27.8		1	84	70.1
	2	56	20.9		2	87	60.2
	3	53	44.4		3	89	77.1
	4	47	31.9		4	92	74.6
	5		36.5		5		69.1
Oporto	St. V		18.8	Bergen	St. V		45.3
	St. VI		25.1		St. VI		74.2
	1	51	26.2		1	64	85.0
	2	47	26.9		2	79	91.7
	3	47	36.5		3	79	96.1
	4	48	28.8		4	82	97.8
	5		37.1		5		96.8

TABLE VIII.

TEST C 2 - RAINFALL.

Singapore	61	St. V		4.9	^{xx} Napier	St. V		-23.3
	68	St. VI		34.0		St. VI		3.5
	142	1		18.9		1		15.2
	102	2		19.0		2		15.7
	46	3		39.1		3	(.)	18.3
	50	4	33	40.9		4	(For 29 London)	17.6
	7	5		49.2		5		25.7

^x Christchurch was substituted for York. Both occupy the same relative position in the table.

^{xx} Napier replaces London in the original test. Both occupy the same relative position in the table.

(.) 29 is the score for London.

TABLE VIII (Ctd)

	Year.	Value of K. Eng.N.Z.			Year	Value of K. Eng. N.Z.	
Bombay	St. V St. VI 1 2 3 4 5	2.1 42.0 30.9 10.7 47.1 54.1 34.4	51	Capetown	St. V St. VI 1 2 3 4 5	-12.3 - 5.9 - 4.9 2.7 3.4 -4.4 4.8	7
Bergen	St. V St. VI 1 2 3 4 5	2.2 15.1 2.5 7.0 13.7 31.6 -10.6	-17	Winnipeg	St. V St. VI 1 2 3 4 5	-12.6 3.3 -11.3 - 0.9 25.7 40.0 30.9	18
Tokio	St. V VI 1 2 3 4 5	-14 13.4 1.7 7.4 8.2 23.0 47.1	16	Madrid	St. V VI 1 2 3 4 5	3.0 19.3 18.3 18.4 11.9 42.2 30.5	31
Buenos Aires)	St. V St. VI 1 2 3 4 5	10.2 7.1 15.5 14.5 15.7 25.6 20.0	26	Cairo	St. V VI 1 2 3 4 5	-12.8 32.7 29.1 34.2 52.7 66.2 42.9	63

TABLE IX.

TEST C 3 - TEMPERATURE. (LATITUDE).

	No. of Pupils	Year	Value of K.		Year	Value of K.	
			Eng.	N. Z.		Eng.	N. Z.
G. Lat. $8\frac{1}{2}^{\circ}$ N.	57 70 137 99 46 51 7	Std. V Std. VI 1 2 3 4 5	81 75 76 75	34.1 63.2 63.8 64.3 74.4 62.5 74.6	E. Lat. $31\frac{1}{2}^{\circ}$ N.	Std. V Std. VI 1 2 3 4 5	39.6 54.9 54.5 53.9 60.0 48.2 71.4
F. Lat. 1° S.		Std. V Std. VI 1 2 3 4 5	50 50 50 50	38.8 55.2 56.8 59.3 65.9 62.9 76.8	I. Lat. 41° N.	Std. V Std. VI 1 2 3 4 5	40.9 85.7 83.0 86.5 81.5 70.2 89.4
H. Lat. 18° S.		Std. V Std. VI 1 2 3 4 5	85	27.0 74.7 77.9 76.9 87.4 67.1 90.8	J. Lat. $48\frac{1}{2}^{\circ}$ N.	Std. V Std. VI 1 2 3 4 5	34.9 81.6 80.7 87.3 82.5 74.1 100
C. Lat. $22\frac{1}{2}^{\circ}$ S.		Std. V Std. VI 1 2 3 4 5	27 25 30 23	38.3 81.5 80.5 79.0 83.9 69.5 100.0	D. Lat. 54° N.	Std. V Std. VI 1 2 3 4 5	33.1 72.6 78.3 81.7 81.2 70.9 96.1
A. Lat. 34° S.		Std. V Std. VI 1 2 3 4 5	82	32.6 54.3 47.4 54.7 47.0 42.7 60.0	B. Lat. 60° N.	Std. V Std. VI 1 2 3 4 5	12.3 78.7 78.9 85.9 84.1 85.2 96.8

AVERAGE FOR ALL TESTS.

England

New Zealand

With the exception of Test 3., the results given in Table X. are the results given in Table X. SUMMARY OF RESULTS FOR THE BRADFORD SERIES.

TESTS.	INVESTIGATION.	Primary.		Secondary.				
		Std.V	Std.VI	1st yr.	2nd yr.	3rd yr.	4th yr.	5th yr.
A.1. Vocabulary	Eng.			30.0	42.3	39.5	47.6	
	N.Z.	16.1	25.1	29.4	39.7	55.7	68.0	68.1
B.1. Distance	Eng.			33.3	38.8	42.3	48.4	
	N.Z.	28.4	37.8	50.5	48.9	48.3	56.2	64.5
2. Population	Eng.			24.0	24.5	31.5	34.2	
	N.Z.	32.0	35.5	40.9	38.5	43.7	43.1	54.9
3. Location	Eng.			14.0	20.8	22.0	25.4	
	N.Z.	2.4	8.7	13.2	16.4	24.2	34.2	43.3
C.1. Temp. names	Eng.			39.0	41.3	40.5	50.2	
	N.Z.	21.1	33.0	36.5	36.3	48.8	44.2	50.7
2. Rainfall	Eng.			6.3	13.5	19.0	17.6	
	N.Z.	-4.0	16.5	11.1	12.9	23.6	33.7	27.5
3. Temp. Latitude	Eng.			64.0	71.0	65.5	68.0	
	N.Z.	33.2	70.2	70.2	73.0	74.8	65.3	85.6
AVERAGE FOR ALL TESTS.		Primary.		Secondary.				
England				30.0	36.7	36.7	43.0	
New Zealand		18.5	32.4	36.0	38.0	45.6	49.2	56.4

With the exception of Tests A, 1 and B 3., the results given in Table X are the means of the scores recorded for the striking individual locations in the preceding Tables. The average results at the foot of Table X are the means of the scores given in the first part of Table X.

A detailed analysis of this series of results and their relationship to the original series, is beyond the scope of this thesis. The results were obtained in order to discover if there was a general resemblance in the measure and yearly increase of geographical perspective possessed by school children of similar grades in English and New Zealand schools. The results indicate a fairly close resemblance in the scores of each group in each test, but with an advantage generally in favour of the New Zealand results. This is reflected in Table X - the average scores for all tests - where in each group-comparison the results of the present investigation are scored higher than those of the original. However, the New Zealand results in the third and fourth year groups are below those of similar groups in a small London Grammar School where the results were particularly good. The Grammar School average percentages for all tests were 62.1 and 52.3 for the fourth and third years respectively, as against 49.2 and 45.6 for the same years in the New Zealand schools tested.

In Test A scores become, not only a measure of geographical vocabulary, but also of English composition.

When a comparison of the improvement in perspective measured by the two investigations is made, there is a striking similarity. The improvement in four years of instruction in geography in the former research was 13 per cent., in the latter, 13.2. It is this "slow and meagre development of geographical perspective during four years of schooling" that Bradford deplores. The results obtained would seem to warrant his further remark that "geographical perspective seems to be almost non-existent for the majority of pupils even at the end of their school course." This investigation, however, raises two points. In the first place, in view of the analysis of the tests submitted in the opening division of this section can it be maintained that the tests have adequately tested geographical perspective? Secondly, is it possible to discover whether some aspect of perspective is so weak as to lower materially the results measured by composite tests of such a nature as Bradford's? It is the aim of subsequent Chapters to answer this latter query. Regarding the first question, this section will be concluded by a summary of the points which bring the writer to his conclusions.

In Test A scores become, not only a measure of geographical vocabulary, but also of English composition. The writer would accept as a definition of perspective some expression which would incorporate within it the manipulation of a geographical vocabulary, but a test of the same would

need to be of a form different from that of Test A. Gradations of perspective in Tests B2 and C2 were highly irregular, and in some cases, the difference between towns was negligible. Test C3 was based on a principle which is manifestly unsound, and, as a result, there could be more than one correct answer. It would appear a reasonable deduction that factors other than general weakness of geographical perspective could account for the low percentage scores and the small improvement registered in perspective.

SUMMARIZED CONCLUSIONS.

1. The scores of New Zealand groups are higher than those recorded by corresponding English groups.
2. The quantitative increase in four years of secondary instruction is practically identical in both enquiries.
3. Serious weaknesses which lessen the value of the research as a test of perspective are considered to exist in the construction of Bradford's tests.

SECTION IV.THE ANALYTICAL APPROACH TO THE PROBLEM.

The Information and Reasoning Tests. Compilation and Application

As has been stated, the object of the tests compiled by the writer was to isolate and measure the growth of the two major components of geographical perspective, viz., information and reason.

"Whenever any test of individual ability has to be constructed, its diagnostic success will depend, not only upon the nature, but even upon the number of its unit processes of which it is compounded" (1).

THE ANALYTICAL APPROACH TO THE PROBLEM.

This dict----- test of group ability and to this end were constructed two series of tests. The first, divided into Tests 1, 2, 3, and 4, attempted to test predominantly information; the second series subdivided into Tests 5, 6, 7, 8 and 9, aimed at obtaining an estimate of the development of reasoning ability. These two series are henceforth referred to as Series I and Series R, respectively. It was pointed out at an earlier stage that to devise tests of a purely informational or rational type was practically impossible, particularly so in the case of the latter type. The tests, however, profess to have one or other of the factors predominant. The tests were timed so that each series might be presented and completed within a forty-minute school period.

The pupils tested were identical with those who answered the Bradford series, with the exception of two classes of primary school girls. The non-examination of these classes reduced the total number tested from four hundred and ninety-six in the Bradford series to four hundred and fifty-three in Series I and R.

(1) C. Spearman, "The Nature of 'Intelligence'. p. 59.

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"Whenever any test of individual ability has to be constructed, its diagnostic success will depend, not only upon the nature, but even upon the number of its unit processes of which it is compounded" (1).

This dictum can be applied with equal truth to a test of group ability and to this end were constructed two series of tests. The first, divided into Tests 1, 2, 3, and 4, attempted to test predominantly information; the second series subdivided into Tests 5, 6, 7, 8 and 9, aimed at obtaining an estimate of the development of reasoning ability. These two series are henceforth referred to as Series I and Series R, respectively. It was pointed out at an earlier stage that to devise tests of a purely informational or rational type was practically impossible, particularly so in the case of the latter type. The tests, however, profess to have one or other of the factors predominant. The tests were timed so that each series might be presented and completed within a forty-minute school period.

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TABLE XI.

NUMBERS IN THE VARIOUS YEAR GROUPS FOR SERIES I AND R.

Primary		Secondary					Total
Std.V	Std.VI	1st year	2nd year	3rd year	4th year	5th year	
43	52	138	110	47	56	7	453

The tests were completed early in the second term and in no case was there more than six weeks' schooling between the completion by any group of both the Bradford and the supplementary series.

The tests were conducted during school hours by the teacher responsible for the geography of the class under examination. To ensure uniformity of conditions as far as possible, a typed sheet of instructions accompanied the test papers to each school. The instructions were as follows:-

DIRECTIONS TO THOSE PRESENTING SECOND AND THIRD TEST GROUPS.

- (1) Pupils require pens only for Second Group and pencils and rulers in addition for Third Group of Tests.
- (2) Before the Test begins give out for each pupil:-
 - (a) 1 copy each of tests 1, 2, 3, and 4 (of Series I) turned face downwards on the desks. It will be as well to give No. 4 out first as the tests will then be in order to work from.
 - (b) For the second test, Series R, give out questions Nos. 5,6,7,8,9.
 - (c) 1 paper clip for each group of tests.

- (3) **Map:** For questions 1 & 2 attach map to the blackboard with drawing pins.

TEST 1.

- (4) Pupils are to write on all the sheets used the following particulars:-

- (a) Form or Standard. The position of each group, mountain, river, island, etc. is marked on the map. The column below write the number of the group, mountain, river, island, etc. will notice that only the name is given, and not whether it is a cape, river, town etc.
- (b) Age in years and months.
- (c) The same code number as used in the previous tests.

- (5) The Times for the tests are as follows:-

Example:- "Auckland". Look at the map and you will see '41' the position of each group, mountain, river, island, etc. is marked on the map. The column below write the number of the group, mountain, river, island, etc. will notice that only the name is given, and not whether it is a cape, river, town etc.

Series I	Question 1	7 mins.
"	2	4 "
"	3	7 "
"	4	7 "
		<u>25 mins.</u>

Name	Corresponding Map Number	Series R.	Question	Time
Auckland	41		5	6 mins.
			6	10 "
			7	6 "
			8	4 "
			9	7 "
				<u>33 mins.</u>

The above times are exclusive of the time taken in reading aloud the directions to the class. Where the question consists of two parts, read directions for both parts before the class begins, to save any further interruption. Announce the time when there is one minute to go.

- (6) **Collection of Papers:-** After each of the Series I and R has been completed each pupil will clip together at the top left corner all his or her papers. Arrange papers in order of tests. Please collect papers by forms.

B. THE CONTENT OF THE TESTS.

In order to save the repetition of the tests at a later stage, the marking keys are here printed in red.

SERIES I.

TEST 1. On the map you will see 2 parallel red lines drawn. These mark latitudes 40 and 50 degrees north, respectively.

Here is a list of 40 names of towns, rivers, island groups, mountain ranges, and straits. The position of each is marked on the wall map by a number. In the column below write the number opposite the name for which it stands. You will notice that only the name is given, and not whether it is a cape, river, town etc.

Example:- "Auckland". Look at the map and you will see '41' the position of Auckland, so write 41 opposite the name, "Auckland", on the list.

Now do as many of the others as you can. Time:- 7 minutes.

Name	Corresponding Map Number	Name	Corresponding Map Number.
Auckland	41		
Vladivostock	29 ^x	Freetown	11 ^x
Buenos Aires	8	Delhi	3
Vancouver	22	Dunedin	23
Douro	24	Torres	4
Bahamas	12	Oslo	25
Horn	28	Seychelle	26
Leeuwin	7	Atlas	5
Rio de Janeiro	2	Corinth	6
Ob	32	Zambesi	1
Danube	10	Caucasus	30
Samoa	21	Hindu Kush	39
Suva	27	Johannesburg	9
Para	19	Bangkok	17
Aral	36	Hawaii	35
Dardanelles	40	Huron	34
Applachian	16	Barrow	14
Yellow	33	Comorin	20
Mozambique	18	Cardigan	38
New Orleans	13	Trinidad	31
Kattegat	37	Durazzo	15

^x These are the key numbers and, as has been stated, , were not printed on the test sheet. This explanation applies also to the red figures or words of the subsequent teststs.

TEST 2.

On the map you will see 2 parallel red lines drawn. These mark latitudes 40 and 50 degrees north, respectively. You are to write opposite the correct continent in the list below the names of those countries which lie, wholly or in part, between the two marked lines.

Reckon as a country all the area governed from a principal seat of government; do not count provinces or states as separate countries.

If a country lies partly in one continent and partly in another, write the name in for both continents.

Example:- See how North America has been done, and then do Europe and Asia similarly. Time: 4 minutes.

Continent	COUNTRIES.	
N. America	United States Newfoundland	Canada
Europe	Spain France Germany Poland Italy Hungary Yugo-Slavia Rumania Turkey	Portugal Belgium Russia Switzerland Austria Czecho-Slovakia Albania Bulgaria Greece
Asia	Russia China Japan	Turkey Manchukuo

TEST 3.

This question has 2 sections.

- (a) In the first are two lists. The column headed A contains the names of products or some other factor which is closely associated with the name of some place in column B. You are to arrange in column C the terms from the first column, placing them opposite the name with which they are best associated.

Example:- Sheffield manufactures cutlery, therefore

A	B	C
	Sheffield	Cutlery

- (b) In the second section, you see three columns, A.B.D. containing words, and column C empty. You are to write in column C a word which names something that bears the same relationship to the word in column D, as the word in A does to the word in B.

Example:-

London : England :: : France
 London is the capital of England, what is the Capital of France ? Answer, Paris. Therefore write Paris in column C.

steel : Birmingham :: : Manchester
 Steel is manufactured in Birmingham, what is manufactured in Manchester ? Answer, Cotton. Therefore write cotton in column C. Now do both sections. Time: 7 minutes

(a) A

B

C

salmon
 tin
 herrings
 woollen goods
 nitrates
 camphor
 rubber
 N.Z. Mandate
 Naval dockyard
 silk
 art centre
 porcelain
 coal
 sponges
 coffee

Rio de Janeiro
 Samoa
 Wilhelmshaven
 Dresden
 Ruhr
 Macclesfield
 Florence
 Penang
 Formosa
 Straits Settlements
 Bahamas
 Yarmouth
 Fraser River
 Roubaix
 Atacama

COFFEE
 N.Z. MANDATE
 NAVAL DOCKYARD
 PORCELAIN
 COAL
 SILK
 ART CENTRE
 TIN
 CAMPHOR
 RUBBER
 SPONGES
 HERRINGS
 SALMON
 WOOLLEN GOODS
 NITRATES

(b) A

B

C

D

Laysanne
 22nd June
 Marseilles
 Canberra
 Kalahari
 Nor-wester

:Lake Geneva ::
 :Sweden ::
 :Rhône ::
 :Australia ::
 :S. Africa ::
 :Canterbury ::

CHICAGO
 22 DECEMBER
 NEW ORLEANS
 WASHINGTON
 THAR
 CHINOOK †

: Lake Michigan
 :Tasmania
 :Mississippi
 :United States
 :India
 :Canada

x S. Westerly allowed

(b) Ctd.

A	B	C	D
N. Atlantic Drift	British Isles	(1)	
Tornado	West Indies	KURO SIWO	Japan
Ryot	India	TYPHOON	East Indies
Praires	United States	FELLAH (-EEN)	Egypt
Tea	Ceylon	PAMPAS	Argentina
Sulphur	White Island	SUGAR	Jamaica
Gt. Britain	New Zealand	PHOSPHATES	Nauru
Waikato River	Lake Taupo	HOLLAND	Java
		CLUTHA	Lake Hawea

TEST 4.

Here are some sentences from which words are missing. Put the right words in the spaces - one word only in each case. Time: 7 mins.

New Zealand has for its size unusually varied attractions for the tourist: the **geysers** in Rotorua district, the **Limestone** caves at Waitomo, the **Sounds, fiords** of South West Otago.

The limits north and south of the **Equator** where the sun is seen overhead are called **tropics**, the northern one is called the **Tropic of Cancer**, and the southern the **Tropic of Capricorn**. The zone round the earth between these limits is called the **torrid zone**.

The animals and plants of Australia and New Zealand are distinct from those of any other part of the world. Many of the native plants are of kinds extinct millions of years ago in other countries. Australia has the only **mammal** that lays eggs, namely the **platypus**, and most of its native animals are **marsupials**, that is pouch-bearing. New Zealand has the **nikau**, the only tree surviving from the coal measures, and the **tuatara**, the only living survivor of the great saurians of past geological ages.

A **nomadic** tribe is one that wanders from place to place; an **estuary** is the wide open mouth of a river; a **simoom** is a wind that blows over the deserts of Arabia; a **steppe** is a wide treeless plain in Russia.

Distance north or south of the equator is called **Latitude** and is marked on maps by lines called **parallels**, while distance east or west of the Greenwich **meridian** is called **longitude**. The distance from the equator affects **climate** while position east or west causes a difference in **time**.

The time of the sun's crossing of the equator is called the **equinox** while the term **solstice** is applied to the time when it is overhead at the tropics.

Masses of igneous rock that have made their way in a molten state into a crack in the strata and there have solidified are termed **dykes**.

The **thermometer** is an instrument used for measuring temperature.

Lacustrine deltas are often formed where a river enters a lake.

Llanos are level treeless plains in the middle and lower courses of the Orinoco River.

The term **scarp, cliff** is applied to the abrupt steep face of a ridge of land.

A Spanish term applied to the parallel ridges of the Andes is **cordillera**.

When plotting a cyclonic area, if the isobars are close together the **gradient** is said to be steep.

A land surface that has been reduced to a gentle seaward slope by the action of rain and rivers is termed a **penoplain**.

The **Cold wall** is the boundary line where the Arctic Current meets the Gulf Stream.

Isohyets are lines drawn on maps to indicate places of equal rainfall.

TEST 5.

SERIES R.

In the following story there are a number of statements which, under the given circumstances, are either quite false or most improbable. With pencil and ruler you are to underline such absurd statements. Number the errors you find from 1 upwards, placing the figures in the margin opposite the mistakes.

Example:- The higher the mountaineer climbed the warmer the temperature became.

Underline "warmer" because the result of climbing higher is to experience colder temperatures. Place the number of the error in the margin.

Now find as many as you can in the passage below.

Time:- 6 mins.

- I remember quite well the date and time. It was 9 a.m., January 5, 1933, the last day of our holiday in Christchurch. We were up early that morning in spite of a heavy frost in order to pack our lunches ready for a day at the seaside. As we hurried to catch a tram, we pictured our cousins in England setting out at the same time for the harvesting fields. They, however, would have the advantage of the daylight saving, which for us, unfortunately, was limited to the winter months. Leaving the tram at the terminus we walked northwards, our shadows stretching far away ahead of us, causing Harry to begin quoting the lines of "My Shadow."
- Some distance along the road we crossed over the Waimakariri River. Turning southwards at a bend of the road, we suddenly felt a gust of wind in our faces - it was the cold nor-wester that had come over the Alps. After its passage over the Pacific Ocean, the nor-wester had struck the eastern coast of New Zealand and dropped its moisture on the Canterbury slopes of

x "Southwards" was allowed as an alternative to "in our faces."

- the Alps. Dad told Harry that the spring and early summer floods in the Canterbury rivers were due to such heavy rainfall. Three or four dairy factories were noticed in the course of our short walk, an indication that the dry climate of Canterbury is particularly suitable for dairying.
- During a ramble along the beach Jack aired his geographical knowledge. He showed us examples of the strength of the waves by pointing to ⁽²⁾ rows of boulders thrown up on the beach with smaller ones the nearer you approached the water's edge. On the cliff faces several strata composed of sea-shells clearly indicated that the land had once been higher than it now was. Too soon the afternoon shadows began to lengthen, and we reluctantly commenced to retrace our footsteps. As the moon was in its last quarter and would not rise till very late, we hurried back not wishing to be caught in the dark by the high spring tides while rounding any of the headlands. On the way home Jim remarked how much shorter the twilight was than in Auckland.

Note. (1) "Southwards" was allowed as an alternative to "in our faces".
 (2) "the nearer you approached the water's edge" was allowed as an alternative to "smaller".

TEST 6.

Here are 20 statements each followed by 4 reasons. Draw a line under each of the 2 best reasons.
Example:- The dairy industry flourishes on the west coast of the North Island because -

1. most dairy farms are there.
2. there is ample rain and warmth to keep the grass growing.
3. people like milking cows.
4. the soil is very fertile.

Plainly Nos. 2 and 4 are the best reasons, so these two reasons are underlined.

Now work as many of those below as you can. Time: 10 mins.

1. England is a great manufacturing country because -
 1. her people are inventive and energetic.
 2. she has abundant coal and iron.
 3. she is near the European markets
 4. the climate is a satisfactory one.
2. A Chinese peasant's staple diet is rice because -
 1. the people are very poor.
 2. rice is liked by the people.
 3. there are very few animals.
 4. rice is a product of the monsoon regions.
3. The Canterbury Province produces more wheat than Hawkes Bay because -
 1. the climate is drier.
 2. the Canterbury farmers prefer wheat to maize.
 3. there are extensive plains.
 4. there are many flourmills in Canterbury.
4. There are dense populations in the lower Ganges valley because -
 1. the plains are very fertile.
 2. there is abundant rainfall.
 3. agriculture can be successfully practised.
 4. monsoon regions have dense populations.

5. People in England prefer to live on the slopes with a southern aspect because -
 1. the northern slopes face away from the sun.
 2. the southern slopes are in the south of England.
 3. the prevailing S.W. wind is warm.
 4. there are a number of people already living there.
6. The heat equator does not always coincide with the geographical equator because -
 1. the earth's axis is inclined at an angle of $23\frac{1}{2}$ degrees.
 2. the equator is always very wet.
 3. the heat equator follows the overhead position of the sun.
 4. the land heats more quickly than the sea.
7. New Zealand is not a great beef exporting country because -
 1. we are too far from the English market.
 2. the climate is too dry.
 3. there is insufficient suitable land.
 4. competition from Argentine is too great.
8. The Swiss Alps have been pierced by many tunnels while the Himalayas have not because -
 1. the hill tribes of India are very hostile to white men.
 2. the Himalayas are much more rugged.
 3. tunnels through the Alps join Italy via Switzerland to Germany.
 4. Europeans are more progressive than Asiatics.
9. The Irish plain is wetter than the English plain because -
 1. the centre of Ireland is largely a bog.
 2. the Irish have not drained their land.
 3. the Welsh mountains run north and south.
 4. the prevailing wind is westerly.
10. The densest populations in Europe are found -
 1. nearer the sea.
 2. on the coalfields.
 3. where the soil is most fertile.
 4. where the climate is genial.
11. The Amazon is an enormous river because -
 1. the warm moist Trade Winds bring rain.
 2. it is in an equatorial region.
 3. it drains an extensive area.
 4. the Andes act as condensers of moisture.
12. Denmark is a prosperous country because -
 1. the soil is rich.
 2. the people are industrious.
 3. it is near great markets for its produce.
 4. it has mineral wealth.
13. Marseilles is an important port because -
 1. it is at the mouth of a navigable river.
 2. it has a fertile country behind it.
 3. it controls the chief route from the South of France northwards.
 4. it is situated on an extremely busy sea.

14. the northern half of Europe is disproportionately colder than the southern half because -
1. it is exposed to cold winds from Russia.
 2. it is nearer the pole.
 3. it is a great plain.
 4. the central mountains keep off the southerly winds.
15. Electricity is becoming increasingly used for heat, light, power because -
1. it is safe.
 2. it is cheap.
 3. it is easily controlled.
 4. it does not give off smoke or fumes.
16. The causes of ocean currents are -
1. the difference in temperature between the Equatorial and Polar regions.
 2. the rotation of the earth on its axis.
 3. the prevailing winds.
 4. the unequal evaporation in tropical and Arctic regions.
17. The Maoris are higher in the human scale than the Australian blacks because -
1. the Maoris come from a superior stock.
 2. the Maoris are bigger and stronger.
 3. the climate of Australia is hotter than that of New Zealand.
 4. the Maoris had to work harder than the Blacks.
18. New Zealand is trying to build up secondary industries because -
1. she desires to find employment for her increasing population.
 2. she can manufacture better goods than any other country.
 3. N.Z. made goods are always cheaper.
 4. the raw materials are produced in this country.
19. Kingston, Jamaica, has increased in importance because -
1. an increased amount of sugar is exported.
 2. it is on the Panama route.
 3. it has now a strategic value.
 4. oil has been found there.
20. The Suez Canal is of great importance to Britain because -
1. it is the only route to the East.
 2. it is the shortest route to India and the East.
 3. it is a safe route in time of war.
 4. many raw materials are obtained quickest by that route.

TEST 7.

The following sentences are either true or false. If the sentence is true underline the word "Yes"; if it is false underline the word "No".

Example:-

Wellington is the capital of New Zealand. Yes. No.

An island is an area almost surrounded by water. Yes. No.

Time: 6 mins.

1. Longest days are in winter. Yes. No.
2. Hot air absorbs moisture more readily than cold. Yes. No.
3. The earth spins from west to east. Yes. No.
4. A lunar month is the time taken by the earth to revolve round the moon. Yes. No.
5. The west coast of Britain is the driest. Yes. No.
6. A lunar eclipse takes place when the moon is between the sun and the earth. Yes. No.
7. The Alps make the climate of Italy warmer than it otherwise would be. Yes. No.
8. Ireland has a dry climate. Yes. No.
9. There is no snow in the tropics. Yes. No.
10. In January the equator has a shorter day than Wellington. Yes. No.
11. The N.E. monsoon of India blows in the dry season. Yes. No.
12. Places having the same altitude have the same climate. Yes. No.
13. Before rain the barometer falls. Yes. No.
14. Short swift-flowing rivers have deltas at their mouths. Yes. No.
15. The higher in the air one goes the farther away is the horizon. Yes. No.
16. Variations in latitude result in difference of climate. Yes. No.
17. The chief sheep rearing areas of Britain are on the east coast. Yes. No.
18. A wave carries forward with it objects which it meets. Yes. No.
19. On March 22, London has a longer night than Auckland. Yes. No.
20. The St. Lawrence is frozen over in January. Yes. No.
21. The meridian 172 degrees East passing through New Zealand also passes through N.E. Siberia therefore these two countries have the same time. Yes. No.
22. Queenstown has a colder winter than Dunedin. Yes. No.
23. Latitude does not affect manufacturing. Yes. No.
24. The atmosphere is very damp in polar regions. Yes. No.
25. If the Rockies ran along the frontier of Canada and United States, the climate of United States would be warmer than it is now. Yes. No.
26. There are no tributaries in the Lower Nile. Yes. No.
27. All towns at the ends of peninsulas are trading centres. Yes. No.
28. All cattle rearing countries are important exporters of dairy produce. Yes. No.
29. Deserts provide no useful products for man. Yes. No.
30. British industries have been more handicapped than helped through Great Britain being an island. Yes. No.

TEST 7 Ctd.

31. There is one spring tide per month. Yes. No.
32. Although the Great War finished at 11 a.m. it would be possible to have an account of the final shots published in a San Francisco morning newspaper. Yes. No.
33. Anti-cyclones in the northern hemisphere blow in an anti-clockwise direction. Yes. No.
34. The particularly low tides which occur at spring tides are due to the sun and moon exerting their attractive forces at right angles to one another. Yes. No.
35. Crossing the date-line on the way to America a New Zealand traveller would repeat a day. Yes. No.

number them according to their size placing 1 beside the town with the largest population down to 6 beside the town with the smallest.

Time: 4 mins.

(a)	San Diego	147,925	301,582	86,327	684,300
	San Francisco	1,852,121	829,296	674,394	325,379
	Denver	901,299	135,604	287,261	500,308
	Detroit	876,345	1,568,662	632,186	399,487
	New Orleans	458,752	1,106,329	737,453	286,375
	Miami	87,329	401,323	676,834	110,637

(b)	Aberdeen (5)	Belfast (3)	Birmingham (1)
	Cambridge (6)	Cardiff (4)	Liverpool (2)

TEST 8.

This question consists of two parts.

- (a) The population of Seattle, an important port on the Pacific coast of the United States, is 365,583. Below are the names of other towns also in the United States. Beside the name of each town are four different numbers, one of which is the correct number of the town's population. Bearing in mind the given population of Seattle, you are to underline the number which you think gives the correct population of the town.

- (b) In section (b) below are the names of six towns in the British Isles. You are to number them according to their size placing 1 beside the town with the largest population down to 6 beside the town with the smallest.

Time: 4 mins.

(a)	San Diego	<u>147,995</u>	301,582	86,327	684,300
	San Francisco	1,862,321	899,296	<u>634,394</u>	325,379
	Denver	901,299	135,604	<u>287,861</u>	500,308
	Detroit	876,345	<u>1,568,662</u>	<u>632,186</u>	399,487
	New Orleans	<u>458,762</u>	1,106,329	737,453	286,375
	Miami	87,329	401,323	676,834	<u>110,637</u>

(b)	Aberdeen	(5)	Belfast	(3)	Birmingham	(1)
	Cambridge	(6)	Croydon	(4)	Liverpool	(2)

TEST 9.

Below are three sets of rainfall statistics, each containing figures for three towns. Under each set are the three towns to which the figures refer. You are to mark the towns with the letter beside the figures which you think indicate its rainfall. The first three places are all in N.Z.

First set.

Time: 7 mins.

	Jan.	Feb.	Mch.	Apr.	May.	June	Jly.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
A.	1.82	1.06	1.50	1.42	1.00	0.93	0.92	0.80	1.05	1.62	1.35	1.79	15.26
B.	7.56	6.07	7.12	8.09	9.74	10.29	10.21	8.80	9.69	10.39	9.22	7.57	104.75
C.	1.71	2.88	2.03	3.86	4.83	4.62	3.99	3.73	2.84	2.56	1.61	1.65	36.31

Towns for first set.

Cape Maria Van Dieman (C)

Clyde (A)

Inglewood (B)

Second set.

	Jan.	Feb.	Mch.	Apl.	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
D.	4.72	3.58	3.12	3.82	6.21	0.16	0.04	0.04	0.31	0.94	2.38	4.37	29.69
E.	0.04	0.00	0.35	0.51	4.25	5.66	3.98	2.70	1.21	0.43	0.31	0.12	19.56
F.	4.91	4.45	5.27	4.13	3.16	2.22	1.68	1.76	2.57	3.24	4.02	5.42	42.83

Towns for second set.

Valparaiso (E)

Rio de Janeiro (F)

San Francisco (D)

Third set.

	Jan.	Feb.	Mch.	Apl.	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
G.	1.29	1.05	1.21	1.44	1.91	2.26	3.00	2.85	2.15	1.72	1.68	1.57	22.03
H.	0.16	0.12	0.43	0.51	1.07	2.54	7.06	5.62	1.76	0.64	0.48	0.12	20.51
I.	0.94	0.94	0.94	0.91	1.41	1.76	0.94	0.36	0.08	0.04	0.04	0.16	8.52

Towns for third set.

Onslow (Central West coast Australia) (I)

Moscow (G)

Tientsin (H)

C. Observations On The Tests.

Series I. Tests 1 and 2.

The map accompanying these tests was approximately six feet by three feet in size and the numbers on it were visible to pupils seated in the average class room. It is argued that the use of a map overcomes any variation in acuity of visual imagery. The content of the tests is based almost solely on an informational basis.

framed to require the "two best reasons" for the given statements. Thorndike has used the "two sentence" answer in the measurement of intelligence. Several of the questions were obtained from a booklet of geographical questions published by the B.I.E. (1), New Zealand. The key was devised from that published by the firm above mentioned, and from answers to the writer's questions given by the members (approximately forty) of the combined staffs of two of the

Photograph of Wall Map used with

Tests 1 and 2.

TEST 7.

The 'Yes, No' type of question is too well known to require any explanation of its inclusion in a test of reasoning ability. The questions included several containing a negative, for example, "Deserts provide no (1) 'Business in Education,' New Zealand.

TEST 3, a & b.

It may be objected that this test would be better placed in Series R., that section (a) is a question of the eduction of relations and (b) the eduction of correlates. The writer fully agrees with such a view but argues that it is impossible to give the correct answer without knowing the information required. The eduction of the correct relation depends entirely on knowledge of the correct answer, while the eduction of the correlate, even when the relationship between a and b was correctly educed, still depended on information for its ultimate presentation.

TEST 4.

To estimate the development of geographical vocabulary was the object of this series of questions. As only one word was required in each case, the correct answer did not in any manner violate the principle of reducing the answers to the study of the growth of information and, as far as the limits of ingenuity allowed, nothing but information.

SERIES R. TEST 5.

A common intelligence-testing device is the discovery of absurdities. This test adopted the same principle and related it to a piece of prose so constructed as to have special reference to New Zealand conditions.

TEST 6.

In order to reduce the importance of the guessing factor and thereby to increase the significance of reason in reaching the correct conclusions, these questions were framed to require the "two best reasons" for the given statements. Thorndike has used the "two sentence" answer in the measurement of intelligence. Several of the questions were obtained from a booklet of geographical questions published by the B.I.E. (1), New Zealand. The key was devised from that published by the firm above mentioned, and from answers to the writer's questions given by the members (approximately forty) of the combined staffs of two of the Secondary Colleges examined.

TEST 7.

The 'Yes, No' type of question is too well known to require any explanation of its inclusion in a test of reasoning ability. The questions included several containing a negative, for example, "Deserts provide no (1) "Business in Education," New Zealand.

useful products for man," the successful answering of which would involve higher thought processes than those required for questions of a positive nature. A probable objection to some of the questions is that the correct answer may be given as a result of memorized information. The validity of this objection is not doubted, but since the results are group and not individual results it is considered that the effects of such answers will be negligible when taken over the whole test and for the complete group. In other words, the test as a whole is a test of reason and not information.

TEST 8. a and b.

There are involved in the construction of these tests two opinions held by the writer regarding the development of perspective in school children. The first involves a paradox. Populations taught solely in comparative terms, large, larger, largest, or small, smaller, smallest, convey little real meaning of size or extent to a child, while, on the other hand, populations in terms of numbers are, beyond a few thousand, equally meaningless as being outside of the experience of the normal pupil. Some form of compromise would seem the only way out of the dilemma, and yet there must be some degree of statistical precision. Such a compromise occurs in Test 8a.:-

"It is only when some standard of comparison is introduced that figures begin to mean something" (1),

hence the population of a named town is given. If a series of towns is perceived in a perspective of relative importance to the given town and to one another, it is argued that a pupil may be reasonably expected to know approximately the correct population. If a choice of populations involving a fairly wide gradation be then given, a correct deduction of relative importance will lead to a correct estimate of the population. Secondly, it is held that the integration of concepts of world-wide perspectives remains so incomplete that growth of perspective in school children is best tested by measuring growth of regional perspective. This infers neither that world-wide and regional perspectives should be treated in water-tight compartments, nor that the former is any but a continuous growth. It simply maintains that the ability to generalize, which "is of extremely little use if it is not based on an intimate knowledge of particulars" (2), remains largely dormant while the particulars are themselves being acquired. Hence, the perspective of population

(1) James Fairgrieve: "Geography in School", p. 277.

(2) Ibid, p. 279.

involved in both sections of Test 8 does not extend beyond one country in each case.

The monthly rainfall statistics were constructed, however, from the correct population figures for American towns were based on 1930 census returns as reported in "The Statesman's Year Book," 1932. The order of the English towns is based on the 1931 census returns given in the 1933 "Whitaker's Almanac".

TEST 9.

In any geographical scheme formulated on the basis of the interaction of man and his environment, knowledge of rainfall distribution is fundamental. Mrs Woods writes,

"With regard to life on land rainfall is the dominating factor in determining its amount and extent" (1);

and, elsewhere;-

"Man's distribution is, however, limited in the main, by the necessity of obtaining food, and therefore the rainfall map, fairly well determines man's limits." (2)

The writer believes that an adequate, comprehensive perspective of rainfall will be developed only by the integration of concepts based, primarily, on perspective within separate types of rainfall. In other words, unless the major types of world precipitation are first known, there is no foundation on which to build. (3)

The towns mentioned in the three sections of Test 9 exemplify major types of rainfall. Section 1 deals with New Zealand rainfall. The three types are those of Dr Kidson's classification (4), and the towns taken as examples are exceedingly well differentiated. The rainfall regimes indicated are:-

- (A) a dry summer and wet winter, Cape Maria Van Diemen;
- (B) a relatively wet summer and dry winter, Clyde;
- (C) general and heavy rainfall in regions with a westerly aspect, Inglewood.

The data given in each case are 1932 precipitation records.

- (1) Skeat, E.G.. "The Principles of Geography." p. 288
- (2) Ibid, p. 293.
- (3) For a classification of types of rainfall, suitable for school use, see, op. cit., p. 71, et seq.
- (4) New Zealand Year Book, 1933, pp. 18-20.

(1) op. cit., 11th edition, p. 36.

Sections 2 and 3 were compiled on the basis of diagrams in Chisholm's "Handbook of Commercial Geography," (1). The monthly rainfall statistics were constructed, however, from tables in "Réseau Mondial," and calculations have been made in each case to reduce the data to the normal rainfall, calculated on a ten-year period, for the locations given. The cities named in Sections 2 and 3 are examples of the following distribution types of rainfall.

Section 2. San Francisco: Northern Hemisphere, Mediterranean type.

Valparaiso: Southern Hemisphere, Mediterranean type.

Rio de Janeiro: Southern Hemisphere, trade-wind belt, east coast of continent.

Section 3. Onslow: Southern Hemisphere, trade-wind belt, west coast of continent.

Moscow: Northern Hemisphere, continental type.

Tientsin: Northern Hemisphere, monsoon type.

To answer Section 1, knowledge of the rainfall types of New Zealand and the locations of the towns was all required. A successful answer to the last two sections, however, required first of all the apprehension of the rainfall type of each of the towns. To relate rainfall and town required a survey of the monthly statistics in order to discover from the seasonal readings which hemisphere the total distribution indicated, e.g., readings D and E. Or, as in the further case of G and H where the total precipitation varied little, an appreciation of the monthly records was necessary to note in which division there was an indication of marked seasonal precipitation, the phenomenon which marks the monsoon type.

This test surveyed a field which is of fundamental importance in human geography. From the point of view of the inclusion of the test in this research, its result is important also on other grounds. A high degree of group success would indicate the ability to hold a number of conflicting factors in consciousness at one time and to make therefrom the correct deduction. Weak group results would indicate the general absence of such ability. For these reasons, the writer considers this the most exacting of the whole battery of tests.

(1) op. cit., 11th edition, p. 36.

SECTION V.

RESULTS AND STATISTICAL TREATMENT.

MARKING SCHEME.

1. Except where otherwise stated, tests were marked one point for each correct answer, the total of which gave the "gross score". The "net score" was obtained by subtracting from the gross score the total answers wrongly marked on the basis of one point for each error so recorded. Questions for which no answers were given were not taken into account in estimating the net score.

2. The individual scores in each group were then averaged, the result being taken as the group score.

3. In the tests for which there are gross and net scores, the "difference" between those scores has also been shown. The purpose of the measurement was to point out the rate of variation, if any, in the percentage of error registered by the several groups.

4. The numbers, given in the following tables and figures, are the above scores expressed as percentages.

5. A graphical record illustrates each table of results.

SURVEY OF THE RESULTS OF THE TESTS.

TABLE XII.

Scores. Series I, Test 1. Map Locations.

	Year	Gross	Net	Difference.
Primary	Std. V.	17.0	- 15.1	32. 1
	Std. VI.	26.3	7.5	18. 8
Secondary	1st.	32.4	9.9	22. 5
	2nd.	33.7	11.1	22. 6
	3rd.	42.7	21.4	21. 3
	4th.	54.1	32.3	21. 8
	5th.	51.4	36.4	15. 0

Fig. 1 - Graph of Results, Test 1. Map Locations.

N.B. For all graphs the numbers above the term "Secondary" indicate the number of years that a pupil has taken geography in the Secondary School.

SERIES I. (INFORMATION)

TEST I.

The scores of the groups in the secondary department indicate a gross increase of 21.7 per cent reached in the fourth year, while the increase from Standard 5 to Form III amounts to 15.4 per cent in two years. There is obviously a marked decrease in the rate of progress in the secondary school. This is largely accounted for by a 'plateau' in the first and, particularly, in the second year group of the secondary school. The rate of improvement in the third and fourth years is in marked contrast with that of the preceding two years. In this test the fifth year group indicates a retrogression, but little faith can be placed in the results of only seven pupils.

The net score does not differ markedly from the gross score. Only in the penultimate primary grade and in the fifth year secondary is there a noticeable variation in the percentage of error, both of which show a decrease. The very meagre yearly increase in the first and second years shows that the information gained in Form III is largely superficial since the body of error is greater than in the final primary year.

The marking indicated that there was a hazy conception of location in most cases; a fact which is indicated by the presence of a large body of error in every group. This uncertainty is well shown in the cases of Suva and Samoa, and of Rio de Janeiro and Buenos Aires, the positions of which were confused time and time again. That the test was within the ability of the pupils is indicated by one boy marking all correctly.

TABLE XIII.

Scores. Series I, Test 2. European and Asiatic Countries.

	Year	Gross	Net	Difference
Primary	Std. V.	18.9	11.0	7.9
	Std. VI.	24.6	17.0	7.6
Secondary	1st.	35.5	27.7	7.8
	2nd.	34.4	22.4	12.0
	3rd.	40.5	28.4	12.1
	4th.	48.6	37.9	10.7
	5th.	52.2	41.0	11.2

Fig. 2. - Graph of Results, Test 2. European and Asiatic Countries.

TEST 2.

Unlike the majority of tests, the results here indicate a marked gain in the first year of the secondary school, a real increase since the net score shows corresponding improvement. Although this gain is offset in the following year by a decrease it is suggested that the wider knowledge of the countries of Europe would come from the broader scope of the secondary school geography lesson, supplemented by the wider interests of the adolescent.

There is a marked decrease in the percentage of error as compared with Test 1. This is readily accounted for by the fact that very few of the more important European countries were excluded from the test. A common source of error lay in calling islands, such as Sardinia and Corsica, separate countries, and the non-inclusion of Turkey and Russia as Asiatic countries. The very weak gross results and the small percentage of error in the primary grades would indicate that the geographical interests of the twelve-year old are still largely parochial.

One to two per centum of those examined named Manchukuo as a country. This raises a doubt as to whether the information of even senior pupils has any very close connection with the real world beyond these shores. An odd paper or two included Andorra, which was not included in the key list.

TABLE XIV.

Scores. Series I, Test 3a. Relationships.

	Year	Gross	Net	Difference.
Primary	Std.V.	8.1	- 60.0	68.1
	Std.VI.	19.7	- 43.3	63.0
Secondary	1st.	16.6	- 34.3	50.9
	2nd.	22.5	- 20.5	43.0
	3rd.	29.8	- 24.3	54.1
	4th.	41.2	- 9.5	50.7
	5th.	51.4	13.3	38.1

Fig. 3 - Graph of Results, Test 3a. Relationships.

TEST 3a.

This was a test well beyond the ability of the normal junior pupil. It demanded a broad survey of many countries, a demand the pupils tested failed to meet. The most noticeable features indicated by Table XIV and Fig. 3 are the presence of an extremely large body of error and its decrease particularly in the last two years of secondary schooling. The reason for the very great difference between gross and net scores is accounted for by guessing. All the answers were given where the correct relationship was unknown, a relationship was guessed, in most cases with deplorable results.

Of the places given in the test, the writer wishes to refer to "Fraser River" and "Samoa". Of the four hundred and fifty-three pupils tested, three hundred and sixteen, approximately seventy per cent., marked "Fraser River" correctly. This was the best answered question. An attempt to offer a reason can only be a surmise. New Zealand imports from Canada a large amount of tinned salmon. The source of supply is narrowly localized, and hence the same association between place and product is repeated from year to year, while the strength of the association is increased by actual experience. Although one would expect New Zealand children to know the geography of their own country and its dependencies, the results, in so far as they refer to New Zealand, point in the opposite direction. Only fifty-two per cent of the pupils knew that Samoa was a New Zealand mandate. This, in conjunction with the results below, appears to the writer to indicate a serious lack of attention, not only to New Zealand geography but, perhaps, also to New Zealand history.

TABLE XV.

Scores.		Series I.	Test 3b.	Analogies.	
	Year.	Gross		Net	Difference.
Primary	Std. V.	3.7		- 20.4	24.1
	Std. VI.	7.7		- 14.7	22.4
Secondary	1st.	10.8		- 14.1	24.9
	2nd.	18.1		- 14.1	32.2
	3rd.	33.8		4.3	29.5
	4th.	34.9		4.5	30.4
	5th.	33.7		2.1	31.6

Fig. 4. - Graph of Results, Test 3b. Analogies.

TEST 3b.

This is a further association test depending, in this case, on the completion of an analogy. The increasing rate of growth would appear to indicate a corresponding development in ability to handle correlate education. The net scores suggest almost complete stoppage of progress in years one and two, secondary. The improved gross score accompanied by a greater margin of error points to the fact that there was, in the first place, increasing ability to reason in the manner demanded by the test. Secondly, when the well marked positive acceleration qualitatively and quantitatively in the third year group is considered, one comes to the conclusion that a source of error was the lag in the growth of information which, not keeping pace with this increased development in reasoning, led to the education of wrong correlates. In his book, "Experimental Education", Rusk suggests the possibility of a further reason accounting for the rapid improvement in the third year group. "The evidence derived from the application of such tests indicates that the rate of thinking increases with age" (1). There is no means of estimating rate of thinking in the tests here applied, but the result would give some colour to the statement.

TEST 4.

The same lack of precise information mentioned before was noted here also. A very large number of scholars declared New York to be the federal capital of United States of America. Approximately twenty per cent. of the pupils realised that June 22nd was Midsummer for the Northern Hemisphere and could give the corresponding date for their own hemisphere. And in definite information concerning New Zealand, the last question, containing only New Zealand names, showed again a deplorable weakness: twenty-three pupils out of a total of four hundred and fifty-three educed the correct correlate, viz., the Clutha River.

ence of a relatively increasing percentage of errors. Not until the fourth year is there any real consolidation of the information absorbed. The gap between gross and net scores for the fourth and fifth years narrows, indicating that information is being slowly assimilated by the pupils into their general body of knowledge.

(1) op. cit. p. 124. of the information acquired by pupils in the early adolescent period is only of a superficial nature was clearly shown by the large number of answers in all grades which declared that "Australia has the only 'bird' that lays eggs!"

TABLE XVI.

Scores		Series I.	Test 4.	Technical Vocabulary
Year.	Gross	Net	Difference.	
Std. V.	5.9	- 13.5	19.4	
Std. VI.	17.4	- 2.1	19.5	
1st.	22.5	- 0.8	23.3	
2nd	24.3	- 1.3	25.6	
3rd	28.8	3.7	25.1	
4th	33.1	12.5	20.6	
5th	41.7	24.2	17.5	

TEST 4.

The growth and rate of geographical vocabulary is indicated by this test. As would be expected there is a steady increase of information recorded year by year. The rate of growth fluctuates as will be seen from a comparison of the differences between the gross scores recorded by each group. There is a steady lessening of the rate of increase until the end of the second year, secondary. The third year indicates positive acceleration, no increase in rate in the fourth year and, finally, an improved rate in the fifth year. The increased information of the first two years at College is more than counter-balanced by the presence of a relatively increasing percentage of errors. Not until the fourth year is there any real consolidation of the information absorbed. The gap between gross and net scores for the fourth and fifth years narrows, indicating that information is being slowly assimilated by the pupils into their general body of knowledge.

That much of the information acquired by pupils in the early adolescent period is only of a superficial nature was clearly shown by the large number of answers in all grades which declared that "Australia has the only 'bird' that lays eggs ! "

Fig. 5. - Graph of Results, Test 4. Technical Vocabulary.

TABLE XVII.

Scores.		Series R.	Test 5.	Absurdities.
	Year	Gross	Net	Difference.
Primary	Std. V	21.2	0.9	20.3
	Std. VI	41.6	22.9	18.7
Secondary	1st	48.3	29.1	19.2
	2nd	49.8	29.1	20.7
	3rd	58.5	39.9	18.6
	4th	68.2	52.0	16.2
	5th	57.1	36.1	21.0

SERIES R. (REASONING).

TEST 5.

The relatively high gross scores recorded for this test of absurdities was due to a tendency to mark all words or phrases which allowed of an alternative, e.g., "southwards" allows the possibility that the correct term should have been "northwards", that "higher" should have been "lower," and so on. A better indication of the extent and the development of critical reasoning ability is therefore given by the net scores. The percentage of error shows very little alteration in any of the year groups. With the exception of a marked decrease in the number of absurdities marked by the fifth year group and an increase of error in the same year, the graph records the features common to the results of Series 1.

The two absurdities which were the least often marked were numbers six and eight. Only seven pupils indicated that they realised shadows did not stretch "far" in summer. The immediate proximity of the next absurdity in the word "ahead" doubtless influenced this result materially. No such reason, however, can be advanced in the case of number eight, viz., "wind in our faces." The absurdity involved the solution of a double series of relationships. In the first a relationship had to be cognized between "facing southwards" and "north west wind". The conclusion arrived at would be "wind on one's back." Finally, there was the perception of incogruity in the use of "face." Approximately twelve per cent perceived this absurdity.

Fig. 6. - Graph of Results, Test 5. Absurdities.

TABLE XVIII.

Scores.		Series R.	Test 6.	Choice of Reasons.
	Year.	Gross	Net	Difference.
Primary	Std. V.	19.1	- 42.6	61.7
	Std. VI.	29.5	- 33.9	63.4
Secondary	1st.	32.6	- 31.3	63.9
	2nd.	35.2	- 28.8	64.0
	3rd.	41.0	- 15.7	56.7
	4th	44.1	- 10.9	55.0
	5th	47.9	- 4.2	52.1

TEST 6.

An analysis of the records for this test would provide material for a thesis in itself. Every one of the eighty given reasons was considered by at least one pupil to be a satisfactory answer to the given conditions. In a test involving the higher mental processes and covering a wide field of information, one would have looked for a marked increase, not only quantitatively but also qualitatively in the results. There is, however, but a slow gain quantitatively and except for a slight spurt in the third year group, the rate of growth remains practically constant. Taken in conjunction with the net score, the spurt in the third year group acquires added significance since there is in addition to increased content, a marked diminution in the percentage of error, a rate of decrease in error not repeated in the subsequent groups. Such an increase points to a sudden increase in accuracy of thought due to assimilated information coupled with a development in reasoning power. This is in keeping with the observed results of

Tests 3a, 3b, and 5. The percentage of error recorded is alarming. In not one group does the net score rise above zero. In other words, right throughout their school course in this type of test the pupils marked more sentences incorrectly than they did correctly.

The three questions within the test that bore upon New Zealand, viz., numbers 7, 17 and 18 were answered as follows:-

Question	Given Sentences			
	1	2	3	4
7	293	90	132	357
17	248	120	168	276
18	336	44	114	284

(Correct answers in red.)

With one exception, number 17, the highest scores are recorded for the correct answers. Number 7 shows that a number of pupils fail to realise the importance of distance in marketing New Zealand products; number 17 indicates a lack of appreciation of environmental factors in moulding racial characteristics; and in question 18, the one hundred and fourteen who marked number 3 as suitable, do not know that New Zealand protects her industries by heavy customs duties. Probably that statement should be qualified. Granted that the pupils do know that New Zealand's tariff is protective, they still fail to comprehend

Fig. 7. Graph of Results, Test 6. Choice of Reasons.

its bearing on prices. Their information is, to use Professor Whitehead's apt phrase, merely a mass of "inert ideas" that is to say, ideas that are merely received into the mind without being utilized, or tested, or thrown into fresh combinations" (1).

TABLE XIX.

Scores		Series R.	Test 7.	"Yes, No" Answers.
	Year.	Gross	Net.	Difference.
Primary	Std. V.	43.5	2.9	40.6
	Std. VI.	50.9	9.8	41.1
Secondary	1st.	52.2	13.1	39.1
	2nd.	53.9	12.6	41.3
	3rd.	62.0	27.3	34.7
	4th	64.0	31.5	32.5
	5th.	71.8	43.7	28.1

(1) A.N. Whitehead: "The Aims of Education and Other Essays", pp 1, 2.

Fig. 8.- Graph of Results, Test 7. "Yes, No" Answers.

TEST 7.

Although the gross scores from this "Yes - No" test are higher than those for other tests in this Series, it must be remembered that theoretically, pure guessing would return fifty per cent. correct answers. In any test where the guessing element enters largely, there is bound to be a large percentage of error. A decreasing percentage of error, in the last three groups indicated by the mounting net score is in common with the other tests involving a reasoning process.

Detailed results were kept of all recorded answers in all tests, but owing to the burdensome nature of such a mass of statistical data, reference is again made only to that part of the test in which New Zealand is specifically mentioned. Two of the three questions included in this group dealt with the problem of time, a problem not specifically ours. These, numbers 21 and 25, were answered as under:-

(21) 167: 232; (35) 215: 83

(The correct answer is in red.)

The latter answer is good, but in the former, involving a knowledge of the fact that the hour in Eastern Siberia and New Zealand is the same, approximately forty per cent. of the pupils who attempted the question were wrong. The probable conclusion is that they confuse the phenomena of time and seasons.

For number 22, the results read: Yes: 145. No. 272. Again, the result points to a meagre knowledge of New Zealand geography. The possibility of the relative locations of the towns not being known can be dismissed as slight. The numbers then mean that the great majority of our pupils do not know that ranges of temperature are more extreme inland, and, secondly, that in the particular case of these two towns the winter temperatures of Dunedin and Queenstown are 45° F. and 39°F., respectively. (1).

(1) Readings obtained from N.Z. Meteorological Department.

(1) "The New Zealand University Calendar" 1933, p.18.

TABLE XX.

Scores	Series R	Test 8a	Population of Cities in United States.					
	Primary				Secondary			
Year	Std. V	Std. VI	1st	2nd	3rd	4th	5th	
Score	21.0	22.1	19.1	16.5	20.1	28.2	31.0	

TEST 8a.

Results are weak. Very little is known of the relative importance of the towns of United States of America, even by the senior forms. With an examination ridden system of education such as New Zealand possesses, one might have anticipated a better result at least from those forms which are on the eve of sitting for their University Entrance Examination; particularly since the syllabus in Geography reads 'inter alia', -

"A more detailed knowledge of the United States" (1).

The "general compendious awareness" (Spearman) of the primary school pupil apparently fits him to make a better judgment than the added information of the first three years in the Secondary School. (See Table XX). The score reaches a low water mark in the second year secondary, whence it rises to a level of dull mediocrity in the fifth year group.

(1) "The New Zealand University Calendar" 1933, p.18.

Fig. 9 - Graph of Results, Test 8a. Population of Cities in United States.

Fig. 10. - Graph of Results, Test 8b. English Populations.

It is instructive to survey the results of the marking for San Francisco and Detroit. The given populations, the correct numbers are in red, with the number of answers recorded against each given population, follow:-

Given Populations	1,862,321	899,296	<u>634,394</u>	325,379
SAN FRANCISCO				
Scores	257	106	32	7
Given Population	876,345	<u>1,568,662</u>	632,186	399,487
DETROIT				
Scores	96	154	73	79

Almost without exception all the pupils considered San Francisco much larger than it is; more than half of the subjects considered it to have a population a million in excess of what it has ! This is an error dependent on wrong associations. Wellington is the terminus of the Trans-Pacific route to San Francisco. The latter is the American town in closest connection with New Zealand and hence there is the tendency to consider it relatively more important than other towns. The teacher of geography must discover such errors and their sources and immediately strive to overcome the false perspective. To consider San Francisco as larger than Detroit is to have a totally wrong impression of the magnitude of the cities in the American industrial areas. In spite of the ubiquitous Ford, approximately only thirty-eight per cent knew that Detroit is one of the largest American cities.

Example of marking for "Belfast."

TEST 8b.

MARKING SCHEME.

Since the aim of this test was to have the towns recorded in order of population, it would be unfair to give no credit for a town simply if it did not occupy a correct position relative to all the others. It could be correct with reference to some of them. For example, if Croydon were placed sixth instead of fourth, its correct position, it would still bear a correct relationship to Birmingham, Liverpool, and Belfast, all of which are larger. It would be incorrectly placed with regard only to Aberdeen and Cambridge. Hence, as there were six towns in the list, each town had to be in correct relationship to the other five to score the limit marks. If so placed, five marks were recorded, with one mark deducted for each incorrect relationship. The score for the question was, therefore, six towns with a maximum of five marks each, a total of thirty marks.

Primary		Secondary					
Year	Std. V	Std. VI	1st.	2nd	3rd	4th	5th
Score	62.3	73.6	77.1	74.9	79.5	79.6	80.0

All groups score their highest percentages in this test, indicating that there is a satisfactory perspective of the population of the British Isles. Only four pupils, however, correctly placed all towns. The results add colour to the opinion expressed by the writer that satisfactory perspectives within regions can and should be obtained while a world perspective, based on comparison and synthesis, remains more or less nebulous.

Example of marking for "Belfast."(a) Correctly placed.

Birmingham
Liverpool
Belfast
Croydon
Aberdeen
Cambridge

(b) Incorrectly placed.

Belfast
Birmingham
Liverpool
Croydon
Aberdeen
Cambridge

Belfast in correct
position scores - } 5

Belfast correctly
placed with
regard to last
three towns scores } 3

An actual case showing the application of the scheme
is appended.

Pupil in Std. V.

Answer.

		Primary	Secondary
		Rank.	
Cambridge	(1)	0 marks	
Aberdeen	(2)	"	
Croydon	(3)	"	
Belfast	(4)	"	
Birmingham	(5)	1 mark;	correctly placed in relation to Liverpool.
Liverpool	(6)	1 "	Correctly placed in relation to Birmingham.

TOTAL 2 marks

TABLE XXI.

		Series R		Test 8b.		Population of Cities in the British Isles.	
		Primary		Secondary			
Year	Std. V	Std. VI	1st.	2nd	3rd	4th	5th
Score	62.3	73.6	71.1	74.9	79.5	79.6	80.0

All groups score their highest percentages in this test, indicating that there is a satisfactory perspective of the population of the British Isles. Only four pupils, however, correctly placed all towns. The results add colour to the opinion expressed by the writer that satisfactory perspectives within regions can and should be obtained while a world perspective, based on comparison and synthesis, remains more or less nebulous.

TEST 9.

MARKING SCHEME.

In this test only two towns had to be correctly placed in each group; when, this done, the third would be correct. This meant that, allocating one mark for each town correctly placed, no individual scored two points. Hence the scoring method adopted was:-

No town correctly placed	- 0 points
One town correctly placed	- 1 point
Three towns correctly placed	- 2 points

TABLE XXII.

Scores		Series R.		Test 9.		Rainfall.		
		Primary				Secondary.		
Year	Std. V	Std. VI	1st	2nd	3rd	4th	5th	
Score	33.8	39.1	44.3	39.5	50.4	33.0	38.9	

The varied percentages scored by the successive year groups, Table XXII with their irregular rise and fall, is clearly shown in Figure 11. This irregularity points clearly to the fact that the results are due to mere guess work. A University Entrance Group of candidates does not score as well as those boys who have a further year before they sit for their Proficiency Examination! Broadly speaking, the pupils tested showed little or no knowledge of rainfall types. If the reader accepts the position, as the writer does, that rainfall is of fundamental importance to the interaction of man and his environment - and geography is the study of just such interaction - then these results point to some deplorable weaknesses in the methods of organisation, or both, of our geographical instruction. Nor does a review of the following Table, which relates solely to New Zealand locations, mitigate one jot this censure.

Fig. 11.- Graph of Results, Test 9. Rainfall.

Fig. 11.- Graph of Results, Test 9. Rainfall.

TABLE XXIII. (Contd.)

the town GROUP RESULTS, EXPRESSED AS PERCENTAGES, head of the
column. FOR TEST 9, SECTION 1, RAINFALL OF
THREE NEW ZEALAND LOCATIONS.

The following facts and conclusions may be drawn
from Table XXIII:-

Given Annual Rainfall.		A 15'26"	B 104'75"	C 36'31"
Town	Year			Correct
Cape Maria Van Diemen	Std.V	57.2	28.6	14.2
	Std.VI.	45.7	36.9	17.4
	1	60.8	19.2	20.0
	2	47.0	34.0	19.0
	3	51.3	20.5	28.2
	4	46.0	36.0	18.0
	5	50.0	16.7	33.3
		Correct		
Clyde	Std.V	20.0	28.6	51.4
	Std.VI.	26.1	23.9	50.0
	1	22.5	32.5	45.0
	2	29.0	34.0	37.0
	3	28.2	28.2	43.6
	4	30.0	22.0	48.0
	5	33.3	33.3	33.3
			Correct	
Inglewood	Std.V	22.9	42.9	34.2
	Std. VI.	30.5	36.9	32.6
	1	15.8	47.5	36.7
	2	24.0	33.0	43.0
	3	20.5	48.7	30.8
	4	26.0	40.0	34.0
	5	16.7	50.0	33.3

- Note.
1. The correct columns are headed "correct".
 2. The majority score of each year group is in red.
 3. In this test there were only six papers submitted in the fifth year group.

The numbers in Table XXIII indicate the percentage of the pupils, in each year group, who selected, as correct for

THE PROBLEM OF ERROR (TABLE XXIII. Contd.)

the town in question, the rainfall given at the head of the column.

The following facts and conclusions may be drawn from Table XXIII:-

1. A majority of every group, with the exception of the consistently weak second year secondary, correctly paired Inglewood and its rainfall. This apparently satisfactory result, however, reveals weaknesses upon closer examination. The highest correctly recorded group percentage is fifty. Hence, it follows that not more than half of any form or standard realises that the west coast of New Zealand receives a heavy precipitation.

2. A majority in every group reversed the rainfalls of Cape Maria Van Diemen and Clyde. That is to say, these pupils declared that the far north of New Zealand (Cape Maria Van Dieman) received less rainfall than Central Otago (Clyde). It may be that wrong associations have been built up on such advertising slogans as "The Winterless North". Against such associations, geographical instruction does not appear to have had much effect.

3. Finally, in the columns in which the majority group scores are recorded (typed in red,) there is a very small numerical difference between the lowest and highest percentage. The three differences are 15.1, 18.1 and 17 per cent., respectively. The practically constant percentages recorded would show that incorrect information regarding New Zealand rainfall present in the primary school grades, remains neither corrected nor even reduced to any serious extent, throughout the secondary school course.

The writer is thus forced to conclude that these results indicate that very little is known by the children tested of the causal factors controlling rainfall in this country.

THE PROBLEM OF ERROR.

Although the problem of error is not an immediate concern of this research, it is clear that the presence of error has a very distinct bearing upon mental growth. It is desirable, therefore, to point out very briefly, the results obtained in the two series of tests.

TABLE XXIV.
Summary of Percentages of Error recorded by each Year Group in each of the Series I and R. (Tests 1 - 7).

	Year	Series I					Series R.		
		1	2	3a	3b	4	5	6	7
Primary	Std. V.	32.1	7.9	68.1	24.1	19.4	20.3	61.7	40.6
	Std. VI.	18.8	7.6	63.0	22.4	19.5	18.7	63.4	41.1
	1st.	22.5	7.8	50.9	24.9	23.3	19.2	63.9	39.1
Secondary	2nd.	22.6	12.0	43.0	32.2	25.6	20.7	64.0	41.3
	3rd.	21.3	12.1	54.1	29.5	25.1	18.6	56.7	34.7
	4th.	21.8	10.7	50.7	30.4	20.6	16.2	55.0	32.5
	5th.	15.0	11.2	38.1	31.6	17.5	21.0	52.1	28.1
Year		Std. V	Std. VI	1st	2nd	3rd	4th	5th	
Series I.									
(Tests 1-5)		30.3	26.3	25.9	27.1	28.4	26.8	22.7	
Series R.									
(Tests 5-7)		40.9	41.1	40.7	42.0	36.7	34.6	33.7	

(1) "British Journal of Experimental Psychology." Vol. 11, 1932.

pp. 297 - 318

(2) Op. cit., p. 306.

(3) Ibid., p. 304.

The first factor to which the attention of the reader is directed is contained in Table XXIV. In this summary of the percentage of error made by each group in Tests 1 - 7, there is a marked similarity in the percentage of error in individual tests. This suggests the possibility that within each test there may be a common type of error. Such a possibility would agree with a conclusion reached by Meyer Fortes, of University College, London. In "A Study of Cognitive Error," (1), an article containing many suggestions provocative of further thought on this problem, he states that error is not due to chance, but "that erroneous cognition is determined by the stimulus situation, just as accurate cognition is" (2). The sameness quantitatively of the errors in these tests agrees with such a thesis. It should be mentioned that Fortes worked with totally different material from that in the writer's tests. His investigation was based on a number of perceptual tests consisting "entirely of meaningless two-dimensional spatial figures." (3).

TABLE XXV.

Mean Percentage of Error recorded by
each Year Group in each of the Series
I and R. (Tests 1 - 7).

Year	Primary		Secondary				
	Std.V	Std.VI	1st	2nd	3rd	4th	5th
Series I. (Tests 1-5)	30.3	26.3	25.9	27.1	28.4	26.8	22.7
Series R. (Tests 5-7)	40.9	41.1	40.7	42.0	36.7	34.6	33.7

(1) "British Journal of Experimental Psychology." Vol.11.1932, pp.297 - 318

(2) Op. cit., P. 306.

(3) Ibid, P. 304.

Fig. 12.- The Mean Percentage of Error recorded by Each Year Group in each of the Series I and R. (1-7).

The second characteristic of error, as recorded in this investigation, is that the percentage of error in each year group remains virtually constant. In Table XXV, the errors made by each group in all the tests have been averaged. This mean percentage of error is graphed in Figure 12. It will be noticed that in the Information Series the difference between the percentage of error made by Standard five and that of the fifth year secondary is only a decrease in the case of the latter group of 7.6 per cent. In the Reasoning Series the greatest percentage of error occurs not in Standard five but in the second year secondary. The difference between that score and that of the final grade is 8.3 per cent. To put the matter bluntly, the more children know, the more mistakes they make. One would have expected that at the close of their secondary school course the proneness to error on the part of pupils would have been very greatly reduced. The writer's results, however, do not support such a view. When averaged, the decrease in error is only a little over one per cent. per year.

Meyer Fortes concluded from the similarity of results obtained from groups of children, the average age of which was about thirteen years, graded according to factor "g" that, "This consistency of error at all levels of "g" ability indicates that the kinds of cognitive error

which may arise in a given situation are not contingent upon the amount of "g" but upon the qualitative laws of cognition". (1) The small variation in the percentage of error spread over seven years of schooling would agree with that conclusion. Error then appears to depend not on "general intelligence" but on the nature of the specific problem.

If the writer may be allowed to anticipate a conclusion reached in the next section, a further instructive result may be dealt with here. The years covered will be shown to divide into three periods, the primary years, the first two secondary and the remaining three. Although these periods indicate well marked variations in growth, yet the percentage of error in each group bears a striking resemblance. It is not desired to further elaborate on this point, so Figure 13 will be left to speak for itself.

The psychology of error is of vital importance to teachers, if scientific methods are to be used in dealing with problems of learning, and the question warrants further investigation. This section can, therefore, fittingly conclude with the following remarks of Professor John Adams: "The Teacher may not know the cause of error; so much the worse for him. He ought to know." (2)

(1) Op. cit., p. 309.

(2) J. Adams: "Errors in School," p. 203.

TESTS.

Period 1:- Primary grade.
 Period 2:- Years 1 and 2, Secondary School.
 Period 3:- Years 3, 4, 5, Secondary School.

Fig. 13. - The Mean Percentage of Error made by each Period in each of the Tests 1-7.

SECTION 6.

DISCUSSION AND CONCLUSIONS.

MEAN RESULTS.

Conclusions based on single tests are apt to be unreliable, hence a concluding series of tables and figures have been prepared based on the mean of the scores of the individual tests. Such a combination of results tends to smooth out any abnormalities and to present clearly general tendencies.

TABLE XXVI.

MEAN GROSS SCORES FOR EACH YEAR GROUP

Year.	Primary		Secondary					Increase per cent
	Std.V	Std.VI	1st	2nd	3rd	4th	5th	
Mean Gross Score of Series I.	10.7	19.1	23.6	26.4	35.1	42.4	46.1	35.4
Mean Gross Score of Series R.	33.5	42.8	44.6	45.0	51.9	52.9	54.5	21.0

TABLE XXVII.

MEAN NET SCORES FOR EACH YEAR GROUP.

Year.	Primary		Secondary					Increase per cent
	Std.V	Std.VI	1st	2nd	3rd	4th	5th	
Mean Net Score of Series I.	- 19.6	- 7.1	-2.3	-0.5	6.7	15.5	23.4	43.0
Mean Net Score of Series R.	- 12.9	- 0.4	3.6	4.3	17.2	24.2	25.2	38.1

Fig. 14.- The Growth of Information, Gross and Net Scores, based on the Mean of Each Group's Scores in Series I. (Tests 1-4).

Fig. 15.- The Growth of Reason, Gross and Net Scores based on the Mean of Each Group's Scores in Series R. (Tests 5-9).

Observations based on Tables XXVI and XXVII and Figures 14 and 15.

1. Growth of Information and Reason.

Both sets of tables and figures indicate a yearly growth in both factors, greater, however, in "information" than in "reasoning". This accords with Winch's findings when he says: "We find high positive correlation between reasoning ability and age." (1). When tables XXVI and XXVII are analysed it is found that the "information" series shows a gross increase of 35.4 per cent. and a net increase of 43 per cent. "Reasoning" on the other hand increases according to gross and net scores 21 per cent. and 38.1 per cent., respectively. The net increases, since they eliminate the effect of chance, are plainly the better indication of growth. The differences between the net increases are seen to be only 4.9 per cent. over all the years from Standard five to the fifth year in the secondary school.

This small growth in reasoning ability which is most marked in the early years, conforms to the findings of Bradford in another field of investigation. (2). He finds that at ages twelve to thirteen only 25 per cent. of children have developed critical ability. (3).

- (1) W.H. Winch: "Children's Reasonings," "The Forum of Education," Volume 1, 1923, p. 154.
- (2) E.J.G. Bradford: "Suggestion, Reasoning, and Arithmetic", "The Forum of Education," Vol.III, 1925.
- (3) Vide, Table on Page 8, loc. cit.

Per Cent. 14

118.

Fig. 16.- Annual Fluctuations in the Rate of Growth of Information.

Per Cent. 14

Fig. 17.- Annual Fluctuations in the Rate of Growth of Reason.

2. Rate of Growth.

When the rate of growth is investigated marked fluctuations in both series are observable. The broad generalisations which can be made from Figures 16 and 17 are:-

- (a) A period of rapid growth from Standard five to Standard six.

The rapidity of growth in this period is unequalled in any other year examined. The average age of Standard five is twelve years one month.

- (b) A period of decreasing rate of growth in the first two years secondary. The average ages of these groups were fourteen years one month, and fourteen years eleven months.

- (c) Rapid acceleration in the rate of growth in the third year. Age: fifteen years eleven months.

- (d) The final two years vary somewhat in the Information Series and Reasoning Series. In Series I, growth in net scores increases in the fourth and remains practically constant in the fifth year. This points to consolidation of the information held. In Series R., the marked acceleration in growth of the third year is followed for the next two years by as well marked slackening. (1)

The second year secondary showed to the greatest extent the presence of retardation in growth together with the largest body of error. This group was one month short of fifteen on its average age. The weak results, illustrated in the preceding Tables, are in keeping with the evidence

- (1) Attention is again drawn to the fact that there were only seven pupils in the fifth year group.

presented by Dr. Rusk, who summarises the results of a number of psychologists who have investigated the problem of memory - the basis of information. For all special memories, "the period between the ages of fourteen and fifteen is most unfavourable" (1). And since reasoning cannot be carried on "in vacuo" but depends on information for its fundaments, any psychological or physiological factor which influences the growth of information must, "a fortiori" affect reason.

The results of the writer's research, however, do not agree with the conclusions of Professor Fowler D. Brooks. In an enquiry into the "Rate of Mental Growth, Ages Nine to Fifteen" (2), after making certain allowances which were considered to influence his results, Brooks says that, "the rate of mental growth is probably very nearly constant from nine to fifteen for school population." (3). The graphical results obtained by Brooks, however, showed a gradually declining rate of growth, and, therefore these, without making the allowances thought to be necessary, agreed substantially with the present results. Brooks did not include in his research the years beyond fifteen so that the rapid increase noted in the writer's results for later years may have been missed. However, the differences in the empirical evidence produced, suggests that there is room for further investigation.

(1) Robert R. Rusk: "Experimental Education," p.85, et. seq.

(2) "The Journal of Educational Psychology," Vol. XII, 1921.

(3) Op. cit., p. 508.

3. Presence of well defined Periods.

The results suggest a threefold division based on growth. The primary years, the first two secondary years, and the remaining year groups. The first and last are marked periods of growth, the middle group is practically at a standstill. This raises the problem for school classification purposes whether a chronological year means a difference of a mental year. Certainly it would appear that in the middle group, each additional chronological year is not accompanied by a year's increase in mental age. Further empirical investigations on this question for other subjects would probably point out that the traditional grading by chronological yearly advances is psychologically unsound.

To illustrate these marked periodic fluctuations Figures 18 and 19 have been prepared. The total increase in each period has been divided by the numbers of years covered by the period to obtain the mean annual increase. These data have been graphed in the following figures. Such marked variations in growth should influence the method and content of our geographical instruction.

4. Comparison with Bradford's Conclusions.

One must agree that these results bear out the conclusion "of slow and meagre development in geographical perspective" reached by Bradford. They also support his

Fig. 18.- Variations in the Mean Annual Growth of Information and Reason in each Period. (Gross Scores).

Fig. 19.- Variations in the Mean Annual Growth of Information and Reason in each Period. (Net Scores).

conclusion number six (1), that perspective of precipitation is extremely weak. It will be remembered that Test 9 of this investigation showed practically no knowledge of rainfall types. (2).

It would appear that the scanty growth in geographical perspective is evidenced to an almost equal extent in those phases based on information as on those based on reasoning.

Summary of Conclusions:

A. Bradford's Tests.

1. There appears to be in the construction of the tests serious weaknesses such as the varying size of the gradations within individual tests, the possibility of two "correct" answers in one case, the confusing and useless nature of "shortest distance" perspective, all of which are detrimental to the value of the whole battery as a test of geographical perspective.

2. In geographical perspective, logical reasoning is equally as important as memorized information, and often may result in more "meaningful" knowledge.

3. The results obtained from the application of Bradford's tests gave a slightly higher percentage for New Zealand classes. The percentage of increase was, however, practically identical.

4. The conclusions reached by Bradford regarding

(1) Op. cit., p. 349.

(2) Ante, p. 104.

paucity of development and weakness in knowledge of precipitation are supported by the results obtained in the application of Bradford's tests and also of the writer's tests.

B. The Writer's Tests.

5. The meagre development of geographical perspective is influenced to an almost equal extent by paucity of "true" growth (net scores) in information and reason.

6. There is a yearly increase in growth of both information and reason.

7. The rate of growth fluctuates and gives rise to three periods:

- (a) Primary grades marked by rapid growth.
- (b) First two years secondary marked by a "plateau" showing practically no increase in either factor.
- (c) The final three years marked by accelerated growth in the first year of the period with a lessening of the rate of increase in the final two years of the period.

8. The percentage of error is practically constant for each test and, based on the mean percentage of error for all tests, practically constant for each group.

9. In those questions within the tests which bore on New Zealand, detailed analysis revealed a scanty knowledge of New Zealand geography.

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