AN APPRAISAL OF A PROJECT

FOR ACADEMICALLY GIFTED CHILDREN

by

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A THESIS

Submitted in partial fulfilment
of the requirements for the degree of

MASTER OF ARTS IN EDUCATION

Massey University

1968

PREFACE

The study which is the basis of this thesis is part of a project for the education of gifted children which had its inception in the deliberations of the Palmerston North Institute for Educational Research in the late 1950s. For a period of 7 years a committee, specially set up for the purpose, has organised a series of 'enrichment' programmes for groups of gifted children from Std 4 through to Form II. A complete review of the whole project is being undertaken by Mr K. McIlroy who is the secretary of the Committee for the Education of Academically Gifted Children, but this particular study was designed to provide some objective evaluation of a programme being provided for one group over a two year period. This necessitated the selection of a control as well as an experimental group, both of which were given a series of tests and rating scales at the beginning and the end of the period of study. By comparing the amount and direction of change in scores from the pre-test to the post-test situation it was anticipated that some conclusions could be made about the effectiveness of this particular enrichment programme. The results of this analysis seem to indicate quite clearly that, as far as can be determined by the instruments used, the programme had no significant effect on the experimental group as a whole compared with the control. Consequently it would be well worth considering ways of educating the gifted other than those used in this Palmerston North project.

In addition to the analysis of the data obtained from the series of tests an attempt has been made to review some of the extensive literature on the gifted as it relates to the objectives and procedures of this local programme. In the light of some of the current writings in this field and as a consequence of the findings of this study some attempt has been made to make constructive suggestions about any future developments in this area.

In carrying out my investigations I have become indebted to many more people than could possibly be named. I wish, however, to express my grateful thanks to Professor Hayman of the Mathematics Department, Massey University, for suggestions about, and approval of, suitable statistical methods; to members of the Committee for the Education of Academically Gifted Children, and especially Mr J. Foote of the Psychological Service, for making information and material readily available; to the Headmasters of the schools where the pupils were enrolled for making time and facilities available for testing; to the class teachers who willingly provided information about the pupils in both groups; to the pupils themselves who undertook all the tests without any signs of dissatisfaction; and to Dr Bray, senior lecturer in Education at Massey University for his help and advice in planning and executing this study.

November 1968 A. Forrest

C O N T E N T S

APPENDICES (Cont.)

SECTION I: ORIGINS AND AIMS OF THE PALMERSTON NORTH PROJECT

1. ORIGINS OF THE PROJECT

"Society's needs and the individual's needs are violated whenever we fail to truly challenge our most able students". (Durr, 1964, p.5). This concern with power wasted when those capable of the greatest intellectual attainment are not helped to realise the maximum potential gave rise to an explosive increase in interest in this area as indicated by the number of studies appearing since the early 1950s. It was this same concern that stimulated the Palmerston North Institute for Educational Research to undertake a significant, if limited, project for the education of academically gifted children. It was their view that, although it is a generally agreed educational policy that every child should get the education best suited to his ability, this aim was not being met as fully as it could be in New Zealand using the existing facilities.

After careful consideration of a number of projects that had already been reported on, a perusal of the available literature on suggested methods for educating gifted children, and an evaluation of the local climate of opinion regarding this problem, a committee set up by the Institute suggested, amongst other things, that "1. able pupils from a group of schools could be enabled to join forces on particular studies of interest to them;

2. there could be increased opportunities for individual and small-group studies aimed at improving students' study skills, and at stimulating their exploration of the world around them;

3. for suitable children there would be a place for occasional seminars on particular topics held either in or out of school hours".

In any of these suggested activities the aim was to integrate any special programme as closely as possible with the pupils' whole syllabus of work so as to provide a unified curriculum, not just a series of special discrete efforts.

For four years a system of 'tutoring' in out-of-school hours was in

operation and two groups of gifted primary school children were involved. However no systematic or comprehensive evaluation of the effectiveness of the project was made during this time. This lack of evaluation seems to have been a general feature of many similar projects. Gallagher (1960) states that "the evaluation of educational programs for gifted children has not been common nor too well done from a research standpoint". Many of the findings related to the effectiveness of various programmes have tended to be the subjective opinions of teachers, administrators, parents and students, culled from questionaires and rating scales (Carter, 1957). Dissatisfaction with such evaluative techniques is implied by Durr (1964) when he states that an essential ingredient in any planned programme for the gifted is a consistent plan of evaluation evolving directly from the stated purposes. He further stresses the need for making this evaluation as objective as possible for in too many cases "a feeling that everything seems to be going well has been the sole or major criterion of value".

In 1965 the Palmerston North Committee for the Education of Academically Gifted Children decided to build into their program the essential ingredient of evaluation referred to above. In a letter to parents of gifted children it was stated that "while the committee believes that during the first four years of providing tutoring in out of school hours the children have benefited it is by no means sure that this is the best method of enriching the education of bright children. It may seem at first glance to be obvious that out of school tutoring must be beneficial. This is not necessarily so. The advantages of doing this may be outweighed by the disadvantages; such as, taking children from their homes in the early evening, reducing the time they have to pursue their own activities, perhaps even leading them to feel they are being forced. The committee has therefore prepared a new plan for 1966. It proposes that the problem shall be approached in a different way". The plan agreed upon at a

committee meeting on 22 September 1965 was that

'(a) 48 children with an IQ above 130 would be selected from the Std 3 classes in the city at the end of 1965 :

(b) from this group of 48 children two matched groups (an experimental and a control) would be formed :

(c) the experimental group would receive extra tutoring in out of school hours for two sessions a week, each session of an hour's duration :

(d) all 48 children would have their education enriched and extended during school hours, using methods developed by their own schools and drawing on the body of information that has been amassed on hte education of the gifted :

(e) at the end of two years a comparison would be made between the two groups :

(f) details of the evaluation procedures would be undertaken by the Education Department of Massey University." (From the Committee's minutes.)

The topics chosen to be the basis of an enrichment programme for the experimental group in their out of school tutoring sessions were:

1966 Term 1 - Reading and study skills Term 2 - Mathematics
Term 3 - A free choice in the aesthetic field

1967 Term 1 - Study skills applied and reinforced in Social Studies
Term 2 - Mathematics Term 3 - Science

Implicit in this plan are a number of basic assumptions, procedures and hypotheses which must now be examined in detail.

2. OBJECTIVES

The objectives of the project are, basically, an adaptation of the aims

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† Not implemented. See p. 28

† The 'evaluation', apart from identification and selection procedures (carried out by members of the Psychological Service), was undertaken by the investigator as a graduate student enrolled in the Education Department at Massey University.

determined by the Institute for Educational Research that led up to the initial scheme in 1961/62. At that time it was decided that gifted children in their Std 4 year should, in addition to what the school could provide, receive "special tuition on two afternoons a week" and that the instruction should be of "the enrichment type as outlined by Parkyn (1953) and should, as far as possible, avoid overlapping the syllabuses of higher classes".

In his study of enrichment practices Parkyn found that the quantitative fallacy is commonly held: many bright children were simply doing more work at the average level rather than penetrating deeper. He therefore maintained that certain general principles should apply to any enrichment practices. One of these was that in addition to the gaining of wider knowledge, a broader experience and more facts the bright child should have a curriculum that goes deeper into every subject enabling him to appreciate complex and subtle relationships among facts, interpret them and gain insight into their meaning. Another was that studies should not be concerned merely with conserving existing knowledge and values but should aim to encourage original thinking, critical evaluation and personal forms of self-expression.

With these objectives in mind the committee set up a project aimed to "place emphasis on creative effort, intellectual initiative, critical thinking and the development of unselfish qualities of leadership" (Progress Report, 1963). In addition the following specific objectives were placed before the tutors:

(a) To foster self direction, independence, a love of learning, a desire to achieve consistent with the pupils abilities and to create and experiment with ideas and experience.

(b) To build a sound liberal foundation on which they could develop at the highest level of which they should be capable.

The original objectives were to be modified somewhat by the experiences

gained with the early groups. In a review of the whole project in 1964 it was found that the programme had in actual fact emphasised the development and refining of certain skills to encourage confidence in handling tasks, stimulated higher levels of thinking, developed research into and evaluation of source material, promoted independence through concentration on individual tasks, promoted creative expression, and remedied individual weaknesses and faulty attitudes. On the other hand some weaknesses were revealed within the groups. These included under-achievement in some areas such as arithmetic, satisfaction with a low standard of written work, an inability to settle readily to pursue individual tasks, a tendency to be unreliable in carrying out responsibilities accepted, poor work habits, and an inability to organise the attack on work to be done.

When the Committee agreed, on 22 September 1965, to set up the 1966/67 research project they did not state their objectives except to record that one group would be tutored in out of school hours. This presumably implied that an enrichment programme would be undertaken designed to achieve the objectives as set out for previous groups. However, on 22 June 1966 the Committee recorded in its minutes that the aim of the project could be narrowed to:

"1. Making the tools of learning and thinking more accessible to the children.

2. Helping the children make effective use of the tools of learning and thinking.

3. Providing enriching aesthetic experiences for the children".

It is obvious that this rather brief and limited statement of aims must be interpreted in the light of the objectives the committee had already set before itself in the preceding few years. It is also equally obvious that these aims must be compared with the stated objectives from other authorities before any definite and specific hypotheses can be determined.

Most writers are agreed that a programme for the gifted should represent an extension of general educational objectives. It should, according to Durr (1964) "have a stimulating learning environment which differs both quantitatively and qualitatively from that provided for other students, with special emphasis on creative thought, social responsibility and fundamental skills, knowledges and appreciations". But before these purposes can serve as true guides to the education of the gifted goals must be stated in terms of specific behavioural outcomes. Only when objectives are stated succinctly and specifically is it possible to base a programme directly on them and to evaluate the programme realistically. Many of the published statements on objectives, like that of the Committee fail in this respect. For example Cutts and Moseley (1958) list as general objectives of an enrichment programme the following:

1. Challenge the full use of abilities.
2. Broaden the base of knowledge.
3. Deepen understanding.
4. Increase level of skills, etc.

But some authors have dealt with more specific points which are a help in interpreting and developing the intention of the Palmerston North Committee. In outlining the goals towards which the staff of Hunter College work Hildreth (1952) comes nearer to a specific statement of objectives in behavioural terms. She includes such things as: developing habits of reflective thinking, studying, investigating, judging, solving problems; efficient planning and organising of study materials; learning how to express ideas creatively in oral and written English; using the scientific approach in studying problems; learning the basic skills, knowledges, techniques of communication, scientific methods, study techniques that are needed for practical purposes. These are listed under the general goal of learning to become an economically efficient citizen. Other quite specific goals are mentioned under the headings of mental and physical

health, skill in social relationships and becoming an enlightened and active world citizen.

A further statement of objectives, which, in part, expresses some quite specific behavioural outcomes is that of DeHaan and Havighurst (1958). In this the aim of education for the gifted is to develop "such a variety of gifts and talents as:

(a) General intellectual ability (Ability to think abstractly and do other kinds of relational thinking) and its various components, such as reasoning, verbal skill, mathematical skill and spatial imagination.

(b) Ability in such useful areas as science, mechanics, social leadership and human relations.

(c) Talent in creative arts, such as graphic arts, music, creative writing and dramatics".

A more useful approach is that of Lucito (1963) who sets out to develop specific objectives in relation to the role the gifted might play in society. He sees their role as different from the non-gifted in that they can be expected to be the major contributors to knowledge by offering innovations, evaluating them and solving complex problems as well as being the major participants in complex practical decision making. It can be assumed that competency in productive and evaluative thinking is essential for the gifted to fulfil his role as innovator, evaluator and problem solver. Therefore the aim of any programme for these students should teach these types of thinking plus the supporting skills and attitudes. Lucito generates some specific objectives by analysing these components along the lines of explorations conducted by Guilford, Merrifield, Myers, Taylor and others. The operations of productive and evaluative thinking in any subject area depend on skills such as combining ideas and elements, exploring possibilities, analysing ideas, seeing relationships

sensitivity to problems, ideational fluency, and redefinition. But thinking is not performed in a vacuum. The probability of productive and evaluative thinking increases when students possess a wide background of information. Consequently the increasing of the store of information should be one of the objectives. However, quality as well as quantity should be considered and quality contributions to the body of knowledge depend on high level ideational thinking. This implies that gifted students should be exposed to difficult concepts at their level. In addition to these thinking skills, the body of information that goes with them and the opportunity to reach high levels of conceptualisation Lucito (1963) claims that a programme should aim to develop "certain attitudes which support productive and evaluative thinking, and assist students to interject their innovations and evaluations into the cultural stream". The attitudes as he sees them are independent work skills and habits, independence from peer group pressures on judgments, tolerance for different opinions and a predisposition to examine many sides of an issue, ability to delay gratification of rewards, predisposition to critically evaluate accepted ways of doing things, and assumption of responsibility for the betterment of society.

It is clear that the statement on objectives by the Palmerston North Committee fails to specify behavioural outcomes. The 'tools of learning and thinking' should have been analysed more carefully along the lines suggested by Lucito or expressed in much the same way as Dehaan and Havighurst stated them. A more useful approach still would have been to select some of the appropriate objectives from Bloom's Taxonomy in the cognitive domain (1956). This classification lists various aspects of knowledge which could be readily related to any subject area and to Lucito's wide background of information. In addition it provides a clear statement of the intellectual abilities and skills which are not specified in most statements of aims and which Lucito has not

carefully tabulated and organised. It would seem that all the intellectual abilities and skills listed by Bloom are appropriate objects for study in a programme for the gifted but in relation to the 'productive and evaluative' or creative aspects of thinking that all are agreed upon the skills of application, analysis, synthesis and evaluation are particularly appropriate. Before problem solving and creative behaviour, in any significant sense, are possible a student must be capable of analysing, synthesising and evaluating the knowledge he has acquired (Woodruff, 1961).

Even though the Palmerston North Committee can be criticised for not making an explicit statement of satisfactory aims it is possible to infer them from their earlier statements on objectives and from the programme of tutoring that was to be undertaken. The objectives of the scheme prior to 1966 have already been referred to, as has the programme of tutoring for the two years. Hence it might fairly be claimed that the specific objectives of the project were to:

1. Develop greater understanding and a wider background of information in the Mathematics, Science and Social Studies areas.
2. Develop the skills of reading and of effective study.
3. Foster, not only the skills of comprehension, but also the higher levels of analytic, synthetic and evaluative thinking out of which come the abilities to solve problems and be creative.
4. Develop a sense of awareness and appreciation in the fields of Art and Drama.
5. Develop attitudes of independence in work skills and attitudes, self-reliance in task performance, tolerance for the opinion of others and a predisposition to critically evaluate accepted ways of doing things.

These objectives provide, not only the foundation for tutoring within the programme, but also the basis on which the evaluation of the programme's effectiveness was evaluated.

3. ENRICHMENT

The decision to use a programme of 'enrichment' to achieve the desired objectives in the education of the gifted group requires some comment. It is clear, as Durr (1959) points out that enrichment is a much abused term embodying a concept of disarming and deceptive simplicity. Examination of suggested enrichment practices in the literature will uncover everything from busy-work activities to changes in curriculum content and methods. This is due largely to the fact that both content and method are usually left to the teacher concerned. Consequently enrichment has come to mean many different things and the resulting ambiguity must be specifically defined if understanding is not to suffer (Lucito, 1963).

Obviously the intention was that enrichment was to be of the horizontal (Jordan, 1962) or breadth (DeHaan, 1957) type. There was a clear undertaking that the programme would not encroach on the work of higher classes, or in other words, there was to be no element of acceleration involved. This denial that acceleration might be a legitimate aspect of enrichment seems a little inconsistent when it is claimed that Parkyn's (1953) viewpoint was to be the guide in this respect for he quite clearly sees the early introduction of advanced subjects as part of enrichment. The Currie Report (1962, p.276) also suggests that acceleration as a vertical form of enrichment is appropriate in advocating the beginning of secondary work in Form 1 for able pupils. The idea of enrichment need not be confined to extending the work horizontally in existing subjects, it may just as logically mean the extension into more advanced stages of subjects or the beginning of completely new subjects.

Much of what has been written on the effect of enrichment has been in relation to enrichment in the regular classroom. One of the most intensive studies (Gallagher, 1960) indicates that although many of the personnel involved

'felt' that worthwhile improvements had accrued, no significant differences were revealed through objective measures of achievement, social adjustment or self attitudes. There is, however, some experimental evidence to show that desirable changes occur through an intensified programme of enrichment. Baldarf (1959) in reporting on the Cedar Rapids experiment which involved 95 pupils with I.Qs. of 125 or higher from grades 4 through 7 indicates that there were some significant changes but these were neither spectacular nor consistent from grade to grade. But the Palmerston North project was not primarily concerned with enrichment within the regular classroom. Quite clearly their concern was with enrichment in a limited segregated situation. Limited in the sense that special classes were to be held outside of school hours so as not to interfere with the normal class programme and segregated in the sense that the classes were to be restricted to students of high ability and achievement.

In choosing to make educational provision for the gifted through a programme of 'horizontal' enrichment in part-time special classes the Palmerston North Committee clearly and successfully interpreted the climate and conditions of the current educational scene. In the first place, as the Currie Report (1962, p.278) indicates, the attitude to acceleration, be it associated with more advanced work or the policy of promotion, was one of caution. It was felt that acceleration to the extent demanded by the intellectual ability of the gifted would come very frequently into conflict with their maturity. Hence enrichment through advanced work for such pupils outside school hours in the form of clubs and societies related to special interests was considered to be more acceptable. That the Palmerston North Committee gauged the climate of opinion accurately is seen by the close resemblance between their conception of an adequate programme and the suggestions of the Currie Report (1962, pp.278-9) when stating that enrichment would frequently be "in subjects such as mathematics, science, foreign

languages - subjects of huge scope that offer much that is of fascinating interest in creative aspects of the arts and literature in which this group are often also specially endowed, and in aspects of work such as archaeology or astronomy, that lie somewhat off the beaten track of school subjects."

Secondly, there has not been, in New Zealand, a favourable attitude to the segregation of gifted pupils in selective schools. It has been felt that any high degree of segregation may cut these pupils off from experiences shared in common with others of lesser capabilities and that this loss may later prove a handicap. In the light of this attitude the Currie Report (1962, p.278) suggests that "the best treatment will probably lie between the extremes of segregation and dispersion" and goes on to recommend that schools in the main centres of population should co-operate in providing experimental forms of concentration of these pupils in particular subjects or in schools. This is precisely the way in which the Palmerston North Committee interpreted the situation and acted along the lines that the Commission recommended bearing in mind that the wishes of pupils, parents and schools had to be considered and that the arrangements that could be made would depend on the opportunities that were offering.

Thirdly, the Palmerston North Committee had to work within the limitations of the current provisions for primary education. It would have been an advantage if the Department of Education had been able to appoint teachers with responsibilities for the education of the gifted in much the same way as they appoint Area Organisers for the education of the intellectually handicapped in Special Classes. This was not possible. Nor was it possible to officially arrange for special classes to be held in school time; this presented problems of transport, interruption of school programmes and conflicts of loyalty on the part of the pupils.

Consequently the Palmerston North Committee made the wisest, almost the only, choice it could in deciding to make educational provision for the gifted through an enrichment programme in special classes held in out of school hours. In making this provision they had to depend on the voluntary help of their own committee members, the willingness of school and university staff members to undertake tutoring outside of their own professional commitment, and the goodwill of headmasters and the Teachers' College principal in making facilities and equipment available. The assumption that such a programme, even within the limits imposed upon it, would benefit those participating in it is not an unreasonable one. Carter (1957, p.588) claims that "most reports indicate that students profit markedly from their experiences in enrichment programmes" and also that "special programmes are regarded by investigators, and by the gifted themselves, as providing valuable educational experiences for which the cost and trouble involved are amply justified". A programme that closely parallels the Palmerston North project, except that the twice weekly enrichment classes were held in school hours, was undertaken in University City, Missouri. In summarising the results, which included a follow-up study of the first 23 enrichment students to enter junior high school, Dunlap (1955) states that "evidence from spontaneous comments of children, principals, teachers and parents, indicates that the enrichment programme fosters certain desirable outcomes for a large majority of gifted children. Stastical data point to the fact that the bright, but not the brightest pupils are frequently the best students. However, more important is the evidence that the enrichment programme helps to motivate a substantially greater number of the most able pupils to make more effective use of their abilities".

4. DEFINITION

In its decision to select pupils for an enrichment programme who had I.Qs. above 130 the Palmerston North Committee was using the class of definitions that Lucito (1963, p.183) designates as I.Q. definitions. This type of definition has a long and honoured tradition. Terman's famous studies (1925-1959) have used this type of definition. He referred to gifted children as those having an I.Q. of 140 or above as measured by the Stanford-Binet Intelligence Scale. Others have used different I.Q. tests and the minimum cut off scores have been either raised or lowered - more frequently the latter. Cruickshank and Johnson (1964) define 'gifted' pupils as those having an I.Q. above 135-140 as measured by an individual test such as the Stanford-Binet and Parkyn (1953), likewise, avoids any confusion about the meaning of the term 'gifted' by taking the top 5 per cent as determined by intelligence.

Limiting the concept of giftedness in this way has been severely criticised by some authorities. Getzels and Jackson (1958, pp.75-77) claim that there are "several types of confusion, if not outright error in this unidimensional definition". These authors claim that the intelligence test does not represent an adequate sampling of all intellectual functions and neither does it have a satisfactory theoretical basis or predictive function. It is asserted that even in the classroom "learning involves the production of novelty as well as remembrance of course content", and therefore, "measures of creativity as well as the I.Q. might become appropriate in defining characteristics of giftedness". (Getzels and Jackson, 1958). This emphasis, supported by the work of Guilford and Torrance implies that creativity represents an aspect of thinking which is as important in its own right as is intelligence. Indeed, Getzels and Jackson attempt, in their study, to verify the hypothesis suggested by Guilford that "if the correlations between intelligence test scores and many types of creative

processes are only moderately low, it is because the primary abilities represented in the tests are not all-important for creative behaviour, and some of the primary abilities important for creative behaviour are not represented in the tests" (Guilford, 1950).

When Burt (1962) analysed the Getzel and Jackson study he concluded that the weight of evidence "is strongly against the somewhat simplified interpretation that there are just 'two basic cognitive or intellective modes', the 'creative' and the 'intelligent'". This conclusion is supported by Marsh (1964) who applied a number of corrections to the Getzel and Jackson data and found that the correlations between I.Q. and the various tests of 'creativity' were sufficiently high to indicate that "creativity is determined by different phenomena than those Getzel and Jackson assume". Likewise Wallach and Kogan (1965, pp.1-13) in a review of the major studies on 'creativity' concluded that there was no evidence for conceiving of a single unified dimension that would be appropriately labelled 'creativity' after the manner of the concept of general intelligence or G. It would appear then, as both Burt (1962)and Marsh (1964) suggest, that the general factor of intelligence is the most conspicuous and constant ingredient of 'creativity' and the conventional I.Q. test, widened to include types of items found in tests of 'creativity', may still be the best single criterion for creative potential. This is the same point that Lucito (1963, pp.184-5) is making when he suggests developing a class of definitions that he calls 'creativity definitions'. In an attempt to encourage consideration of some aspects of Guilford's model of intellect he suggests that the gifted might be defined as "those students whose potential intellectual powers are at such a high ideational level in both productive and evaluative thinking that it can be reasonably assumed they could be the future problem solvers, innovators, and evaluators of the culture if adequate educational experiences are provided". This position is not inconsistent with

the wider view of intelligence preferred by Vernon (1958) who thinks it best regarded "as a fluid collection of infinitely varied thinking abilities and is simply an average of whatever abilities the tester likes to include". Hence it would seem that the traditional type of I.Q. test, refined and standardised by years of research, must clearly be used as the major tool for indicating intellectual giftedness, but limitations of the I.Q. should be recognised.

Some of the workers in the field felt that the I.Q. definition was limited because some individuals were in fact achieving at a level definitely indicating gifted ability but were not scoring at the level on I.Q. tests to be regarded as gifted. It was also felt that the I.Q. did not identify many students who were later able to excel in areas such as music and art. Consequently a comprehensive type of definition was proposed. This has been referred to as the 'social' definition by Lucito (1963, p.183) and is perhaps best exemplified by DeHaan and Havighurst's (1957) statement that "children may be considered gifted who are in the top 10 per cent of their age group in one or more of the following areas of talent:

(a) general intellectual ability;

(b) ability in such areas as science, mechanics, social leadership, and human relations;

(c) talent in creative arts, such as graphic art, music, creative writing, and dramatics".

However, this type of definition renders the topic of 'giftedness' too widely amorphous. Furthermore, it might fairly be assumed that 'intelligence' could be an important constituent in these 'talents' as it appears to be in respect of creativity. In fact it was found that a group of 11-year-old gifted pupils at Hunter College, admitted on the basis of I.Q. scores, showed in general "superiority in abilities in art judgment, music memory, science, and

mechanical abilities, as measured by seven different standardised tests. The findings corroborate other reports of trends towards excellence in abilities of various kinds among gifted children". (Wilson, 1965, p.112).

Another departure from the strict or unidimensional I.Q. definition is that which Barney (1965) refers to as the 'academically talented'. This really refers to the 'superior-achieving high-I.Q. child' and is often implied, though seldom made explicit, in the identification procedures for the selection of gifted groups. Tests of attainment, school records and teachers' reports are commonly used along with intelligence tests as part of the selection procedures but it cannot be assumed that achievement or attainment in school subjects is a single or unified concept separate from intelligence. It has been clearly pointed out by Vernon (1958) that the difference between intelligence and attainment is much less than commonly supposed and there is good reason for regarding intelligence as a kind of attainment, ~~and attainment~~, and attainment as a kind of intelligence. Intelligence refers to the more general thinking capacities which have very wide applicability to daily life situation and educational materials, whereas attainments refer to more specific capacities which are more directly moulded by stimuli received in the classroom.

The Palmerston North Committee by including 'Academically Gifted' in their title have paid lip service to this last type of definition mentioned. The reasons for this are not clear for their main criterion for selecting the 'gifted' group was in terms of I.Q. In so doing they have followed time honoured precedent, and by choosing to define 'giftedness' in this way have avoided needless complications. The experiences at Shimer College (Carter, 1957, p.584) indicate that persons selected on the basis of traits other than high intelligence do not fulfil the expectations implied by the use of the term 'gifted'. Carter also claims that children classified as gifted on the

basis of I.Q. are also more attentive, more original, more interested in school subjects, such as mathematics and reading, and more capable in spelling than the average child. In addition he concludes from the available evidence that "it is apparent that achievement in the more abstract aspects of musical theory, such as theory and sight reading, requires intelligence, and that as a result persons who are highly successful in musical careers are likely to be intellectually gifted. Although the evidence is more limited, this generalisation probably applies to art, mechanical ability, and other fields which require special talents". (Carter, 1957, p.585).

5. IDENTIFICATION

The identification of the gifted depends on the definition that is adopted. Thus for those who choose a wide social definition of giftedness a wide coverage of special abilities and talents is necessary. A multiple criteria approach is recommended by DeHaan and Wilson (1958, pp.171-183). They suggest that standardised tests and observations be used to evaluate such factors as intelligence, special aptitudes, scientific ability, interests, achievements, personality, artistic ability, dramatic talent, mechanical aptitude, etc. In the development of the 33 special classes for the gifted in elementary schools of Ontario up to 1962 this approach was used. Selection was based on group and individual intelligence tests, school records of achievement and health, teachers' and principals' recommendations, subjective estimates of social and emotional maturity and parental consent. (Johnston, 1964, pp.39-48).

In so far as the Palmerston North Committee chose to use an I.Q. definition of giftedness a more limited selection procedure would seem to be appropriate. But to depend on I.Q. alone, particularly at the initial screening procedure,

could result in some of the gifted being overlooked in the final selection. The limitations of the group intelligence tests, which must inevitably be used for screening purposes, are clearly pointed out by Barney (1965). Many of the group tests have such a 'cramping' or low 'ceiling effect' that very few gifted children would be identified if the lower limit was set at 130 I.Q. without considering the SD of the tests used. "In a California study of 332 gifted children with Binet I.Qs. of 130+, examination of the group test IQs revealed that if these, alone, had been used for identification, over 50 per cent of the group would have been eliminated if the group test I.Q. of 130 had been set as the lower limit, and approximately 25 per cent if set at 125". (Barney, 1965). In addition, it is pointed out that group test results can be adversely affected by sickness, anxiety, negative attitudes and faking on the day of the test. It is because of factors such as these that authorities like Gallagher (1963) and Lucito (1963, pp.186-191) recommend a combination of I.Q. and scholastic achievement tests. It is possible that scholastic achievement may tend to reflect factors of personality and divergent thinking favourable to academic success to a greater extent than I.Q. tests with their stress on 'convergent' items. In light of the work of Getzel and Jackson (1962) and Torrance (1962) who found that their distinctively 'creative' groups achieved better than might have been expected from their I.Q. results this consideration of scholastic achievement could be important, Lucito (1963, p.188) suggests that a larger number of highly creative students will be identified in the screening stage if high achievers with I.Q. scores as low as 115 or 120 were considered candidates for final selection. Thus the combination of I.Q. and academic achievement is clearly indicated in the identification of the gifted, particularly as tests of productive and evaluative thinking have not yet reached the stage for routine use.

But even this combination of intelligence and attainment test results comes in for some criticism by Barney (1965). He claims that it ignores superior worthwhile talent outside of the purely academic area in that it does not provide opportunities for the child to demonstrate his superiority in the performing arts, creative abilities and leadership attributes. He, therefore suggests that varied sources of information should be pooled to overcome elements of unreliability and difficulties of interpretation in each of the suggested techniques: intelligence tests, attainment results, parent observations, teacher observations, school records, and assessment of creativity. Carter (1957), likewise claims that there is much agreement that the intelligence test should be supplemented by other evidence from teachers' judgments, achievement tests, school records, age-grade placement and various items indicative of physical, social and intellectual maturity for the purpose of screening gifted pupils. But Lucito (1963, pp.189-191) issues a word of warning about the use of observations by teachers and others, check lists and school grades. For example, a study by Pegnato and Birch (1959) involving 1,400 Junior High School pupils demonstrated 'that teacher judgment of gifted students had a frighteningly low level of effective efficiency'. Of 154 identified, 41 were later shown by objective measure to be really gifted and the other 113 not so, while 50 of the rejected group later qualified as gifted.

A more important consideration than the specific measures for screening and selecting gifted pupils are the two criteria devised by Pegnato and Birch (Lucito, 1963, p.191) - effectiveness and efficiency. When these are maximised the best screening procedure has been obtained.

The Palmerston North Identification Procedure began late in 1965 when all the Std 3 children in 12 city schools were screened on the Raven's Coloured Progressive Matrices Test and a check list (See Appendix A) was completed for

each of the 780 pupils by their class teacher. As the standardisation of the Raven's test is not particularly satisfactory in that many more New Zealand children obtain high scores than would be expected from the norms provided, all the children who scored at the 50th percentile or above were re-tested with the 1938 Raven Progressive Matrices test. From the results of this second test and the check lists provided by the class teachers 96 children, plus another 10 especially recommended by Head teachers or Class teachers, were chosen for further group testing.

The battery of tests used for this group of 106 comprised:

(a) Otis Self-administering Test Intermediate Form B

(b) Tomlinson Junior School Test

(c) A.C.E.R. Arithmetic Test, Form C parts 1 - 4

(d) N.Z.C.E.R. Silent Reading Tests - Word Knowledge and Speed of Reading

(e) A selection of the Torrance tests of creative thinking

For the final stage of the identification process the three scores from the Intelligence tests already used were aggregated, on the assumption that it was valid to do so in that each test had a mean of 100 and a S.D. of 15. Of the 106 children in this group there were 70 whose aggregate score was 380 or better (i.e. an average I.Q. of 126+ on a group test) and this group of 70 was tested on the Revised Stanford Binet. The cut-off point of 126 seems to be rather high in the light of the findings of Pegnato and Birch (Lucito 1963, p.191) which indicate that when group tests were used all students scoring above 115 needed to be considered candidates for final selection in order to identify 92 per cent of those above 135 on an individual I.Q. test. But in the final selection almost twice the number of children with I.Q. over 130 on an individual test were identified than would have been expected on the basis

of the normal distribution of intelligence. Therefore the screening procedure seems to have been liberal enough to catch most of those who could be considered gifted.

The distribution of I.Qs. of the 70 children on the Revised Stanford Binet test were as follows:

170 +	2	
160–69	1	
150–59	7	
140–49	16	
130–39	27	
120–29		10
110–19		6
100–09		1
	53	17

This means that 6.8 per cent of Std 3 children in Palmerston North schools ~~have~~ had an I.Q. above 130 compared with Gallagher's estimate of 2–4 per cent for average communities and 6–12 per cent for superior socio-economic communities (Lucito, 1963, p.193). This data along with information about the group's socio-economic background, to be referred to later, warrants some special study, but it is not germane to this particular study.

For the 53 who were finally classified as 'gifted', parental consent was sought for their participation in the two year project and, of these, 48 were ultimately chosen.

The screening and selection procedures for this project seem to have met the requirements and recommendations referred to previously in that group and individual intelligence tests, attainment tests, creativity tests, teachers and headmasters recommendations, and parental consent have all been considered.

However, it was the results of intelligence tests that received the major emphasis and the tests of creativity were not fully analysed prior to the final selection.

SECTION II: RESEARCH DESIGN AND METHODOLOGY

1. HYPOTHESIS

From the project's objectives, either stated or implied, the type of enrichment programme planned, and the topics for study it was possible to generate the following hypothesis:

That gifted children, undergoing a special programme of extra-curricular tuition and guidance, will show significant improvement in:

(a) General thinking and reasoning abilities
(b) Productive and evaluative thinking abilities
(c) Attainment in Mathematics, and Science
(d) Reading ability
(e) Study skills and habits
(f) Interests in and attitudes to school and school activities
(g) Desirable personality factors

2. EXPERIMENTAL DESIGN

MATCHED GROUPS

To test the above hypothesis it was necessary to have two matched groups - a control and an experimental group. The groups were matched on the basis of I.Q. (Stanford Binet), sex, and socio-economic background.* The fathers' occupations were divided into three groups -

(a) Professional, comprising the professional, the semi professional and managerial;

(b) Intermediate, comprising the armed forces, trades, small owners and proprietors, clerical and sales;

(c) Non-skilled. 32 per cent of cases came in group (a), 56 per cent in group (b), and 12 per cent in group (c) making possible a fairly even distribution from each of these categories in both the experimental and control groups. (See Appendix B).

* Matching done by members of the Committee.

The decision to control socio-economic background by using it as one of the matching criteria is supported by the overseas and New Zealand evidence that there "is a distinct relationship between the occupations of fathers and the intelligence of their children" (Parkyn, 1953, p.115). There is also evidence that the father's occupation is a reasonably good index of socio-economic status. In his study of gifted children Parkyn (1953, Chap.6) classifies occupations of fathers into seven categories in his attempt to find correlations with this factor and such aspects as level of achievement, length of schooling, breadth of interests and attitude to education. The study by Havighurst and others (1954) also attempts to establish indices of socio-economic status, and although they claim that a composite of occupational rating, dwelling area and house type gives greater predictive power they also state that "if one index alone is to be used the best one is occupational level" (Havighurst, 1954, ISS p.14).

The limiting of the socio-economic categories in terms of fathers occupation to three was wise in view of the relatively small numbers in the total sample. In other New Zealand studies a greater number of categories has been used. Parkyn (1953) used seven based on a scale adapted by McQueen and used in several studies sponsored by the New Zealand Council for Educational Research. In Havighurst's (1954) study the occupational status of the father was assessed roughly according to a scheme worked out by Congalton and Havighurst (1953) but modified and simplified for use in the communities being studied. Four categories were used - professional and managerial; higher clerical and small business; skilled and service workers; labourers. "The occupations were rated by teachers in the community who were acquainted with local variations of occupational status, and who took into consideration the individual factors that affected the status of some people" (Havighurst, 1954, II-4). This is the same sort of procedure that was used by the Palmerston North committee in deriving their three categories.

Consideration was also given to the evidence that a number of the pupils were significantly retarded in certain aspects of Arithmetic as determined by the A.C.E.R. test. It was not possible, with the numbers available in the total sample to ensure satisfactory matching of this attainment criterion but in the final composition of the two groups the overall level of achievement in Arithmetic was comparatively even. An added complication was the fact that for their 1966 school year the children would be spread over eleven classes in eleven schools and to keep the classroom experience as similar as possible for the two groups overall it was necessary to try to match children, group for group, in each classroom. It was not possible to control this factor and in the final arrangement of the groups there were five classrooms without matching pairs, involving three children from each group. Nor was it possible to plan at the outset to control the teacher variable for the second year of the project when the children would move on to an Intermediate school. In fact at this stage all the children were spread over four classes - in one class there was a single child from the control group, in another 10 from the control and 11 from the experimental, in a third 3 from the control and 4 from the experimental, while in the fourth class there were 9 from the control and 8 from the experimental. This inability to match or balance the teacher variable and the classroom experience for the whole group was unfortunate but unavoidable. Nevertheless, within the limitations imposed on the project, this variety was spread fairly evenly over both groups.

The matching, and the placement throughout the eleven classes for the Std. 4 year, are as follows:

Matched Pairs

Control Group					Experimental Group				
Pupil	Binet I.Q.	Socio-econ. group	Retarded in Arith.	Class	Pupil	Binet I.Q.	Socio-econ. group	Retarded in Arith.	Class
Boys									
J.B.	170+	B		8	J.H.	170	B		4
C.M.	159	B	*	4	S.A.	163	C		3
T.B.	153	A		9	P.N.	151	A		5
T.A.	151	B		4	M.T.	147	A		2
N.B.	149	C		9	B.W.	142	B		1
S.B.	141	B	*	7	R.L.	139	B	*	9
J.O.	138	A		2	A.M.	136	B		5
D.B.	137	A		1	R.R.	134	A	*	7
G.A.	134	A		5	P.L.	133	C		3
M.D.	134	B		7	P.O.	135	B		9
R.S.	133	A		4	A.R.	132	A		4
R.W.	133	B		10	K.L.	131	C	*	9
Girls									
C.L.	146	B		4	P.P.	156	B	*	10
B.W.	144	A		6	M.G.	153	A		4
C.G.	138	A	*	5	D.S.	143	A		6
B.V.	141	B		3	P.B.	142	B	*	7
G.T.	140	B	*	7	L.J.	141	C		10
H.Mc.	142	B		4	C.T.	141	B		1
A.D.	136	B	*	9	G.Mc.	138	B	*	3
T.W.	135	B		8	J.Mc.	138	B		11
L.P.	137	A	*	7	C.B.	137	A		7
S.H.	132	B		1	G.O.	134	B		8
C.R.	132	A	*	6	A.H.	133	B	*	7
L.W.	132	C		3	R.T.	134	B		8

In addition to the classroom experiences shared alike by children in both groups the experimental group had the benefit of the extra tuition and guidance referred to previously. No control was exercised over the classroom situation

in the project and, apart from information relating to the test results of the children participating, no specific help was given to class teachers, but the programme for the experimental group was organised and controlled by the Palmerston North Committee. The choice of tutors, topics and objectives were clearly in their hands but in effect the tutors chosen were relatively free to use whatever methods they thought appropriate and emphasise any aspects of topics or objectives that seemed important to them. No attempt was made to objectively evaluate each course that was undertaken, but tutors were asked to make

(a) a general report on the course to the Palmerston North Committee, and

(b) a written report on each pupil. For these latter reports a special report form was provided which included the following items:

"i. Evaluate this pupil's progress in -

(a) Reading is a thinking (sic) process (i.e. his ability to read in your subject, to understand fully what he read, and to draw from it its full significance).

(b) Research skills, (use of references, materials etc., making notes, evaluating when purpose achieved).

(c) Individual research or creative project.

ii. Evaluate pupil's ability to -

(a) Discuss a question.

(b) Listen to an argument (i.e. see how an argument relates to his own point of view).

(c) Follow an argument (i.e. correctly follow the course of an argument).

(d) Distinguish between fact and opinion.

(e) Draw conclusions.

(f) Organise own ideas.

(g) Co-operate with other children.

(h) Accept responsibility.

(i) Accept own errors.

iii. Did the pupil show signs of having -

(a) Used opportunities for individual creative and research work.

(b) Developed special interests in one or more subjects.

(c) Changed his attitude to studies.

(d) Developed plans for his future. "

This type of evaluation suffers from two major weaknesses as far as the whole project is concerned. First, the subjective nature of the report is such that it is almost impossible to compare one tutor's reports with another and arrive at any valid conclusions about progress or standards achieved. Secondly, it is not possible to compare these results from the experimental group with anything comparable for the control group to determine if there are any significant differences.

STATISTICAL METHODS

It was necessary in this situation, to set up an evaluation programme whereby objective tests and rating scales could be used on both groups at the beginning and end of the special tutoring period. From the results of these pre- and post-tests it would be possible to determine if there were any significant differences between the groups that might be attributable to the effect of the tutoring programme.

The relevant factor in this situation is one of change - how much has one group changed with respect to the other group over the two years of the project? Therefore, where the same standardised tests were used in both the pre- and post-test situations a 't' test would be used to determine the significance of difference between the mean change in the control group and that in the experimental group. This procedure avoids, on the one hand the problem of matching the groups on every factor to be explored, and on the

other any need for analysis of covariance to adjust post-test means in relation to any pre-test differences between the groups. The method to be used for finding a value for 't' was to compute a pooled SD by the formula

$$SD = \sqrt{\frac{(X_1 - M_1)^2 + (X_2 - M_2)^2}{(N_1 - 1) + (N_2 - 1)}},$$

and then to calculate the standard error of the difference by the formula

$$SD \sqrt{\frac{N_1 + N_2}{N_1 N_2}}.$$

't' is then obtained by dividing the actual difference between the means by the SE_D and by entering the table of 't' for the appropriate degree of freedom the level of significance can be found. (Garrett, 1958, pp.223-5) and (Paradine, 1960, pp.111-3). (See Statistical Appendix for worked example).

In some cases tests were used only in the post-test situation (e.g. the N.S.W. Reading battery) but as there was evidence that the groups were comparatively even on other tests allegedly measuring the factors or abilities at the beginning of the project, a test for significance of difference between means along the above lines would be used.

The foregoing parametric statistical methods assume that the data collected would come from tests that measured factors which are normally distributed throughout the population. This is true of all tests used except the Attitude Scale which had not been standardised before use with the gifted groups. Therefore, in this case a non-parametric statistic would be used, namely the Chi-square test as outlined by Siegel (1956, pp.104-111). To test the hypothesis that the two groups would differ with respect to their attitudes the amount of change within each group would be entered in a 2 x 3 contingency

table and 'independence values' for each cell would be calculated so that X^2 could be computed (Garrett, 1958, pp.262-4). (See Statistical Appendix for worked example).

In view of the relatively small size of the two groups and because they have come from such a select sample the .05 level of significance would be used. But as judgments concerning differences are never absolute but range over a scale of probability any differences between the .10 and .05 levels are given as they could be indications of significant change.

3. METHODS OF ASSESSMENT

When the objectives of a project are as broad as those for this particular project it is difficult to find evaluative instruments that will adequately determine the success or otherwise of some aspects of the programme. But, even within the limitations of this, it was possible to select a number of standardised tests and develop rating scales that would satisfactorily test the hypothesis that was chosen. The tests used and their relationship to each aspect of the hypothesis were as follows:

GENERAL THINKING AND REASONING ABILITY

During the selection procedure four intelligence tests were administered - Raven's Progressive Matrices, Tomlinson Junior School Test, Otis Self-Administering Test Intermediate Form B, and the Stanford-Binet Intelligence Scale Form L-M 3rd revision. The results of these tests, along with information form the Wechsler Intelligence Scale for Children, administered after the two groups were finally selected, provided a considerable amount of initial data on the groups' general thinking and reasoning.

For the post-test the Otis was re-administered. This was used for two reasons:

(a) As well as being a group test that is economical to use from point of view of time it also includes a reasonable selection of items that Knight (1950) would claim "are highly saturated with intelligence".

(b) From an analysis of all the data available from the identification and selection procedures Mr Harper, of the Psychological Service, concluded that although the Revised Stanford-Binet would be the best guide if intellectual ability was to be the sole basis for consideration, the Otis was the superior test if academic factors were to be taken into consideration (See Appendix BI). Insofar as this project was concerned with 'academically gifted children' and in the light of Vernon's (1958) stated relationship between intelligence and attainment it was considered that the Otis would provide satisfactory information for comparison in the post-test situation. However, if the results of this test had provided indications of significant changes between the two groups an individual test would have been used for further analysis.

PRODUCTIVE AND EVALUATIVE THINKING ABILITIES

For both the pre- and post-tests the following selection of 'Creative Thinking Tasks' from Torrance (1960) and Guilford (1959) were used:

Non-verbal tasks	-	Incomplete figures task Form A	Torrance
		Circles Test	
Verbal tasks	-	Unusual uses (Tin can)	
		Consequences Form B	
Plot titles test	-	Missionary in Africa	Guilford

These items, it was felt, would give a sufficient, though not a comprehensive, sample of the children's productive ability in that 'divergence' could be evaluated in terms of the variety of responses while 'convergence' could be assessed in relation to the uniqueness of responses. This later factor, associated as it is by both Guilford and Lucito with 'conventionally accepted

outcomes' is also measured to some extent by conventional tests of intelligence.

No specific tests of "ability to evaluate" were available. In fact, Guilford (1959, p.476) points out that this area has had the least investigation of all the operational categories. But insofar as evaluation refers to "reaching decisions or making judgments concerning the correctness, suitability and adequacy of information in terms of identity and consistency" (Lucito 1963, p.184) it was felt that some items in both the intelligence tests and attainment tests would involve this ability. For example in the S.T.E.P. Science test used, pupils are asked to evaluate critically, select adequate procedures, suggest suitable hypotheses, etc., all of which involve evaluative ability.

ATTAINMENT

Mathematics

Information for pre-test data was gained from two sources:

1. A.C.E.R. Arithmetic Test Form C parts 1 - 4.
2. Arithmetic sub-test of the W.I.S.C. Verbal Scale.

Neither of these tests provide completely satisfactory information about the pupils' understanding of mathematical concepts or processes but they did indicate the level of attainment in respect of basic tables, the four processes of addition, subtraction, multiplication and division, and solving relatively simple mathematical problems expressed in verbal terms.

In view of the fact that there was no significant difference between the two groups on these initial tests and in the light of their limitations, it was decided to use a different test altogether for the final evaluation. This was the Mathematics Test Form 3B of the Sequential Tests of Educational Progress series. This test, in addition to testing some aspects of computational skill

claims to evaluate the following mathematical concepts: number and the operations, symbolism, measurement and geometry, function and relation, proof, probability and statistics. (STEP Teacher's Guide, 1959).

Science

For both the pre- and post-test in this area the Science Test Form 3B of the Sequential Tests of Educational Progress series was used. This test is designed to evaluate pupils' skill in definite problems, suggesting hypotheses, drawing conclusions, evaluating critically, and reasoning quantitatively about subject matter connected with biology, chemistry, physics, astronomy, geology and meteorology.

READING ABILITY

During the selection procedure the Word Knowledge Test Form C of the A.C.E.R. Silent Reading Tests was administered. This same test was used again at the end of the project but, in addition, the Reading Test Form X of the N.S.W. Tests of Basic Skills was used. This latter test was chosen because it seems to be a more effective measurement of the complex functions in reading. In addition to the information it provides about vocabulary development data is also gained about the child's level of comprehension, separated into 'Literal' and 'implied' meaning. "Understanding of implied meaning would seem to demand a level of cognition beyond word recognition and recall of facts. In other words, reading is thinking". (Clark, 1966, pp.15-15).

STUDY SKILLS AND HABITS

For both pre- and post-test occasions the Work-Study Skills Test B Advanced (Grades 5-9) of the Iowa Every-Pupil Tests of Basic Skills was used. This test covers a wide variety of skills in the areas of map reading, use of references, use of index, use of dictionary, and reading graphs, charts and

tables. No attempt was made to interpret the scores in terms of age or grade equivalent norms. The raw scores were considered in each case on the assumption that this would be a sufficient indicator of any significant changes or differences in mean scores.

INTERESTS IN AND ATTITUDES TO SCHOOL AND SCHOOL ACTIVITIES

For evaluation (on both occasions) in this area an Attitude Scale was developed (See Appendix C) which was designed to determine how much the pupils liked or disliked each item listed. The format of the scale is similar to the attitude scale of Adams (1962) which he found as effective as other scales and in addition gave evidence of having validity against a behavioural criterion. Even though, in this test, pupils are constrained to conceptualise their attitudes not in words, as is customary, but in numbers there seems to be a reasonable degree of reliability in this procedure (Adams, 1962, p.205).

PERSONALITY FACTORS

The Children's Personality Questionaire was used for both the pre-test and the post-test for it appeared to assess reasonably well some of the characteristics of personality associated with the gifted. It was also felt that the results of this test might give some indication of personality factors that could be related to creativity along the lines suggested, in Information Bulletin No.10 (1963), for the 16PF test.

In a further attempt to assess personality factors a Rating Scale was devised for the class teachers to complete (See Appendix D). Each of the bi-polar factors was rated on a 9-point scale and the items were so arranged that what might be considered the favourable ends of the scale were sometimes at the high end and sometimes at the low end. This was done in an attempt to make the rater carefully consider his decision each time so that the results would be

more reliable. However, the value of this test was seriously undermined by the fact that so many class teachers were involved for a relatively small number of cases, and in addition to the change of teacher from Std 4 to Form 1, some of the pupils had a change of teacher during their Std 3 year.

In addition to the 20 items related to aspects of personality there were a number of items on which academic achievement, creative ability and study habits were also rated.

TEST ADMINISTRATION

Of the tests referred to the following were administered by members of the Psychological Service as part of the identification and selection procedures late in 1965 :-

Otis Self-Administering Test Form B
Raven's Progressive Matrices
Tomlinson Junior School Test
Stanford-Binet Intelligence Scale Form L-M 3rd revision
A.C.E.R. Arithmetic Test Form C parts 1 - 4
A.C.E.R. Silent Reading Tests Part 1 (Form C) and Part 2 (Form I
A selection of sub-tests from Torrance's (1960) 'Creative thinking tasks'.

On the basis of data from these tests, and the information about socio-economic status, members of the committee were able to match pupils for the two groups.

When the two groups had been selected the Wechsler Intelligence Scale for Children was administered to each child by members of the Psychological Service w some assistance from staff members of the Education Departments of Massey Univers and the Palmerston North Teachers' College.

All the other tests, as well as the re-tests with the Otis, the Creativity tests and the A.C.E.R. Silent Reading Tests Part 1, were administered by the investigator over 5 separate testing sessions, first in February 1966, and again in late November 1967.

SECTION III: ANALYSIS OF DATA

Intelligence Test Results

The following figures indicate the range and level of intelligence in relation to age, sex, and socio-economic group.

Experimental group:

Pupil's Initials	Sex		Date of birth	Socio-econ. group	I.Q.s				
	M	F			WISC Verb.	R.S.B.	Otis	Tomlin	Raven
S.A.	M		6.11.55	C	147	163	142	123	125+
P.B.		F	11.12.55	B	120	142	135	121	125+
C.B.		F	23. 4.56	A	120	136	136	111	125+
M.G.		F	1. 6.56	A	125	153	130	118	125+
A.H.		F	25.11.55	B	128	133	130	123	115
J.H.	M		13. 3.56	B	148	170	154	132	125+
L.J.		F	28. 8.56	C	121	141	139	120	125+
R.L.	M		10. 2.56	B	123	139	132	122	125+
P.L.	M		11. 3.56	C	131	133	140	121	-
G.Mc.		F	4. 6.55	B	114	138	132	129	125+
J.Mac.		F	2. 3.56	B	135	138	139	128	125+
A.M.	M		19. 1.56	B	119	136	131	125	125+
P.N.	M		22. 6.55	A	133	151	150	126	125+
G.O.		F	8.10.55	B	111	134	126	117	125+
P.O.	M		24. 9.55	B	128	135	136	117	125+
A.R.	M		12. 4.56	A	140	132	133	126	122
R.R.	M		6. 9.55	A	137	134	136	128	125+
P.S.		F	18.12.55	B	134	156	127	120	125+
R.T.		F	31. 5.56	B	126	134	131	118	125+
M.T.	M		10.12.55	A	131	147	132	123	125+
C.T.		F	20. 1.56	B	137	141	134	123	125+
D.S.		F	18. 5.56	A	121	143	143	124	125+
B.W.	M		14.11.55	B	126	142	135	122	125+
Total	11	12							
Mean					128	141.8	135.7	122.2	123.9(?)
Range					111-148	132-170	126-154	111-132	115+
S. D.					9.45	9.9	6.2	4.5	

Control group:

Pupil's Initials	Sex M	Sex F	Date of birth	Socio-econ. group	I.Q.s WISC Verb.	R.S.B.	Otis	Tomlin	Raven
T.A.	M		6. 5.56	B	142	151	137	126	125+
G.A.	M		25. 6.55	A	130	134	137	120	115
J.B.	M		27. 2.56	B	140	170+	142	135	125
S.B.	M		24. 6.56	B	139	141	131	120	125+
D.B.	M		11. 3.56	A	121	137	129	121	125+
N.B.	M		29. 5.56	B	130	149	145	123	125+
A.D.		F	10.10.56	B	128	136	134	117	125+
M.D.	M		6.11.55	B	128	134			
C.B.		F	25.12.55	A	126	138	135	124	125+
S.H.		F	1. 8.56	B	134	132		121	125+
C.L.		F	19. 4.56	B	130	146	135	123	125+
H.McI.		F	5. 7.55	B	131	142	137	120	125+
C.M.	M		4.12.55	B	135	159	140	122	125+
J.O.	M		25. 4.56	A	130	138	132	132	125+
L.P.		F	8. 1.57	A	131	137	134	121	125+
C.R.		F	4. 6.56	A	135	132	133	121	125+
R.S.	M		18. 8.56	A	128	133	145	126	125+
G.T.		F	6.11.56	B	140	140	134	124	125+
B.V.		F	24. 9.55	B	135	141	134	121	
T.W.		F	23. 5.56	B	139	135	143	120	95
L.W.		F	5. 5.56	C	133	132	136	121	125+
B.W.		F	14.10.56	A	139	144	139	124	125+
R.W.	M		28. 9.55	B	120	133	140	125	125+
Total	11	12							
Mean					133	141.1	136.36	123.3	123.5(?)
Range					120–142	132–170+	129–145	117–135	95+
S.D.					6.0	9.0	4.2	4.1	

These figures, collected during the identification and selection procedure, indicate quite clearly that the group tests of intelligence fail to discriminate effectively in the upper range. The Raven ceiling is far too low for this

purpose, and when one considers the I.Q. of 95 for one of the girls it appears to be rather inconsistent also. The range of the Otis is somewhat limited, but it does appear to be selective of gifted pupils provided the cut-off point is taken at 120 approximately. The range of scores and the difference in means on the W.I.S.C. is also rather surprising, but it must be remembered that the two groups were matched on the Binet and the administration and scoring of the W.I.S.C. were done by at least 5 different testers and at different times.

A comparison of sex differences reveals that the boys were superior in all cases. This has been the case with previous groups and is possibly accounted for by the fact that generally on intelligence tests, although the means for boys and girls are comparable, boys tend to be found at the extremes of ability ranges more than girls do.

	Stanford Binet	WISC Verb	Otis	Tomlinson
Mean for boys	143.5	131.8	137.4	124.4
Mean for girls	139.4	128.9	134.6	121.2

The data from the pre-test and post-test on the Otis and the Raven revealed no significant differences between the means of the two groups, either in terms of I.Q. or raw score.

Mean I.Q. (Otis):

	Pre-test	Post-test
Experimental	135.7	133.3
Control	136.36	132.6

t_{41} (between means of differences) = .08 $P > 0.10$

Mean raw score (Otis):

	Pre-test	Post-test
Experimental	51.2	66.86
Control	49.25	65
Difference	1.95	1.86

t_{41} (between means of differences) = .09 $P > 0.10$

Mean raw score (Raven):

	Pre-test	Post-test
Experimental	46.1	49
Control	43.9	46.4
Difference	2.2	2.6

t_{40} (between means of differences) = .61 $P > 0.10$

Creativity Test Results

Although the 4 tasks used in this section were taken from the selection published by Torrance in 1960 it was found that there were no suitable scoring procedures and the norm data was only tentative. Consequently the scoring guides published in 1966 were used as a basis for evaluating the pupils' responses in respect of fluency, flexibility and originality. In each case the fluency score was easy to determine in that it is simply the number of separate and relevant responses made in each task. The other two categories were much more difficult to evaluate objectively. . The flexibility score is obtained by counting the number of different categories into which the responses fall. For the Circles test and Unusual Uses (Tin can) lists of categories were provided which, it is claimed, would cover 99 per cent of responses. As these two tests are the same in both the 1960 and 1966 editions these flexibility categories were used 'as is' for scoring purposes. The later edition of the Incomplete Figures task is

different from the 1960 tests but the flexibility categories appeared to cover the responses made in this survey quite adequately; hence, these were used, as is, also. For the Consequences test no list of categories is provided - flexibility is defined as a change or shift in attitude or focus. Scoring for flexibility on this test is somewhat subjective but as all responses (both pre-test and post-test) were scored in a single marking session, there should be a reasonable degree of consistency in the marking.

Scoring for originality presented the greatest problem for, although the categories used for scoring flexibility were also given an originality weighting (0, 1 or 2) based on a frequency of occurrence in a large American sample, there is no guarantee that the same responses would occur with the same frequency in a New Zealand environment. However, it was futile with the small numbers in this local sample to determine frequencies of response that would clearly indicate originality. Consequently, in spite of the limitations the originality weightings as listed in the scoring guide were used as a consistent and relatively objective measuring tool. In the case of Consequences and Incomplete Figures the schedules for originality were entirely unsatisfactory. Instead of using these any item that was not duplicated by any other member in both groups received a single score.

No attempt was made to evaluate responses in respect of elaboration. In the scoring guides this scoring is listed as 'optional' for the verbal tests although it is used in the non-verbal items.

The results obtained were as follows:

(t-test between means of differences in each group)

Mean Scores	Pre-test		Post-test		t_{44}
	Control	Experimental	Control	Experimental	
-for FLUENCY					
Incomplete Figs.	5.7	5.0	5.0	5.0	.5
Circles Test	13.38	12.6	14.0	15.0	.9
Unusual Uses	6.6	7.7	6.4	7.8	.9
Consequences	5.7	5.3	6.9	6.0	.6
-for FLEXIBILITY					
Incomplete Figs.	5.0	5.0	4.3	4.5	.5
Circles Test	9.4	8.4	9.6	10.5	.5
Unusual Uses	4.8	5.5	5.3	6.4	.53
Consequences	2.1	2.2	3.5	2.8	.7
-for ORIGINALITY					
Incomplete Figs.	2.2	2.2	2.4	2.8	.94
Circles Test	13.6	11.5	11.2	14.2	2.34*
Unusual Uses	2.8	3.0	4.2	4.8	.37
Consequences	1.5	1.6	2.0	1.7	.6

* $P < 0.05$ In all other cases $P > 0.10$

Originality Score (all tests):

	Control		Experimental	
	Pre-test	Post-test	Pre-test	Post-test
Mean	20.1	19.6	18.0	23.4
Range	9 - 36	10 - 32	9 - 41	10 - 40
S.D.	7.55	7.1	8.65	5.25

t_{42} (between means of differences) = 2.47 $P < 0.02$

As measures of creativity these tests seem to have only a limited effectiveness. In all the tests, except the Circles test, there seems to be a limitation on the number of responses an individual will make. In fact in the Incomplete figures test the possible total for fluency is 6. When the fluency score is low it inevitably means that for most individuals the flexibility and originality scores will be even lower. With the range of scores limited in this way it is

not possible to fully explore individual differences in creativity. Wallach and Kogan (1965) further criticise these tests on the grounds that there is too heterogeneous an array of procedures in the attempt to operationalise the creativity concept, and furthermore the test atmosphere, with the use of time limits, mitigates against effective evaluation.

However, in spite of the limitations of the tests, it is interesting to note the significant differences that were found. They can fairly be held to indicate that the special programme for the experimental group has probably helped these pupils to think a little more divergently in some situations. The tutors were not bound by any restrictions relating to content or method and felt free to explore over a wide range. Pupils' own interests were catered for and the relatively free and relaxed atmosphere that developed would certainly be conducive to the production of unusual and original ideas. This opportunity to be more divergent and the satisfactions that it brings could well have some effect on the pupils' conceptual style.

It is a little surprising that, while there was a significant change in the experimental group's originality score, it was not matched by a similar change in the fluency score. Both fluency and originality are seen by Wallach and Kogan (1965) as significant factors in creativity. The tests they used proved to be highly reliable and it was found that while, on the one hand, these dimensions possessed generality and pervasiveness they were, on the other hand, quite independent of the traditional notion of general intelligence (p.292).

The Plot Titles Test, that was used, failed to give any results that could be analysed. The pupils were asked to provide a title for the story of the missionary in Africa who refused to marry the chief's daughter in order to save his life. The titles recorded were analysed by a member of the Teachers'

College Library staff who selected the following titles as the only original or unusual ones:

Control group:	Love in a cooking pot.	What a potty situation.
Experimental group:	Marriage gone to pot.	Eaten love.
	Missionary at stake (steak).	

Mathematics Test Results

The results obtained from tests given for selection purposes were as follows:

A.C.E.R. Arithmetic : (Attainment Groups)

	Control		Experimental	
	Mean	Range	Mean	Range
Addition	8.1	2 - 10	8.2	3 - 10
Subtraction	7.8	1 - 10	7.5	3 - 10
Multiplication	7.2	2 - 10	6.8	2 - 10
Division	7.3	2 - 10	7.3	2 - 10

W.I.S.C. Arithmetic Sub-test - (Raw Scores)

Control		Experimental	
Mean	Range	Mean	Range
11	8 - 15	11.2	9 - 15
	S.D. = 1.26		S.D. = 1.4

It is obvious that both groups were reasonably even in mathematical ability, at least as far as these tests measure it, and it was on this assumption that it was considered legitimate to use a different test for the final evaluation. It must be admitted that the S.T.E.P. Mathematics Test Form 3B tests aspects of the subject that are different from those in the A.C.E.R. but in view of the greater emphasis on the 'new' mathematics that these pupils were meeting over the two years of the project it was felt that the S.T.E.P. test would be more appropriate. The results from this test were as follows:

S.T.E.P. Maths Form 3B (Raw Scores):

	Control	Experimental
Mean	26.4	29.5
Range	15 - 42	16 - 44
S.D.	7.05	8.1

Testing for significance of difference between means of scores resulted in $t_{43} = 1.3$, which is not significant even at the 0.10 level. Therefore, it can be concluded that neither of the special studies in Mathematics contributed any worthwhile gains to the experimental group. However, in the first Mathematics course some attempt was made to provide remedial assistance for 8 members of the experimental who were considered to be seriously under-achieving in this subject as determined by the A.C.E.R. test. Had this test been used again in the final evaluation there might well have been an improvement in performance and a significant difference from the control group which also had a similar number of under-achievers.

Science Test Results

In February 1966 the S.T.E.P. Science test Form 4B was administered to both groups with the following results:

	Mean	Range	S.D.
Control	22	15 - 25	2.7
Experimental	22.5	17 - 29	2.58

Although this form of the test was designed for this age level it was felt that it was not discriminating enough for a group of gifted pupils, so at the beginning of 1967 when both groups had just entered Intermediate School a higher form of the same test - Form 3B - was administered. As the pupils would be beginning a more comprehensive science programme in this year and as Science was to be one of the special topics for the experimental group it seemed to be

important to have a set of results that would clearly show the range of individual differences in this subject. The same test was used again at the end of the year. Results from both administrations of this test were:

	Pre-test			Post-test		
	Mean	S.D	Range	Mean	S.D.	Range
Control	17.3	2.9	13 - 26	19.8	2.7	14 - 29
Experimental	18.8	2.9	13 - 24	21.0	2.3	15 - 26

t_{44} (between means of differences) = .55 $P > 0.10$

It is clear from a comparison of the ranges of scores on both forms of the test that Form 3B did not provide any more useful information than Form 4B, nor were the differences in mean scores between the groups of any significance.

Reading Test Results

When the Word Knowledge test of the A.C.E.R. Silent Reading series was administered during the selection process it was found that practically all the pupils in both groups were reading at the A.G. (Attainment Group) 8 - 10 level. In order to maximise the individual differences in reading ability the raw scores on this test were compared with the raw scores on the same test used in the post-test series. The results were:

	Pre-test			Post-test		
	Mean	S.D.	Range	Mean	S.D.	Range
Control	39.8	9.0	22 - 65	66.2	12.0	48 - 93
Experimental	39.5	7.35	30 - 55	68.0	13.95	45 - 90

t_{42} (between means of differences) = .11 $P > 0.10$

As both groups were comparatively evenly matched on the initial test and in an attempt to measure additional aspects of reading the Reading Test from the N.S.W. Tests of Basic Skills was administered in the final testing programme with

the following results:

N.S.W. Reading Test (raw scores):

(t-test between means of differences in each group)

	Control Mean	Experimental Mean	t_{43}
Literal meaning	25.6	26.5	.66
Implied meaning	27.0	26.7	.59
Vocabulary	43.9	44.8	.66
Speed	151	148.4	.57

The differences in mean scores between the groups were not significant (in each case $P > 0.10$), which would indicate that the committee's specifically state objective relating to reading was not realised, at least in measurable terms.

STUDY SKILLS TEST RESULTS

The results from the IOWA Work-study skills test for Grades 5 - 9 were:

(t-test between means of differences)

	Control (Means)		Experimental (Means)		
	Pre-test	Post-test	Pre-test	Post-test	t_{41}
Map reading	9.7	16.2	10.9	17.2	0
Use of references	8.7	13.5	9.4	13.0	1.66
Use of Index	8.5	14.3	8.5	14.0	1.25
Use of dictionary	9.0	16.0	10.3	16.5	.5
Reading graphs	7.4	12.3	7.4	12.5	.95
Total score	43.9	72.4	46.5	73.1	1.61

In this set of data there are no significant differences between means among the groups (in each case $P > 0.10$) so it would appear that the programme of tuition for the experimental group did not measurably make the 'tools of learning more effectively used'. However the value of 't' for the "Use of references" sub-test approaches the 0.10 level of significance and thus indicates

an interesting trend. But it should be noted that the trend is in favour of the control rather than the experimental group.

As a further check on study skills and habits the Form I teachers were asked to rate these pupils on a 9-point scale thus: (See App. D : item 25)

Work habits are good. Standard of work is poor or patchy.

Application and persistence. Poor study skills and work habits.

Uses study skills effectively.

1 2 . . . . . 8 9

This rating was done twice - early in 1967 when the class teacher had been with the class for approximately a month and knew the pupils reasonably well, and again at the end of the year. Mean scores for the groups were as follows:

	First rating	Second rating
Control	3.0	2.36
Experimental	2.5	2.5

These results reveal no significant differences between the groups and thus lend further support to the previous conclusion.

ATTITUDES AND INTERESTS

The scores from this scale were analysed to see how much each pupil had changed from pre-test to post-test. The amount of change was organised into three categories - i. a negative change of more than 5 points;

ii. a minimum change of up to 5 points in either direction;

and iii. a positive change of more than 5 points.

Within these three categories for each group a 2 x 3 contingency table was formed and a value for Chi-square was calculated to determine if the amount and direction of change in one group was significant with respect to the other group. The

results of this analysis are as follows:

Attitude to:	Control group means		Experimental group means		X^2 for df = 2
	Pre-test	Post-test	Pre-test	Post-test	
School	67.8	71.1	67.8	70.1	1.14
Teachers	67.4	59.8	61.8	59.5	.9
Arithmetic	65.9	62.2	64.1	64.7	.12
Art	87.3	81.0	85.9	83.2	.48
English	41.5	44.7	46.9	45.0	1.12
Spelling	59.6	55.3	64.6	56.0	1.45
Music	58.9	59.7	58.7	66.7	1.68
Social Studies	66.4	75.9	70.7	72.0	1.56
Science	65.7	60.4	66.3	65.7	3.42 *
Physical Education	82.1	72.3	69.4	74.8	.94
Being a leader	69.0	65.6	73.8	69.2	1.2
Being told what to do by adults	47.1	48.5	36.6	41.6	1.0
Helping at home	64.0	62.1	48.6	56.9	1.44
Going to church	61.0	50.0	51.9	42.4	.81
Watching T.V. news	66.2	68.8	61.6	68.6	2.12
Pop music	44.5	69.6	43.3	65.0	3.08
Team games	69.7	71.3	67.2	66.5	2.62
Writing stories	56.5	67.4	51.6	65.5	1.38
Doing things alone	58.5	64.5	59.7	66.4	1.4
Classical music	45.9	43.5	45.1	50.2	1.56
Visiting relations	61.9	56.0	58.3	49.8	.46
Going shopping	61.5	68.6	56.5	64.5	1.04
Obeying rules	64.8	56.9	49.6	45.9	1.44
Solving difficult problems	56.0	53.1	48.5	65.5	3.72 *
Choosing clothes	74.3	78.7	83.3	82.9	3.02
Doing tests	69.1	60.7	67.6	56.1	2.96

* P between .2 and .1 In all other cases P is greater than .2

Although there is no conclusive evidence of the effect, if any, of the

experimental programme there are some interesting trends showing up in the above data. The fact that the experimental group's attitude to Science is almost significantly better than that of the control group could be due to their satisfying and enjoyable experience of the Science unit which came last in the tutoring programme. It is less easy to see why their attitude to 'Solving difficult problems' is likewise almost significantly better, but it could be that in the tutoring programme that they had more opportunity to tackle problems and carry them through to satisfactory solutions. Both groups show interesting downward trends in their attitude to going to church and doing tests but upward trends in respect of Pop music, doing things alone, writing stories. The control group show a marked downward trend in attitude to teachers and Phys Ed which is not evident in the experimental group.

For both groups it seems that English, going to church and classical music are the things liked least of all while Art, Social Studies, Phys Ed., and choosing clothes are the things they like most. It must be born in mind, however, that for every item the scores ranged widely over the 100-point scale and for individual children there were some very marked changes in attitude which are masked somewhat by the statistical methods which had to be used with such relatively small samples.

Although this scale is primarily measuring attitudes it does reveal, insofar as a person tends to like what he is interested in, something of the interests of these groups. In the Rating Scale filled in by class teachers both groups were rated between 7 and 8 on the 9-point scale indicating that these pupils generally had wide interests, were well informed on a wide variety of subjects and showed intellectual curiosity, but there were no significant differences in mean scores within or among the groups.

PERSONALITY TEST RESULTS

The results from both administrations of the Children's Personality Questionnaire indicate that although many individuals obtained scores that were significantly high or low in the scale and some showed considerable changes in a few factors from the first to the second administration, the mean scores of the groups tend to fall within the average or middle range - stens of 5 and 6. Apart from Factor B (related to intelligence) the only factors that show a small but definite departure from the average are: A - reserved, detached, critical, cool; D - excitable, impatient; E - assertive, independent, aggressive, stubborn, dominant; G - disregards rules, undependable, by-passes obligations; and Q4 - tense, driven, overwrought, fretful. (See group profiles - Appendix E).

The mean C.P.Q. Sten scores and the values of t_{44} for test of significance between means of differences in each group are as follows:

	Control		Experimental		
Factor	Pre-test	Post-test	Pre-test	Post-test	t_{44}
A	5.5	4.4	5.8	4.0	0.9
B	7.8	7.3	7.6	7.8	1.01
C	5.8	5.3	6.2	5.8	0.6
D	6.0	6.1	4.8	6.6	2.84 *
E	6.2	6.8	6.2	7.0	0
F	4.5	6.3	5.1	6.6	0.76
G	6.4	4.2	6.4	4.0	0.6
H	5.6	5.2	6.5	5.2	1.52
I	5.7	5.0	5.4	4.0	0.8
J	5.2	5.8	5.1	6.4	1.22
N	4.8	5.3	4.7	6.1	1.37
O	4.8	5.4	4.6	5.4	.01
Q3	5.7	5.0	6.2	4.9	0.9
Q4	5.5	6.2	5.4	6.7	0.58

* $P < 0.01$ In all other cases P is greater than 0.10

The single case of a significant difference is interesting in that the disparity between the scores is found at the outset of the project when the C.P.Q. was first administered. A t-test of significance between the mean scores of the two groups on the pre-test gave a value for t which is significant at the 0.05 level. This would indicate that the experimental group, at the outset, was, as a group, more placid, self-sufficient, deliberate, self effacing, constant and phlegmatic than the control group. Why this should be so is impossible to determine from the data available for this survey. All that can be stated is, that by the time the test was administered for the second time the experimental group obtained scores which would indicate that they had become more like the control group in that they were then more demanding, impatient, attention getting, excitable, over active, self assertive, distractible and over-active. This change within the group itself was significant on a t-test well beyond the 0.01 level but it is not possible to assert that this change was the result of the special tutoring programme. It is possible that some chance factor gave rise to the initial disparity between the groups for in no other case of either personality or intelligence was this the case. This is especially likely in view of the fact that responses to only ten items in the questionnaire are used to determine the sten score for factor D and from this single score a bi-polar factor with some seven contrasting aspects is determined. The similarity of the two groups at final testing could indicate that the chance factors no longer operated and thus a truer picture is presented of the two groups who are similar in so many other respects.

It seems unlikely that a programme which gave attention to this group, which tried to meet their intellectual demands and which sought to develop their self-sufficiency should make the group impatient, attention getting and less self-sufficient. On the other hand, it is possible that the special tuition

and consideration they received could have increased their demand for attention, made them more egotistical and excitable, and may even have made them more impatient with some of their normal school work. But it is impossible to come to any firm conclusion about the cause of the significant change - it is not clear which aspects of this factor have been measured; the number of test items seem very limited; and some of the test items suggest situations that could be purely hypothetical for some members of the group. It should also be born in mind that, although there was a statistically significant change in scores between the groups, the mean score of the experimental group on both occasions lies within the average band. (See Appendix E).

Although it is clear that, as a group, the pupils who participated in the experimental programme did not show many significant personality changes over the two-year-period it would be interesting to analyse the background of those individuals whose scores changed considerably. It might also be fruitful to study individual cases in relation to the personality factors that are considered to be associated with the creative person - reserved, serious and self sufficient (IPAT Bulletin No.10, 1963) - but this line of research is not directly appropriate to this study.

An interesting study is that of Frierson (1965). He administered Form A of the C.P.Q. to two groups of gifted children (Mean I.Q. 132 on the Stanford Binet) matched for sex, age, ethnic background, grade and school experience. One group was of upper socio-economic status while the other was of lower socio-economic status. Neither of the group's means on the C.P.Q. deviated sufficiently from the population means to be classified other than normal and the mean differences between the groups were not significant enough to indicate that socio-economic background is a strong determinant of personality. In fact,

in comparing these groups with two average groups of similar status Frierson concluded that giftedness was a relatively stronger determinant than socio-economic background. However, there were some trends that were worth noting. The upper status gifted group was higher on factors G, I and Q_3, while the lower status gifted group was higher on factors D, F, J, N and Q_4.

In addition to the information from the C.P.Q. some interesting data was gained from the Rating Scale filled in by class teachers. The attempt to get teacher opinion in the first year of the project was unsuccessful as too many teachers were involved for the ratings to be summed with any degree of reliability. Even the first rating of the Form III teachers is somewhat suspect because of the relatively short time they had been teaching these pupils. But the final rating should be a reasonably valid one, insofar as subjective assessments ever are. No significant differences between the means for the final rating were found but it is interesting to compare the teachers' judgments about the groups' personality factors with the pupils' assessment of themselves.

Not all the items in the rating scale are directly related to the CPQ factors but a number are and in the summary to follow this relationship will be indicated.

F.I. Teacher's Second Rating (mean scores on a 9-point scale):

Attribute 1	through	9	Control	Experimental	Related CPQ Factor
Co-operative	:	Obstructive	2.3	2.8	J
Predictable	:	Unpredictable	2.2	2.0	
Assertive	:	Submissive	4.6	4.3	E
Depressed	:	Cheerful	7.0	6.9	F
Frivolous	:	Serious	7.6	7.6	
Attentive	:	Cool, aloof	2.6	3.3	A
Easily upset	:	Poised, self possessed	6.4	7.0	I
Suspicious	:	Trustful	7.6	7.4	
Good natured	:	Self centred	2.9	3.4	
Silent	:	Talkative	6.3	6.0	
Cautious	:	Adventurous	7.1	6.7	H
Socially poised	:	Socially awkward	2.8	2.9	
Rigid	:	Adaptable	7.2	7.1	
Dependent	:	Self sufficient	7.2	7.0	
Placid	:	Worrying	3.6	3.6	Q4
Conscientious	:	Not conscientious	2.5	2.6	
Imaginative	:	Unimaginative	2.9	2.7	
Frank	:	Secretive	3.2	3.4	N
Dependent minded	:	Independent minded	7.3	7.5	I

From these figures it can be seen that, in general, the pupils saw themselves as cooler and more aloof, but less assertive, cheerful, adventurous, self-possessed, co-operative, open and placid than did the teachers.

SECTION IV: CONCLUSIONS

1. SUMMARY OF FINDINGS

In this study 69 tests for significant difference were made but in all but two of the cases the differences between the two groups failed to reach the .05 level of significance. Consequently the hypothesis that was formulated (See p.24) must be rejected. As far as can be determined by the evaluative instruments used the special programme of tutoring failed to bring about any significant improvement in the group's general thinking and reasoning ability, productive and evaluative thinking abilities, attainment in Mathematics and Science, reading ability, study skills and habits, attitudes to school and school activities, and desirable personality factors.

The two cases where a significant difference was found - the C.P.Q. personality factor D which differentiates between the phlegmatic temperament and excitability, and Originality as determined by the tests of 'creativity' - do not warrant acceptance of even sections of the hypothesis. Considering the number of tests of significance that were made and the level of significance that was accepted it is not unreasonable to expect up to three cases of significant difference on a purely chance basis. But even if these two cases are not due merely to chance it is impossible to determine whether or not the tutoring programme produced the change. In neither case is there any supporting evidence. The change between the groups for C.P.Q. factor D was significant at the .01 level (See pp.51-2) so it might, therefore, seem that the special programme helped to develop excitable, impatient, demanding and over-active characteristics within the experimental group but as there were no similar changes in other factors, especially factor C, it is reasonable to assume the difference was due to chance. This assumption is supported by the

fact that at the outset this factor was the only one that showed a significant difference between the groups (See p.52). The change in scores for 'originality', which was significant at the .05 level (See p.42) might indicate that the special programme encouraged independent, original and divergent thinking. While it is true that this could be the case such an assumption would be rash in view of the fact that no such changes occurred in the other aspects of 'creativity' that were measured - fluency and flexibility.

In one case - the 'Use of References' sub-test of the Iowa Study Skills test - the results showed a difference between groups that was significant at the 0.1 level, but the trend towards a significant positive change was in favour of the control rather than the experimental group. (See pp.47-8). It is conceivable that the members of the experimental group relied heavily on the tutors as resource personnel or were provided with pre-selected reference material which required only a minimum of research on the part of the pupils, whereas the control group without this special help would have to rely more on their own initiative and research skills to find and process reference material. But this can only be an interesting speculation for the evidence does not warrant the making of any firm conclusion. In three other cases the difference in amount of change between the groups approached, but did not reach the 0.1 level of significance - C.P.Q. Factor H with a trend on the part of the experimental group towards more shy, restrained and timid behaviour (See pp.51-2); attitudes to Science and Solving Difficult Problems with the trend in both cases towards a greater liking for these things on the part of the experimental group (See pp.49-50).

However the significant differences and the trends noted above are insufficient grounds for not rejecting the hypothesis - the weight of evidence is clearly in the other direction. It is, perhaps, not surprising that there

were not more dramatic and significant changes in relation to thinking abilitie and intellectual function for these only alter appreciably as the result of considerable and long-term environmental changes (Lynn, 1959 and Vernon, 1958). Likewise it was probably rather optimistic to expect significant changes in attitudes and personality factors over so short a time without providing some unusual or traumatic experience. But it is disappointing that in areas of attainment, reading, and study skills that one might have assumed would have been responsive to special educational influences, no really significant results were found.

2. INTERPRETATIVE COMMENTS

Even though the hypothesis must be rejected this does not necessarily mean that the pupils in the experimental group did not receive some benefit from their extra studies. There is clear evidence that most of the special programmes for educating gifted children are regarded by investigators and by the gifted themselves as providing valuable educational experiences for which the cost and trouble involved are amply justified (Carter, 1957). But, in this project, any benefits that might have accrued from the educational experiences were either (a) too insignificant to be discerned by the tests that were used, or (b) were of such a nature as to be quite distinct from the dimensions that some of the tests were measuring.

(a) If the influence of the programme of tutoring was so slight that significant differences between the groups did not eventuate this could be due to a number of factors:

(i) Length of course

As each topic was studied for only a term, the time available would vary between 20 and 30 hours in each case. A proportion of the time

would be utilised in establishing satisfactory teacher-pupil relationships before the maximum benefit of the small teacher-pupil ratio could be realised. Some of this time would also be required for the tutor to appreciate each child's individual strengths, needs, attitudes and abilities. When it is also realised that the group's attitudes to Teachers, Arithmetic, English, Social Studies and Science were not especially favourable it is not surprising that tutors did not make a bigger impact on the group as a whole in the relatively short time available. (See p.49).

(ii) Timing of course

Although it was necessary, for reasons already indicated (See pp.11-13), to hold the tutoring sessions in the evenings, this very fact could have mitigated against the success of the venture. Coming to courses after a day's work at school must have been an effort for, at least, some members of the group especially during the bleak middle term. It is a credit to the group that they did persevere throughout the two years with only a minimum of dissatisfaction with the evening hours. But the factors of tiredness near the end of the day, encroachment on their time to watch T.V., participate in club activities or follow their own hobbies, as well as the interference with school homework must have meant that group was not always in the most receptive frame of mind for experiences of the programme.

(iii) Tutors inexperience in educating gifted children

Even though the tutors, selected as they were from various sections of the Education service, brought with them a wide range of experience and skill in their respective spheres their experience of educating a group of gifted children was limited. Added to this is an apparent lack of direction on the part of the committee as to specific goals to be achieved or methods to be used. In each case the tutors were met by two members of the

committee who discussed the general aims and expectations of the project. Each tutor then prepared an outline of the course to be undertaken in his or her particular subject and this was submitted for approval. This procedure provides admirably for freedom and flexibility in course planning but it also throws the responsibility of interpreting and implementing the goals onto teachers already heavily committed in their own sphere. It is feasible that, with their own particular backgrounds, they may have attempted to achieve goals that were too broad for either the time at their disposal, or for the tests to identify.

Although there is little documented evidence to prove that generally excellent teachers would not also be excellent teachers for the gifted, it must be recognised that some writers as well as gifted people themselves, especially those who are graduates of gifted programmes, consider that some special qualities are necessary (Freehill, 1961 : p.339). No one teacher is ever likely to have all the qualities considered to be important but it could be presumed that the teacher of gifted children should have some, at least, of the following: reasonably high level of intelligence, avid enthusiasm for learning, a strong personality, tact, openmindedness, alertness, thorough training, sense of humour, patience, wide interests, fairness and impartiality, flexibility, and a thorough knowledge of his subject. These, and many other qualities that are often listed, are summed up in Freehill's (1961, pp.341-2) list of teacher characteristics which are peculiarly important in the education of the gifted -

i. Ability to use laboratory and workshop methods.

ii. Competency and a zest for learning.

iii. Ability to understand and recognise gifted children.

iv. Effective teaching techniques.

In that the aims of the Palmerston North project were more process-oriented than product-oriented the role of the tutor 'necessitates

(1) mastery of a teaching approach that introduces students to material at the exploratory level,

(2) experience that manifests itself in the continuing pursuit of knowledge,

(3) pre-planning to insure presentation of materials at the exploratory level,

(4) intentional interruption of the "lock-step" sequential development of ideas and

(5) teacher involvement in the learning process to the extent that there is an awareness of individual students' involvement' (Barbe, 1965 : pp.322-3)

It seems probable that teaching gifted children effectively requires a different concept of teaching from that which the tutors were likely to have developed from their own background of experience.

(b) If, however, the ineffectiveness of the programme is only apparent, not real, and due to the inability of the tests to measure what changes did occur this could have been the result of the following factors:

(i) Disparity between the objectives as stated and as implemented

It may fairly be assumed that the standardised tests used were designed to measure most of dimensions that the committee hoped to develop in the course of the programme. The selection of the tests to match the objectives has already been referred to. It could be argued that the tests available for this survey were not necessarily suitable in that they were designed and standardised on a population with a different educational background from the sample in this particular project. But in that this was a comparative study where the differences rather than the absolute scores in such areas as general thinking ability, specific reading and study skills

were important this is not a serious defect. It might also be argued that neither the Children's Personality Questionnaire nor the Torrance Tests of Creativity were adequate tests of the committee's objectives - desirable personality factors, and productive and evaluative thinking abilities. But Frierson (1965) found both of these useful in his study of differences between two groups of gifted children and insofar as the committee aimed to develop independence, self-reliance, tolerance, reliability, responsibility and a critical attitude the C.P.Q. would seem to be reasonably adequate. The Torrance tests of 'creativity' would probably measure some aspects of productive thinking but would not be entirely adequate for measuring evaluative thinking.

Another, and more likely, assumption is that the tutors conceived the objectives too broadly and were unable to implement them in the time available. Aims such as 'making the tools of learning and thinking more accessible to the children' and 'providing enriching aesthetic experiences' are too general to be satisfactorily implemented in a short course. Even when these aims were developed more specifically as outlined on page 9 the behavioural outcomes were not specific enough to be readily developed or tested.

On the other hand where specific areas of knowledge and skills were developed by the tutors in line with their own interpretation of the objectives it is possible that these specific factors are significantly different from those being evaluated by the tests used.

If, in fact, this discrepancy between project objectives and test objectives made a significant contribution to the reasons for rejecting the hypothesis, it is obvious that for any future project of this nature a different approach would be worthwhile. In terms of knowledge, and

intellectual abilities and skills it would be an advantage to try to develop quite specific factors such as those referred to by Bloom (1956), Lucito (1963) and Guilford (1959). It is suggested by Guilford that each goal ability, defined by a certain combination of content, operation and product, calls for certain kinds of practice in order to achieve improvement. This implies choice of curriculum and the choice or invention of teaching methods that will most likely accomplish the desired results. Almost the same position is taken by Bloom (1956, p.26) when he claims that educational objectives should be explicit formulations of the ways in which students are expected to be changed by the educative process.

It is clearly indicated (Bloom 1956, p.144) that the explicit objectives referred to as intellectual abilities and skills may be found as the objective of any field of study. Skill in 'analysis', for example, is frequently expressed as one of the important objectives by teachers of science, social studies, philosophy and the arts. But these specific objectives, almost regardless of subject areas, are not only the goals towards which a curriculum should be shaped and toward which instruction is guided. They also provide goals for the construction of evaluative techniques to test the extent to which pupils have attained each of the major objectives of any unit of instruction.

(ii) A 'Sleeper' Effect

In their longitudinal study of psychological development Kagan and Moss (1962) concluded that the effects of specific early experiences are often not evidenced for long periods of time. Their long-time course is one of the major characteristics of psychological phenomena and there may be a lag between a cause and the open manifestation of the effect. It must be admitted that Kagan and Moss (1962, p.277) were considering major experiences

like maternal deprivation during the first year of life and its effect on later development of self-esteem and intellectual skills, but it does not seem to be unreasonable to suggest that some of the experiences of the pupils involved in the Palmerston North project could eventually have a significant effect, especially in connection with their attitudes to and interests in the subjects of the curriculum.

A further study which hints at the possibility of a 'sleeper' effect which could account for the lack of immediate significant changes in ability is reported by Hunt (1961, pp.275-77). Kindergarten children were given special 'number experience' but the pay-off in competence was not immediately evident. In fact these children were for some years in the bottom half of their classes. However, after five years all the children who had had this early experience were in the upper third of scores on a standardised test.

Although there is no direct evidence to support the contention that a 'sleeper' effect in any way contributes to the results obtained in this study it is interesting to speculate on its possibility. The significant difference that was found in the Originality scores are not very momentous, especially in view of the difficulty of establishing suitable criteria of originality with such a small sample, but it could be a hint that in the whole area of creativity there could be a long-term effect. The opportunities that pupils had to investigate topics of their own choosing, the encouragement and freedom to explore, hypothesise and evaluate could well be the basis of productive and evaluative thinking at a later stage when the restrictions of a rigid and conforming education system are no longer present.

A further issue, fundamental to both of the above considerations, concerns the validity of the matching of the two groups for on this the whole research

design could stand or fall. The main variable to control, apart from the obvious ones of age and sex, was intelligence for this dimension was the basis of the definition used for giftedness. Considering the number of cases available the matching for I.Q. has been remarkably well done - in all but four of the cases pairs differ by less than 5 I.Q. points. The four larger variations range up to 10 points but as the S.E.$_{Meas.}$ of the Binet test is 5.9 at this level these variations are not especially significant.

Many writers would argue that socio-economic status is also an important consideration in relation to gifted children. It has been shown (Lucito, 1963, p.195) that more gifted children come from homes where the social and economic level is above average, such as those with professional and managerial parents, for in these the environment is more intellectually stimulating and the interest in higher education is greater. Furthermore, it has been shown (Frierson, 1965, pp.87-8) that there is a significant difference between the top 20 per cent of gifted children from upper and lower socio-economic backgrounds on tests of creativity. It was appropriate, therefore, that an attempt be made to control the socio-economic background variable, but as the table on page 27 shows, it was not possible to control this without destroying the matching for intelligence. Only 15 of the 24 pairs are adequately matched, and one of the other pairs has a child in each of extreme categories in the scale. But this inadequacy may not be as significant as it at first seems for Havighurst (1954, II-10) concludes that in New Zealand only 5 - 10 per cent of the variance in educational attainment is closely related to socio-economic status, whereas intelligence accounts for up to 60 per cent. Havighurst agrees with Parkyn (1948) that there is a more important "motivational" aspect of the home that is best considered separately from socio-economic status.

It is clear that it was not possible to match pairs on the basis of attainment in Arithmetic or classroom experience, but this is not necessarily a critical factor. When it is not possible to set up groups in which subjects are matched person for person it is admissable to match groups in terms of mean and standard deviation even when the numbers in each group differ. The matching variable is usually different from the variable to be studied, but should be related generally to it. Under circumstances such as these there are statistical methods for determining the significance of difference between means (Garrett, 1958, pp.230-2). Furthermore by using the technique of analysis of covariance it is possible to compare groups that are initially unlike without being concerned with 'matching pairs' or 'matching groups'. "Neither of these methods of matching is entirely satisfactory and neither is easy to apply. Equivalent groups often necessitate a sharp reduction in size of N (and also in variability) when the matching of scores is difficult to accomplish. Furthermore, in matched groups it is often difficult to get the correlation between the matching variable and the experimental variable in the population from which samples are drawn". (Garrett, 1958, p.295).

The conclusion, then, is that the 'matching' of the groups was adequate for the research that was undertaken, for the major factors of age, sex and intelligence were well controlled by matching pairs; the groups were fairly evenly matched on mean and S.D. for most of the other variables that were analysed; and adequate statistical methods were available to take account of situations where initial differences occurred between groups. Although the matching of the groups initially was adequately done, two of the boys left the district during the course of the project and, therefore, were not included in the survey. One of the boys (T.B. - Binet I.Q. 153, socio-economic group A) was from the control group, and the other (K.L. - Binet

I.Q. 131, socio-economic group C) was from the experimental group. This undoubtedly had some effect on the results in that the balance of matched pairs was upset. However, in that the high I.Q. was lost from the control group and the lower I.Q. was lost from the experimental group it would seem that the lack of balance would be in favour of the experimental group. An analysis of the changes in score of the 6 boys with the highest I.Q. and the 6 with the lowest revealed that, in general, the boys with the higher I.Qs. made the greatest gains. But, in spite of the fact that, with the two drop-outs, the experimental group had a slightly higher proportion of high I.Qs. this did not seem to benefit this group as a whole except in respect of the two areas of significant difference. Consequently, the factors in (a) and (b) above could conceivably account for the lack of significant differences between the groups which in turn led to the rejection of the hypothesis.

3. RECOMMENDATIONS

(i) The results from this survey do not support a programme for educating gifted pupils by extra-curricula tutoring and guidance of the type used in Palmerston North. If, however, it is necessary, because of the climate of opinion (Shallcrass, 1967, p.110), availability of resources and finance, to plan for enrichment outside the regular classroom any such scheme should:

(a) Be based on specifically and clearly stated objectives such as those contained in Bloom's (1956) Taxonomy to allow for the development of appropriate teaching methods and evaluative techniques.

(b) Provide for much more time in the study of any particular topic so that pupils will get the maximum benefit from studying in both breadth and depth.

(c) Operate at times of the day and week that are most suitable for the encouragement of effective learning.

(d) Utilise tutors who are not only carefully selected but also trained for this particular task (Carter, 1957).

(ii) An alternative that would appear to be feasible in the local situation would be to establish two special classes in strategic schools in the city. The special class is, perhaps, the commonest device for educating the gifted (Carter, 1957, p.589) and involves not merely enrichment nor ability grouping, but a class in which the curriculum has been restyled and specially tailored to meet the problem. O'Neill (1963, p.47) concludes, after studying the various acceleration, enrichment and segregation programmes for educating the gifted in Canada, that "the programme to be employed is special classes in regular schools". Many of the special class programmes have been able to break loose from stultified and conventional procedures thus facilitating enrichment.

It is true that there is a body of opinion that is opposed to special grouping and in favour of enrichment within the regular classroom. (Havighurst, 1955, p.24). But in a city the size of Palmerston North and in schools with class sizes of approximately 40 with little provision for specialist teachers it would be more economical and practical to establish special classes within some selected schools. This would combine the advantages of segregated classes while not isolating the pupils from the wider social and cultural influences of the heterogeneous school population.

(iii) A second, and perhaps more useful, alternative would be to institute a programme for gifted students which employs acceleration in the form of special progress plans. This is not merely 'skipping' classes but

special progress plans whereby individuals or classes may complete work at a faster pace than usual. Witty (1957, pp.512-3) claims that the values of acceleration are two-fold. First, it recognises the fact of individual differences. Secondly, it avoids the dangers of creating personality problems for those who are educationally beyond their classmates but who are held back with them are likely to become lazy and develop careless work habits. O'Neill (1963, p.29) also indicates that allowing a child to 'move ahead at a pace commensurate with his ability provides incentive and motivation, and motivation has been found to be one of the basic requirements in all learning'. In addition to these advantages acceleration is recognised as the most economical way to provide special education for the gifted. The basic curriculum of the school does not have to be disrupted, classes and classrooms do not have to be changed, and there is little extra cost to the school system.

As early as 1933 Witty and Wilkins summarised the literature on acceleration and found that moderate amounts of acceleration seemed justifiable for the gifted (Witty, 1957, p.512). In 1961 DeHaan and Havighurst cite Passow's contention that "the weight of experimental evidence tends to support the position of academic gains through acceleration of the gifted student at all levels. Research into the effects of acceleration on social and emotional adjustment has generally demonstrated no serious detrimental results... On the basis of available research there appears to be no issue as to whether or not some forms of acceleration should be used in school programmes...". Ward (1962) claims that although acceleration is a desirable practice it is often neglected probably because of ignorance of the research evidence that supports it. Pressey (1963) also indicates that the "research testimony as to the advantages of acceleration is weighty, consistent, and

continuous over several decades..... and is now being regarded more favourably than formerly". He also points out that "school entrance before the sixth birthday, non-graded elementary schools, summer sessions, rapid-progress sections in secondary schools, opportunities to earn advanced credit for college entrance, all facilitate progress without the educational gaps of grade-skipping, and with minimal danger of maladjustment. Much research evidence shows that these methods work well..... Wise acceleration has been found to save time and money for all concerned with no educational loss. Accelerated youngsters have been found more likely to go on to college and advanced training, and more likely to succeed in a career, than equally bright youngsters proceeding at the 'lock step' pace".

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A P P E N D I X "A"

CHECK LIST OF IDENTIFYING CHARACTERISTICS

FOR CHILDREN OF SUPERIOR INTELLECTUAL ABILITY

SUPERIOR INTELLECTUAL ABILITY

LIST OF IDENTIFYING CHARACTERISTICS

A. PROCEDURE

1. Fill in the accompanying blank with the names of children in your class, alphabetical order.
2. Read the first behaviour characteristic in the list below. Go down your class list and place number 1 after names of any pupils that stand out from the group on that first characteristic.
3. Read the second characteristic and write the number 2 after the names of those children who stand out on that characteristic.
4. Continue with the rest of the characteristics in the same way, keeping in mind the following basic observational procedures:

GIVE EACH CHILD EQUAL CONSIDERATION ON EACH BEHAVIOUR CHARACTERISTIC

OBSERVE EACH CHILD IN A VARIETY OF SITUATIONS

COMPARE EACH CHILD WITH THE REST OF THE GROUP

BE AWARE OF YOUR OWN BIASES

B. CHARACTERISTICS

1. Learns easily and readily.
2. Is an advanced reader for his age.
3. Shows alertness and quick response.
4. Is able to memorise quickly.
5. Makes frequent and effective use of library facilities.
6. Is superior in the quantity and quality of vocabulary as compared with other children of his own age.
7. Knows about many things of which other children are unaware.
8. Reasons things out, thinks clearly, recognises relationships, comprehends meanings.

9. In solving problems or pursuing interests, shows a high degree of concentration and perseverance.

10. Shows originality or imagination.

11. Follows complex directions easily.

12. Is superior in solving arithmetical problems.

13. Shows social and aesthetic sensitivity.

14. Has an enquiring mind.

15. Displays qualities of initiative and independence.

16. Shows marked talent or skill in some areas.

17. Has a wide variety of interests.

A P P E N D I X "B"

FATHER'S OCCUPATION AS DETERMINANT OF SOCIO-ECONOMIC STATUS

App. "B"

CONTROL
~~EXPERIMENTAL~~ GROUP

Boys	Father's Occupation	Girls	Father's Occupation
(a) Professional			
G.A.	Manager produce auction mart	C.G.	Manager motor business
T.B.	Primary teacher	L.P.	University lecturer
D.B.	Manager bakery business	C.R.	Primary teacher
J.O.	Lawyer	B.W.	University registrar
R.S.	Lawyer		
(b) Intermediate			
T.A.	Armed forces	A.D.	Army warrant officer
J.B.	Foreman horticulturalist	S.H.	Proprietor small business - bicycle shop
S.B.	Foreman, engineering plant	C.L.	Proprietor small business - jeweller
M.D.	Proprietor small business - stud breeder and milk vendor	H.Mc.	Builder
C.M.	Auto electrician	G.T.	Automotive engineer
R.W.	Builder - joint owner	B.V.	Proprietor fish shop
		T.W.	Nameplate engraver
(c) Non-skilled			
N.B.	Cement worker	L.W.	Factory storeman

EXPERIMENTAL ~~CONTROL~~ GROUP

Boys	Father's Occupation	Girls	Father's Occupation
(a) Professional			
P.N.	Hospital accountant	C.B.	University professor
A.R.	D.S.I.R. scientist	M.G.	Librarian
R.R.	Research scientist	D.S.	Optician
M.T.	Radiographer		
(b) Intermediate			
J.H.	Govt. Dept. clerk	P.B.	Proprietor electronics business
R.L.	Electrician	A.H.	Electrical draughtsman
A.M.	Builder	G.Mc.	Insurance agent
P.O.	Foreman, seed merchant	J.M.	Motor mechanic
B.W.	Photographer	G.O.	Cabinetmaker
		P.P.	Proprietor, engineering business
		R.T.	Motor mechanic
		C.T.	Auctioneer
(c) Non-skilled			
S.A.	Storeman	L.J.	Machinist
K.L.	Freezing worker		
P.L.	Welder		

A P P E N D I X "BI"

ANALYSIS OF DATA FROM INTELLIGENCE AND ATTAINMENT TESTS USED DURING SELECTION PROCEDURE

(Contributed by C.B.J. Harper, B.A., Dip Tchg.)

App. "BI"

SOME FIGURES FROM THE GIFTED CHILD SURVEY

On perusing the W.I.S.C. I.Q. scores of both the tutored group and the control group it appeared that there may be considerable imbalance between the two. As this possibility would affect the results obtained by Mr Forrest in his study and also as a calculating machine was available for a short period, it was decided to extract some statistical data from the figures available. This is as follows:

(1) Comparison of sex differences in the selected pupils (control and tutored group).

Stanford Binet	Mean for boys	143.54
	Mean for girls	139.37
W.I.S.C. (Verbal)	Mean for boys	131.75
	Mean for girls	128.87
Otis	Mean for boys	137.43
	Mean for girls	134.61
Tomlinson	Mean for boys	124.35
	Mean for girls	121.21
Ravens Matrices	Mean for boys	124.32
	Mean for girls	123.14
Reading	Mean for boys	132.27
	Mean for girls	124.10
Arithmetic	Mean for boys	109.68
	Mean for girls	108.86

Note: In reading and arithmetic, raw scores have been converted to standard scores, with means of 100 and standard deviations of 15. In the case of reading, word knowledge only was taken and in the case of arithmetic raw scores from all four mechanical tests were summed and then converted to standard scores. This was done to make direct comparison with I.Q.'s possible and also for further work on correlations.

(2) Comparison of tutored group with control group:

Stanford Binet	Mean for Control Group	141.13
	Mean for Tutored Group	141.79

W.I.S.C. (Verbal)	Mean for Control Group	132.75
	Mean for Tutored Group	127.87
Otis	Mean for Control Group	136.36
	Mean for Tutored Group	135.70
Tomlinson	Mean for Control Group	123.30
	Mean for Tutored Group	122.20
Ravens Matrices	Mean for Control Group	123.47
	Mean for Tutored Group	123.95
Reading	Mean for Control Group	128.71
	Mean for Tutored Group	127.91
Arithmetic	Mean for Control Group	109.85
	Mean for Tutored Group	108.78

CONCLUSIONS:

(a) There is a distinct sex difference in the selection made, the boys being superior in all respects. This apparently was also the case with the previous gifted group and would possibly be accounted for by the fact that generally on intelligence tests, although the means for boys and girls are comparable, boys tend to be found at the extremes of ability ranges more than girls do.

(b) The control group and the tutored group are reasonably even in ability. Except for the W.I.S.C. test, in no case is there a difference in means of more than 1.2 points. When it is considered that the groups have been balanced to contain equal numbers of each sex and also for socio-economic groupings this resulting evenness in such a relatively small total number is particularly good. The discrepancy in the W.I.S.C. results could possibly be attributed to the difficulties of standardising both administration and scoring of the test and also the fact that both groups were not tested at the same time.

(c) It would appear that except for about three cases these children are underperforming in mechanical arithmetic.

App. "BI"

SOME RELATIVE DIFFERENCES BETWEEN VARIOUS INTELLIGENCE TESTS

Using the figures available from the recent Gifted Child Project undertaken in Palmerston North, the following calculations and various correlations have been evolved. Initially two premises have been established as a basis on which to work.

(1) For a gifted group selection should be made on intelligence alone and preferably after consideration of scores obtained on several tests. A criterion for this premise has been established by averaging for each child all intelligence scores obtained - Revised Stanford Binet, W.I.S.C. (Verbal only), Otis, Tomlinson and Raven's Progressive Matrices.

(2) For a gifted group selection should not be made on the basis of intelligence alone but should be equally weighted with a selection of attainment scores. A criterion for this premise has been obtained by changing raw scores on arithmetic (A.C.E.R. 4 tests of mechanical arithmetic) and reading (A.C.E.R. Word Knowledge) into standard scores with a mean of 100 and a standard deviation of 15. The mean in each case of these two tests and the mean of the five intelligence tests mentioned in the first premise, have then been averaged. Thus each individual has a final score equally weighted with a selection of intelligence scores and a selection of attainment scores. It could be said that with this criterion we tend to select the intelligent plus the motivated.

With these two sets of scores (1) and (2), have been correlated the five sets of intelligence scores in an endeavour to show which test would be the best for selection purposes when time and resources do not allow an extensive battery to be administered. These figures are as follows:

(1) Correlations of individual intelligence test sets of scores with the set of scores described in premise (1) (Average of 5 intelligence tests)

Stanford Binet and Av. I.Q.	.7979
W.I.S.C. (verbal) and Av. I.Q.	.7205
Tomlinson and Av. I.Q.	.5931
Otis and Av. I.Q.	.5114
Ravens and Av. I.Q.	.2882

(2) Correlations of individual intelligence test sets of scores with the set of scores described in premise (2) (Intelligence plus attainment)

Otis and (I.Q. + Attain.)	.6684
W.I.S.C. (Verbal) and (I.Q. + Attain.)	.4423
Stanford Binet and (I.Q. + Attain.)	.4207
Tomlinson and (I.Q. + Attain.)	.3535
Raven's and (I.Q. + Attain.)	- .2283

Note: It must be remembered that this group of children (44) is highly selected and this makes a very narrow sample in comparison with a normal distribution. Correlations would be expected to be much higher if this same procedure was undertaken with a large randomly selected sample.

CONCLUSIONS:

1. If children are to be selected solely on the basis of intellectual ability it would appear that the Revised Stanford Binet Intelligence Scale (L-M) would be the best guide. It would also appear that either of the individual tests, W.I.S.C. Verbal or Binet, would be superior to any of the group tests.

2. However if attainment scores are to be given equal weighting with intelligence then the Otis group test could be superior to the others. A rather surprising feature of this section of the study was the negative correlation of the Raven's Progressive Matrices with the criterion score. This was followed up by correlating both the Ravens and the Otis tests with arithmetic and reading standard scores with the following results:

Otis and Arithmetic correlated	.3510
Otis and Reading "	.6305
Ravens and Arithmetic correlated	- .2362
Ravens and Reading "	- .3298

This would infer that the Otis test correlates more highly with reading than it does with other intelligence tests and would also reinforce that commonly held impression that the Otis test is the best predictor of academic success. It is doubtful whether negative correlations would have occurred between

between Ravens and attainment scores if a wider sample of population had been used but even so these results do tend to highlight the differences and possible uses of some of the available tests of intelligence

C.B.J.H.

31.5.66.

A P P E N D I X "C"

ATTITUDE SCALE

ATTITUDES

In this set of questions you are asked to show how much you "like" or "dislike" certain things or actions. If you "dislike" something you should put a cross (x) in the first set of little boxes (0–49) and if you "like" it, put a cross in the second set of little boxes (51–100). If you neither like or dislike it, put a cross in the neutral box (50).

Alongside the little boxes there is an enlargement of the box you have already chosen. This enlargement shows ten separate parts. Please put another cross in one of these to show whether your liking is near the low end or the high end of the box you marked first.

Remember: Each item needs two crosses, (unless you chose the neutral box (50) for your first one).

1. School

DISLIKE					NEUTRAL	LIKE				
0 to 9	10 to 19	20 to 29	30 to 39	40 to 49	50	51 to 60	61 to 70	71 to 80	81 to 90	91 to 100

0	1	2	3	4	5	6	7	8	9

(similarly for the following categories)

2. Teachers

3. Arithmetic

4. Art

5. English

6. Spelling

7. Music

8. Social Studies

9. Science

10. Phys. Ed.

11. Being a leader

12. Being told what to do by adults

13. Helping at home

14. Going to church

15. Watching the T.V. news

16. Pop music

17. Team games

18. Writing stories

19. Classical music

20. Visiting relations

21. Doing things alone

22. Going shopping

23. Obeying rules

24. Solving difficult problems

25. Choosing your own clothes

26. Doing tests

A P P E N D I X "D"

RATING SCALE FOR TEACHERS' USE

App. "D"

RATING SCALE

Indicate the subject's rating for each attribute by placing a cross (x) on the appropriate number,

e.g. If subject is very co-operative place a cross on 1, if moderately so, on 2 or 3. If the subject is extremely obstructive place the cross on 9.

ATTRIBUTES

.	Readiness to co-operate. (Generally tends to say "yes" when invited to co-operate. Ready to meet people more than half way. Finds ways of co-operating despite difficulties.	1	2	3	4	5	6	7	8	9	Obstructiveness. (Inclined to raise objections to a project. Cynical "cannot be done". Not inclined to join in. Inclined to be difficult.
.	Predictable. Consistent in day to day attitudes and behaviour	1	2	3	4	5	6	7	8	9	Unpredictable. Frequent shifts in attitudes. Shows changing unpredictable moods and impulses.
.	Assertive. Tends to dominate or influence his associates without being invited. Tends to be assertive and boastful.	1	2	3	4	5	6	7	8	9	Submissive Tends to let people have their own way. Tends to back down in a conflict. Humble, retiring.
.	Depressed. Tends to be depressed. Not easily moved to smiles or laughter.	1	2	3	4	5	6	7	8	9	Cheerful. Generally bubbling over with good cheer. Optimistic. Enthusiastic. Prone to cheerful witty remarks.
.	Frivolous. Not inclined to take responsibilities seriously. Thoughtless. Unaware of responsibilities of his age.	1	2	3	4	5	6	7	8	9	Serious. Accepts appropriate responsibilities towards others. Shows seriousness of purpose.
.	Attentive to people. Interested in people, their troubles and personalities. Makes friends with people and remembers their personal interests.	1	2	3	4	5	6	7	8	9	Cool. Aloof. Tends to be indifferent to or to ignore people.

.	Easily upset. Easily embarrassed or put off balance. Gets confused in emergency. Blushes, shows excitability, becomes incoherent.	Unshakable poise. Self possessed. Does not lose composure under emotional provocation.
	1 2 3 4 5	6 7 8 9
.	Narrow interests. Uninformed in many areas. Narrow, simple interests. Provincial outlook.	Broad interests. Has wide interests. Well informed on a wide variety of subjects. Shows intellectual curiosity.
	1 2 3 4 5	6 7 8 9
.	Suspicious. Believes rather too quickly that he is being unfairly treated. Imagines on insufficient grounds that people dislike him. Feels persecuted.	Trustful. Accessible. Free from suspicion but not to the extent of gullibility.
	1 2 3 4 5	6 7 8 9
.	Good natured, easy going. Generous with his property, time and energy. Gives people the benefit of the doubt, when their motives are in question.	Self centred, selfish. Gets irritable or resentful if property or other rights trespassed upon. Inclined to be 'close' and egotistical.
	1 2 3 4 5	6 7 8 9
.	Silent and introspective. Says very little, gives the impression of being introspective and pre-occupied with thoughts.	Talkative. Talks a lot to everybody. Takes initiative in conversations. When addressed, responds quickly.
	1 2 3 4 5	6 7 8 9
.	Cautious. Avoids the strange and new. Looks at all aspects of a new situation overcautiously. Keeps clear of difficulties. Avoids new things. Does the safe thing.	Adventurous. Ready to enter into new experiences and situations. Ready to face emergencies.
	1 2 3 4 5	6 7 8 9
.	Socially poised. Polite, poised and tactful in social situations. Deals with people gracefully and skilfully. Refined speech, manner, etc. Familiar with good etiquette.	Clumsy and awkward in social situations. Tactless in social situations. Crude in speech and manners. Omits proper formalities. Does not meet people gracefully.
	1 2 3 4 5	6 7 8 9

14. Rigid.
Always does things in one particular way. Life circumscribed by routine. Sticks to his own ideas and does not adapt to ways of doing things different from his own.

Adaptable.
Appropriately modifies his behaviour to situations. Accepts compromises where needed. Is not upset, surprised, baffled or irritable if things are different from what he expected.

1 2 3 4 5 6 7 8 9

15. Dependent.
Expects a lot from other people. Seeks constant attention and irrespective of the needs of others.

Self sufficient.
Capable of meeting frustrations and of renunciations without leaning on others.

1 2 3 4 5 6 7 8 9

16. Placid.
Calm, peaceful, serene.

Worrying. Anxious.
Worries constantly, sensitive, harried, seems to suffer from anxiety without adequate cause. Slight supressed agitation much of the time.

1 2 3 4 5 6 7 8 9

17. Conscientious.
Careful about principles of conduct. Motivated by ideals of truthfulness, honesty, unselfishness. Scrupulously upright where personal desires conflict with principle.

Not conscientious.
Not too careful about right and wrong where own wishes are concerned. Not particularly just, honest or unselfish, inclined to somewhat shady transactions.

1 2 3 4 5 6 7 8 9

18. Imaginative.
Has a rich and vivid imagination. Thinks of unusual angles and aspects of a question. Sensitive to a multitude of emotional or other possibilities not realised by the average person.

Unimaginative.
Lack of imagination. Approaches problems in a literal fashion. Unresponsible to the subtleties of a situation.

1 2 3 4 5 6 7 8 9

19. Frank. Expressive.
Comes out readily with his real feelings on various questions. Expresses his feelings (sad or gay) easily.

Secretive. Reserved.
Keeps his thoughts and feelings to himself.

1 2 3 4 5 6 7 8 9

20. Dependent minded. Intellectually dependent on others. Generally accepts opinion of group or of authority without much thought. Unsure of own opinion. — Independent minded. Thinks things out for himself and adopts a clear and definite independent position. Examines every question persistently and individualistically. Makes up his own mind about it.

1 2 3 4 5 6 7 8 9

21. Limited overt emotional expression. Is apathetic and sluggish. — Marked overt emotional expression. Shows agitated behavioural responses, is overly excitable and over demonstrative.

1 2 3 4 5 6 7 8 9

22. Divergent thinker. Has many original and unusual ideas. Comes up with unexpected answers. — Convergent thinker. Tends to favour conventional ideas. Satisfied with the usual or expected answer.

1 2 3 4 5 6 7 8 9

23. Tends to be formal in written expression. Unimaginative style. — Has a flare for creative writing. Fluent use of imaginative words.

1 2 3 4 5 6 7 8 9

24. Unimaginative in art work. Produces nothing unusual. Conventional. — Original, different. Creative in art work.

1 2 3 4 5 6 7 8 9

25. Work habits are good. Application and persistence. Uses study skills effectively. — Standard of work is poor or patchy. Poor study skills and work habits.

1 2 3 4 5 6 7 8 9

Indicate the subject's standing in each of the following subjects.

	Very good							Very poor	
26. Written Expression:	1	2	3	4	5	6	7	8	9
Arithmetic:	1	2	3	4	5	6	7	8	9
Social Studies:	1	2	3	4	5	6	7	8	9
Science:	1	2	3	4	5	6	7	8	9
Art:	1	2	3	4	5	6	7	8	9
Music:	1	2	3	4	5	6	7	8	9
Physical Education:	1	2	3	4	5	6	7	8	9
Reading:	1	2	3	4	5	6	7	8	9

A P P E N D I X "E"

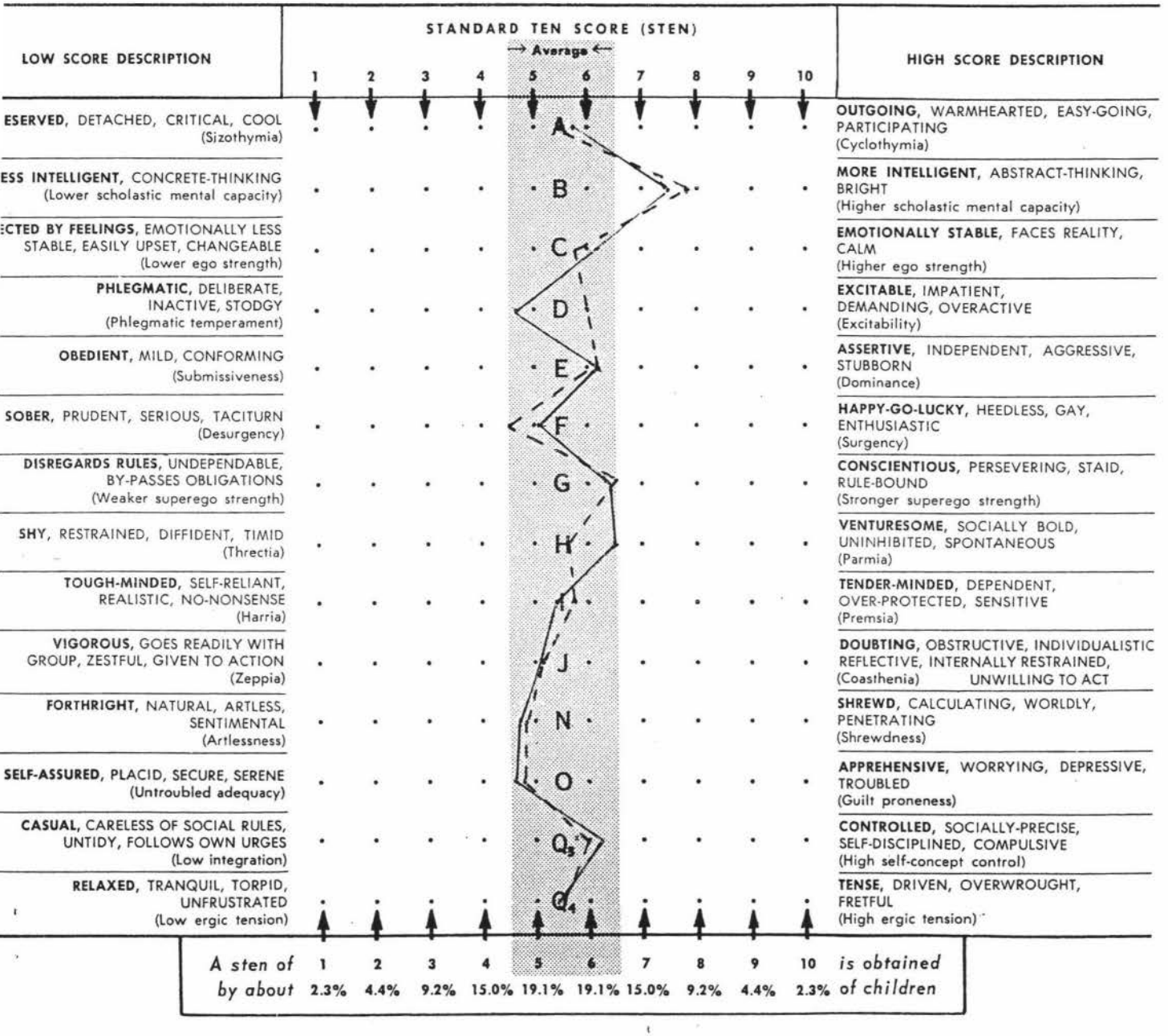
C.P.Q. GROUP PROFILES

Control:	pre-test	— — —
	post-test	— — —
Experimental:	pre-test	————
	post-test	————

App. "E"

C.P.Q. Test Group Profiles

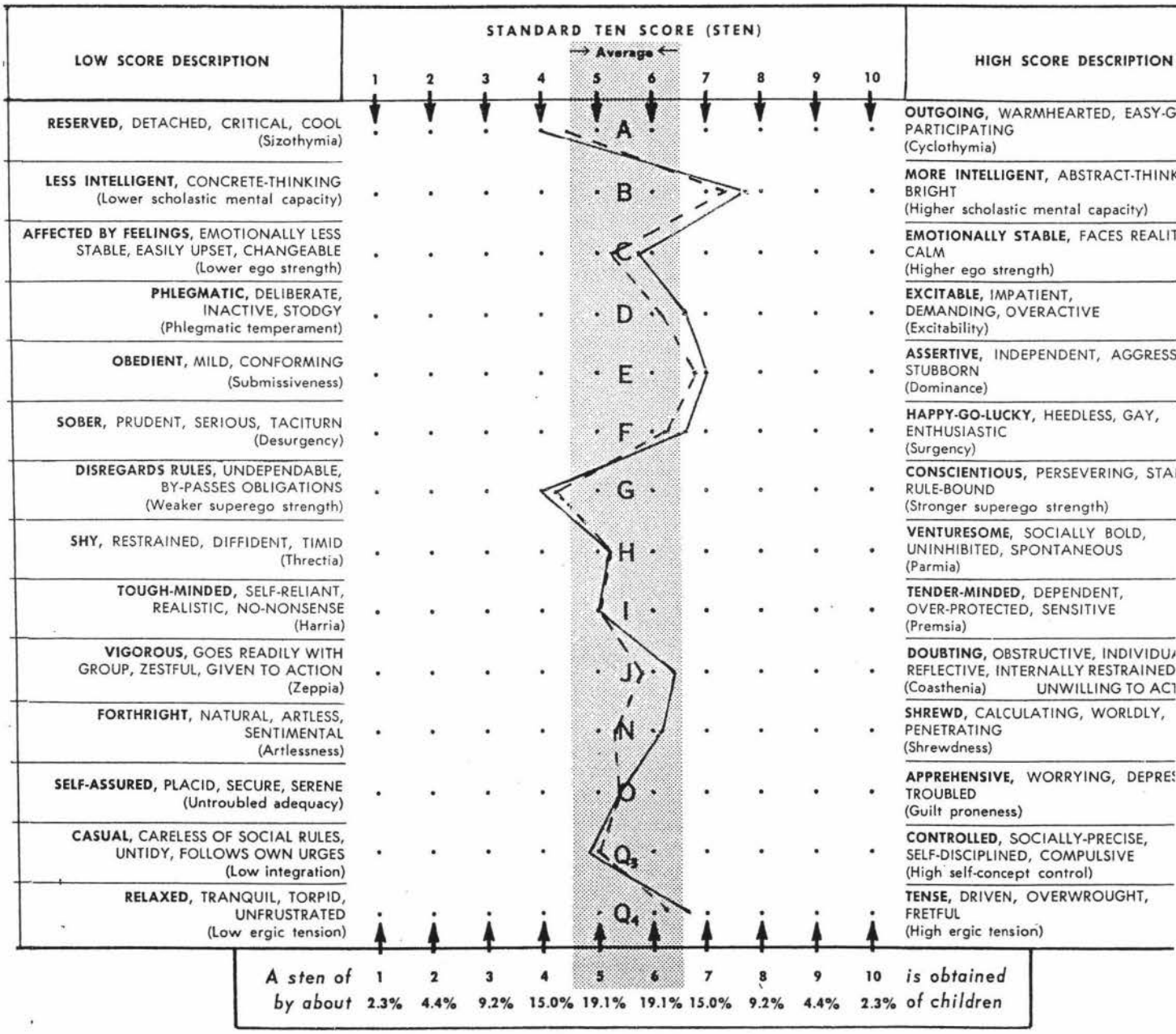
Pre-test



App. "E"

C.P.Q. Test Group Profiles

Post-test



A P P E N D I X "F"

STATISTICAL APPENDIX - (a) FREQUENCY DISTRIBUTION TABLES OF DATA COLLECTED FOR: N.S.W. Reading Test and S.T.E.P. Mathematics

(b) FREQUENCY DISTRIBUTION TABLES OF AMOUNT OF CHANGE IN SCORES FROM PRE-TEST TO POST-TEST

(c) WORKED EXAMPLES OF THE TWO MAJOR STATISTICAL PROCEDURES USED

N.S.W. READING TEST SCORES

	Control			Experimental				Control	Experimental
	Literal Meaning	Implied Meaning	Vocabulary	Literal Meaning	Implied Meaning	Vocabulary		Speed	Speed
73–75						1			
70–72			1						
67–69			1						
64–66									
61–63			1			2			
58–60			1				196–200	1	1
55–57			2			1	191–195	1	
52–54			1				186–190		
49–51			1			2	181–185	1	2
46–48			1			2	176–180		
43–45			2			1	171–175	1	
40–42			2			3	166–170	1	
37–39		1	2	1	1	8	161–165	3	3
34–36	1	2	6	1	2	2	156–160	1	
31–33	3	4	1	1	3		151–155	3	1
28–30	4	3	1	4	3		146–150	2	3
25–27	4	2		8	5		141–145	2	3
22–24	8	3		6	3		136–140		1
19–21	3	6		1	4		131–135	1	4
16–18		2			1		126–130	2	3
13–15							121–125	4	1
Mean	25.8	25.8	43.9	26.5	26.7	44.8		151.5	148

S.T.E.P. MATHEMATICS - SCORES

	Control	Experimental
43–45		3
40–42	3	1
37–39		2
34–36		
31–33	1	1
28–30	6	4
25–27	2	3
22–24	6	6
19–21	3	1
16–18	1	1
13–15	1	
Mean	26.5	29.5

App. "F"

INTELLIGENCE TESTS

Frequency distribution of amount of change in score from pre-test to post-test

	OTIS			RAVEN	
	Control	Experimental		Control	Experimental
28–30		1	16–17	1	
25–27	1	1	14–15		
22–24	5	4	12–13	1	
19–21	1	4	10–11		1
16–18	4	2	8– 9	1	2
13–15	2	4	6– 7	2	4
10–12	4	1	4– 5	4	5
7– 9	2	2	2– 3	3	3
4– 6	2	1	0– 1	4	3
1– 3		1	$^{-}2$–$^{-}1$		
$^{-}2$– 0			$^{-}4$–$^{-}3$	1	1
$^{-}5$–$^{-}3$		1	$^{-}6$–$^{-}5$	4	2

A.C.E.R. SILENT READING - WORD KNOWLEDGE

Frequency distribution of amount of change in score between pre-test and post-test

	Control	Experimental
60–62		1
57–59		
54–56		
51–53		
48–50		1
45–47	2	
42–44		1
39–41	2	1
36–38	2	2
33–35	2	1
30–32	3	3
27–29		1
24–26	2	3
21–23	3	1
18–20	1	3
15–17		1
12–14	4	1
9–11	1	
6– 8		
3– 5		2

App. "F"

S.T.E.P. SCIENCE

Frequency distribution of amount of change in score between pre-test and post-test

	Control	Experimental
9		1
8		
7		
6	2	2
5	2	4
4	5	2
3	3	3
2	5	2
1	2	1
0	1	1
-1	1	2
-2	1	3
-3	1	
-4		1
-5		1

App. "F"

CREATIVITY TESTS

Frequency distributions of amount of change in score between pre-test and post-test

CIRCLES

	Control			Experimental		
	Fluency	Flexibility	Originality	Fluency	Flexibility	Originality
18–20						1
15–17						
12–14			1	2		2
9–11	2			3	1	1
6– 8	3		3	5	4	4
3– 5	6	5	1	1	7	3
0– 2	4	10	4	5	6	4
⁻3–⁻1	3	4	3	3	2	3
⁻6–⁻4	2	3	4	2	3	3
⁻9–⁻7	2	1	3	1		
⁻12–⁻10	1		3	1		2
⁻15–⁻13			1			
Mean	1.1	⁻.16	⁻2.4	2.8	2.1	2.48

UNUSUAL USES (TIN CAN)

7– 8	1	1		1	1	2
5– 6		2	3	4	1	1
3– 4	3	3	6	2	6	5
1– 2	5	7	8	4	5	7
⁻1– 0	6	4	2	5	4	4
⁻3–⁻2	3	3	3	2	2	1
⁻5–⁻4	4	3	1		2	1
⁻7–⁻6	1			1		
⁻9–⁻8				1		
⁻11–⁻10				1		
Mean	⁻.5	.7	1.58	.5	1.2	1.88

CONSEQUENCES

	Control			Experimental		
	Fluency	Flexi-bility	Origi-nality	Fluency	Flexi-bility	Origi-nality
8		1				
7	1					
6						
5	1	1		1		
4	3	2	1	2	3	
3	4	4				
2	1	3	3	4	4	3
1	3	3	7	5	6	4
0	4	4	4	5	3	7
-1	2	2	7	1	3	6
-2	1	2	1	2		1
-3	3	1			1	
-4					1	
-5				1		
Mean	1.2	1.34	.35	.8	.8	.1

INCOMPLETE FIGURES

4						1
3			2		1	1
2		1	2		1	6
1	2	4	5	1	2	4
0	10	9	8	10	7	3
-1	6	6	3	6	6	2
-2	4	2	2	2	1	4
-3	1	1			3	
-4			1	2		
Mean	-.65	-.3	.17	-.8	-.5	.62

PERSONALITY TEST

Frequency distributions of amount of change in sten scores between pre-test and post-test

Control group

Amount of change	C.P.Q. factors													
	A	B	C	D	E	F	G	H	I	J	N	O	Q_3	Q_4
7						1								
6						3								
5				1		1				2		1	1	2
4	1					1					1	2		
3		1		1	3	2		2	1	3	2	1	1	2
2		1	1	3	5	3	1	4	1	3	3	3	1	6
1	3	4	2	4	7	4		2	5	3	7	4	4	4
0	6	4	10	7	2	5	5	6	3	4	4	5	3	4
-1	3	7	5	1	3	2	2	3	6	3	4	4	5	1
-2	3	3	4	5	2		5		2	3		3	4	1
-3	4	1		1	1		3	4	2	1	2		1	1
-4	2	2	1			1	5	1	2				2	2
-5	1							1		1				
-6							2							
-7														
-8									1				1	
Mean	-1.2	-.7	-.57	.17	.7	1.91	-2.13	-.36	-1	.47	.56	.7	-.79	.7

Experimental group

Amount of change	C.P.Q. factors													
	A	B	C	D	E	F	G	H	I	J	N	O	Q_3	Q_4
8										1				1
7														1
6														1
5				2		1				2	1			1
4		1		1	2	3			1	3	2			1
3		3	3	4	2	1					4	4		2
2		1	1	5	4	6	1	2	2	3	3	1	1	2
1	2	3	4	6	4	5	3	1	3	4	6	8	4	4
0	3	4	5	2	5	3	1	7	9	3	3	5	3	3
-1	6	7	4	2	3	3	2	3	2	5	1	3	3	2
-2	5	3	3	1	2	1	4	4	1	2	3	2	5	3
-3	3	1	2		1		3	3	4				4	1
-4	2						4	1					2	1
-5	2		1				4	1	1					
-6							1	1					1	
-7														
Mean	-1.8	-.13	-.27	1.65	.7	1.39	-2.43	-1.31	-.44	1.34	1.3	.65	-1.44	1.2

ATTITUDE SCALE

Frequency distributions of amount of change in scores between pre-test and post-test

Attitude	Control			Experimental		
	Negative change of more than 5 points	Change within the ±5 points range	Positive change of more than 5 points	Negative change of more than 5 points	Change within the ±5 points range	Positive change of more than 5 points
1	8	4	11	6	7	10
2	10	6	7	8	9	6
3	8	8	7	9	7	7
4	5	14	4	7	12	4
5	7	7	9	10	7	6
6	8	9	6	12	7	4
7	9	5	9	5	7	11
8	6	6	11	7	9	7
9	12	6	5	6	8	9
10	8	9	6	6	8	9
11	8	6	9	8	9	6
12	8	5	10	6	8	9
13	8	8	7	6	6	11
14	13	5	5	10	7	6
15	8	7	8	9	3	11
16	4	2	17	1	5	17
17	7	5	11	6	10	7
18	4	10	9	3	7	13
19	10	5	8	6	7	10
20	11	5	7	10	7	6
21	7	3	13	7	6	10
22	4	9	10	6	6	11
23	8	7	8	6	11	6
24	10	4	9	4	6	13
25	4	11	8	6	14	3
26	7	10	6	12	5	6

Worked example : significance of the change in pupils' scores from pre-test to post-test for "Originality" in the Circles Test from the Creativity tests.

	Mean change	S.D.	N	df
Control	−2·4	6·7	23	22
Experimental	2·48	7·2	23	22

$$\text{"Pooled" SD} = \sqrt{\frac{(6\cdot7)^2 \times 22 + (7\cdot2)^2 \times 22}{44}}$$

$$= 6\cdot95$$

$$S.E._D = 6\cdot95 \sqrt{\frac{23 + 23}{23 \times 23}}$$

$$= 2\cdot08$$

$$t_{44} = \frac{4\cdot83}{2\cdot08}$$

$$= 2\cdot34$$

$$P(t \mid |t| > 2\cdot34) < \cdot05.$$

Worked example : significance of the change in pupils' scores from pre-test to post-test for item 9 of the Attitude scale.

	-change >5	5 to -5	+change >5	Totals
Experimental	(9) 6	(7) 8	(7) 9	23
Control	(9) 12	(7) 6	(7) 5	23
Totals	18	14	14	46.

Calculation of (f_e) :

$\frac{23 \times 18}{46} = 9$ $\frac{23 \times 14}{46} = 7$ $\frac{23 \times 14}{46} = 7$

Calculation of χ^2 :

$(-3)^2 \div 9 = 1$ $1^2 \div 7 = .14$ $2^2 \div 7 = .57$

$3^2 \div 9 = 1$ $(-1)^2 \div 7 = .14$ $(-2)^2 \div 7 = .57$

$\chi^2 = 3.42$

$df = 2$

P lies between .2 and .1