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ABSTRACT

This study was designed to test four groups of pupils entering the second grade in the York County School Board area--two groups in open schools and two in traditional schools--chosen because of the similarity in the schools' size and location and in the socioeconomic status of the pupils. The students were tested once each year for three years and comparative data were analyzed for 198 subjects who were in the same schools throughout the three years. Results showed no consistent differences in curiosity and creativity between the two types of school systems. However, there was an increasing difference between the students of the two types of schools in their attitude toward schooling. This difference favored the open school system. (Author)

# STUDIES OF OPEN EDUCATION

No. 12 Curiosity, Creativity and Attitude to Schooling in Open-Plan and Traditional Schools



July 1974

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# CURIOSITY, CREATIVITY, AND ATTITUDE TO SCHOOLING IN OPEN-PLAN AND TRADITIONAL SCHOOLS (GRADES 2 to 4)

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In Cooperation with the York County Board of Education

and

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## ABSTRACT

Research to-date has demonstrated large differences among children in willingness to approach stimulation of high levels of ambiguity, novelty and complexity. This willingness, generally termed "curiosity" has been shown to be unrelated to intelligence while yet a necessary condition for creative productivity.

One of the premises of open-plan schools is the belief that curiosity and creativity will be enhanced in their system of education. In line with new thrusts in education and direction from reports such as the Hall-Dennis Report, school boards in Ontario have been opening schools with little or no empirical evaluation.

This study was designed to test four groups of pupils entering Grade 2 in the York County School Board area, two groups in open schools and two in traditional schools chosen because of their similarity in size, location and socio-economic status of the pupils over three years of schooling. The students were tested once in Grade 2 in 1972, again in Grade 3 in 1973 and finally in Grade 4 in 1974. Comparative data were analyzed for 198 subjects who were in the same schools throughout the three years.

Results showed no consistent differences in curiosity and creativity, between the two types of school systems. However, there was an increasing difference between the students of the two types of schools in their attitude towards schooling favouring the open school system.

## OBJECTIVES OF THE RESEARCH

The educational community in North America is presently in the throes of a dilemma. Authors like Leonard, Holt and Illich have pointed out the failures and weaknesses in the educational system and have argued for change and innovation.

At the same time, there is strong resistance to change possibly goaded by the fear that the introduced innovations may not be effective or worse, that some of the achievements of traditional education may even suffer because of the changes. For it is clearly admitted by those who advocate change, that their ideas have not yet been empirically tested.

Yet, of great merit is the fact that an educational system does not wait for researchers to pioneer change. Rather, new ideas tend to be initiated because of the intuitive genius of individual leaders and reformers. Thus, recently the free school movement has given impetus to the establishment of open-plan schools in Ontario as well as in the rest of North America. These open-plan schools are often (but not always) open-plan architecturally and are invariably based on the criterion of a new type of open or free style of education and social interaction.

But innovations must never be allowed to remain untested. Educational researchers must always stand in the sidelines ready to examine empirically new programmes and to identify the effects, if any, they have on education.

Smart pointed out that evaluation studies are never easy or short-term (Smart, 1972). In his brief survey of experimental models for evaluating programmes, Smart argued that "Once sufficient resources are committed to the success of a programme, it is almost impossible to tolerate anything which might indicate failure. Evaluation studies should, therefore, be done early before it is too late to turn back without losing face." (p. 49)

Smart recommends that quasi-experimental designs be used. In this design one compares either an experimental group with a control, or two different experimental programmes. Subjects are tested on entering the programme and at various points during it. Using the quasi-experimental approach, this study was designed to compare the differences in development of curiosity, creativity and attitude-to-schooling of children in open-plan and traditional schools.

# INTRODUCTION

## The Free-School Movement

One of the main tenets of the free school movement, is its dedication to the development of creativity in children. John Holt, a pioneer in the free school system, claims that:

> "Nobody starts off stupid . . . as we get older . . . this extraordinary capacity for learning and intellectual growth . . . is destroyed . . . by the process we misname education . . . a process that goes on in most homes and schools . . . We adults destroy most of the intellectual and creative capacity of children by the things we do to them or make them do . . . We destroy this capacity above all by making them afraid, afraid of not doing what other people want, of not pleasing, of making mistakes, of failing, of being wrong . . . Thus we make them afraid to gamble, afraid to experiment, afraid to try the difficult and the unknown" (Holt, 1964, p. 167).

The Ontario Task Force on Education, in its report Living and Learning, quotes Ontario's late Deputy Minister of Education, Dr. Z. S. Phimister, as follows:

> "Investiveness, adaptability, and creativity are characteristics which are extremely valuable . . . at present. Yet much of our schooling has to do with memorizing, repeating and following directions . . . Nowadays we are conscious of the need to uncover the so-called 'creative children,'

those not necessarily with a high IQ, but those who want to do things differently" (Hall-Dennis et al., 1968, p. 71).

A reaction against the traditional schools' exclusive focus on academic achievement began to emerge in North America in the late 1950's in the form of developing open-plan schools. These schools are rooted in the philosophy of Rousseau who stressed the belief in intrinsic goals for education rather than such extrinsic goals as high grades, avoidance of failure, pleasing teachers and vocational training. Intrinsically motivated goals stress the characteristics of the learning activity and are assumed to develop curiosity in the pupils and promote creative potential without sacrificing achievement in the traditional achievement areas of reading, 'riting and 'rithmetic.

But formal evaluation of the success of open-plan schools in achieving these goals has been minimal. Relatively few studies have examined differences between pupils from the open-plan and traditional school system. Rarely have the studies been adequately controlled. Most of the evidence presented has been anecdotal, and the statistical evaluation has been almost exclusively of the traditional schools' yardstick of success: academic achievement. Relatively few studies have measured student emotional and social growth; attitudes towards school and learning; and the development of creativity and curiosity. Moreover, findings have tended to be inconclusive and contradictory. They have generated little concrete evidence to prove the superiority of open-plan over traditional schools . . . or vice versa.

Considering the cost of instituting this new type of education--designing buildings more suited to open-plan arrangements of classes and

greater flow of movement, retraining staff, preparing new study materials--the lack of investment in evaluating it is astonishing.

Some researchers have reported no significant difference in cognitive development between pupils in open-plan and traditional schools (Kennedy and Say, 1971; Open Space, 1970; York County, 1971). Others have indicated superior achievement by traditional school students (McRae, 1970; Sackett, 1971), especially after several years in the traditional school setting (Warner, 1970). And conversely, other researchers have reported superior gains by open-plan students (Sudbury, 1972), most noticeably after two years in their open-plan setting (Killough, 1971).

Of the studies which have included an examination of student social and emotional growth in their comparison, most have favoured the influence of the open-plan setting (Burnham, 1970; Carbonari, 1970; Fowler, 1970; Halton, 1969; Mister and McCann, 1971; Open Space, 1970), although Sackett (1971) reported the opposite and Cheek (1970) concluded that "desirable" student behaviour is not necessarily facilitated by an open-plan setting.

A possible explanation for the failure to discover significant and consistent differences between the two types of schooling lies in the methodological weaknesses of the majority of studies so far conducted.

1. Some 25 per cent of the Canadian and American studies reported for the 1969-1972 period by Metro Toronto's Study of Educational Facilities (1972) examined the strengths and failings of open-plan schools without comparison to traditional schools. While experimenters' conclusions

regarding, for example, instructional methods, facility use, interaction patterns, student development, and staff and student feelings towards their environment and program may be useful for in-house analyses, they cannot be extended to prove or disprove the validity of the open-plan alternative.

Yet, with rare exceptions, even those studies which have included both open-plan and traditional schools in their sample have lacked adequate matching controls. Generally ignored have been such factors of possible relevance as the comparability of student age and socio-economic background; teacher selection and preparation; and the length of time which students have spent in their open-plan or traditional school setting.

The length of time a student spends in the open-plan setting appears to affect cognitive gains. Killough's 1971 four-year study comparing cognitive achievement of elementary students in nongraded open-plan schools and graded traditional schools indicated that open-plan students show a significantly better achievement gain in most cognitive areas after, but not before, at least two years in that setting. Few research studies, though, have matched experimental students on the length of time which they have spent in their respective school settings. And few studies have made more than a single comparison in time between open-plan and traditional school students. Only 20 per cent of the studies reviewed by the Study of Educational Facilities were ongoing or beyond one year in length. Yet Kennedy and Say (1971) concluded after their one-year study that a three-year time span is essential to produce maximum validity in data analysis and in the drawing of conclusions.

2. The criteria for selection of open-plan and traditional test schools should be carefully examined . . . and thus the differences or lack of differences reported between school types. The terms "open-plan" and "open concept" tend to be used interchangeably. It is often unclear whether open-plan test schools are selected primarily on the basis of open-space architecture or open-concept philosophy. Schools designed and labelled open may not in practice be open, while schools denoted traditional may actually operate on an open concept. As Mister and McCann (1971) concluded, openness may be a state of mind rather than the presence or absence of walls.

Caswell and Campbell (1972) developed a quantitative test of school openness which they applied to five grade two classes in one traditional and one open-plan school. Adapting the form designed by the Study of Educational Facilities (1971), they made observational recordings on thirteen factors. While the open-plan school operated in a more open fashion than did the traditional school, and vice versa, the open-plan school was by no means totally open in its operation nor was the traditional school completely traditional in its functioning. Both schools used open and traditional methods with their pupils. Despite their labels, the schools did not represent extremes along a traditional-open continuum but rather fell somewhere between.

3. Eighty per cent of those studies reviewed by the Study of Educational Facilities focused on the educational programs in open-plan and traditional schools. Differences in instructional practices, grouping patterns, verbal and nonverbal behaviour, the quantity and freedom of movement, teacher satisfaction, student attitudes, and teachers' perceptions of their students' development were recorded. Also noted were the reactions of

staff and students to such specific features of their physical environment as noise, lighting, thermal conditions, and space potential and its utilization. In fact, these features became the major focus in 20 per cent of the studies reviewed. Yet the evidence presented in most of these studies is essentially anecdotal, obtained by classroom observations of teachers and students, structured and open-ended questionnaires, interviews and informal discussions, and not tested statistically.

4. Nearly all the statistical evidence presented comes from results of achievement and intelligence tests. But in using academic achievement as a measure of program and environmental success, researchers are ignoring the basis of the open-plan concept with its shift away from an authoritarian, academic focus to self-initiated learning and creative activities. The success of schools designed and presumably operating on this open premise cannot therefore be properly and sufficiently measured against the traditional yardstick of academic achievement, especially with instruments designed to measure the differing skills developed in the traditional schools. Open-plan success instead should be assessed in terms of student emotional and social growth; attitude towards school and learning; and the development of curiosity and creativity.

5. Few studies have attempted to assess differences in these areas between the two types of schools, and nearly all have reported either non-longitudinal or uncontrolled results. Sackett (1971) concluded from a single study that sixth-grade, open-plan students have a lower self-concept than comparable students in self-contained or departmentalized schools. Other

studies, though, have generally indicated that children in open-plan schools are better developed socially and emotionally (Burnham, 1970; Carbonari, 1971; Fowler, 1970; Mister and McCann, 1971; Open Space, 1970) and feel more positively about themselves and their school than their traditional school peers (Wilson et al., 1969; Halton, 1969).

The latter two studies also examined differences in curiosity and creativity but with most inconclusive results. The Wilson et al. study, finding no significant difference between the two types of schools in curiosity development, questioned the sensitivity of the measuring instruments. As for the inferior showing on the creativity tests of students in new open-plan schools, the authors blamed the unfamiliar environment and believed that creative performace in the open setting could become superior given sufficient time. Similarly the Halton study concluded that valid assessment of student attitudes, curiosity, and creativity requires continuing evaluation rather than a single comparison in time.

The clearest support for the superior fostering of the creative potential by open-concept schools comes from Haddon and Lytton's 1968 and 1971 studies in England. Students of all ability levels, aged 11-12, in matched "formal" and "informal" schools were tested on their divergent (creative) thinking abilities. Haddon and Lytton discovered that the statistically significant superiority of the "informal" school students in divergent thinking (1968) was so strongly developed in their primary school years that it remained relatively constant even after four years in secondary schools varying in teaching approach (1971).

Curiosity

Motivation can be dichotomized into extrinsic and intrinsic categories. Extrinsically motivated behaviour is that which has its goals extrinsic to the act itself. For example, eating to reduce hunger is an extrinsically motivated act. Intrinsic motivation, on the other hand, is the motivation of behaviour the rewards of which are intrinsic to the task itself. Thus, eating for the pleasure of the taste and odour of the food is an intrinsically motivated act.

Similarly, learning a piece of information for the purpose of displaying it to others at an exam, interview or even in casual conversation is extrinsically motivated learning because the goals are passing in school, or displaying talent and erudition to others. Intrinsically motivated learning is aroused by uncertainty and the curiosity to know and understand material which is novel, complex, ambiguous etc.

Curiosity thus, is a state of mind (and body) in which conflict and uncertainty have been engendered by the perception of characteristics of the environment and which results in intrinsically motivated behaviour, such as exploration, learning and creativity.

The nature of curiosity has been studied by a large number of psychologists, and has been explained in different ways (cf., Day, et al., 1971). The theoretical conceptualization utilized in this study was first presented by Berlyne (cf., 1960, 1963, 1965, 1967) and further researched by Day (for complete list of publications see curriculum vita in Appendix G).

Educational philosophy has changed over the ages and has put greater or lesser emphasis on extrinsic and intrinsic motivation at different times. But always, there were a few voices who argued for the importance of utilizing curiosity motivation in educational practice. Bruner (1960) argued that it was useful to utilize uncertainty in presenting new material for learning. Sears and Hilgard (1964) emphasized the importance of curiosity in school learning and suggested ways of manipulating this motivational variable. In 1970, a large number of researchers presented papers at a special conference on education in Toronto which were later compiled into a text book arguing the importance of intrinsic motivation in education (Day et al., 1971). Many of these researchers outlined the usefulness of curiosity as one of the techniques in the new direction in education. It was argued repeatedly that education must become aware of curiosity in children and must direct educational practice towards utilizing its forces.

The close connection between curiosity and education has been argued by many researchers in education (cf., Berlyne, 1965; Bruner, 1960; Day et al., 1971). Advocates of open-plan schooling especially (cf., Holt, 1964) have been aware of the motivational properties of curiosity and argued that intrinsic motivation should be accepted as one of the main propelling forces in its system. Moreover, these same advocates have suggested that the open-plan concept stimulates curiosity. Yet, there is no evidence of this. Three studies have failed to find differences in curiosity among children of the two types of schools (Halton, 1969; Wilson, Langevin & Stuckey, 1969; Day, 1972), but these studies all examined static situations, i.e., a measure in

a single time period and so could be faulted for many inadequacies. If the open-plan system does indeed affect curiosity in children this should become evident in a longitudinal study starting with two sets of pupils at the same level and subjecting them to different educational conditions.

## Creativity

Despite early and continuous interest by laymen, philosophers and biographers, psychological investigation into creativity was almost non-existent until after World War II. Guilford (1950) was one of the first psychologists to argue that creativity should be adopted as an important new area of research when one is concerned with the quality of human thinking and production. Since 1950 there has been a tremendous proliferation of studies in the area of creativity to the point where hundreds of articles, chapters and books and one journal of creativity are being published annually on the identification of creative talent, its motivation and behaviour, its measurement and its training.

While there is little agreement on the nature of creativity itself the types of research can be classified into four approaches or orientations. These have been outlined by Golann (1963) and Dallas and Gaier (1970) as follows:

a. The nature and quality of the product created
b. The actual expression of creative acts and the continuing process during the "creation"
c. The nature of the individual
d. Environmental factors that tend to initiate and foster creativity

Early research concentrated on the nature of the creative individual and sought to identify and describe those characteristics which distinguished them from their relatively less creative counterparts. The basis for this approach lies in the definition of the creative individual as one who

> "Must make or be capable of making a uniquely original discovery that is different in kind from ordinary expressions of creativity" (Ausubel, 1964).

The search for uniqueness from the standpoint of all humanity, however, is not useful because assessment of uniqueness can usually be done only long after the creative act and often when the unique individual is dead. Thus evidence of personality characteristics are often based on hearsay or anecdotal evidence. Furthermore, the decision of whom to include in the category of unique genius becomes debatable. Finally, there is little scientific usefulness to study the post hoc characteristics of a relatively small number of individuals.

Thus there is a greater tendency to define creative from the standpoint of a peer group so that the assumption is made that everyone has, to some degree, the characteristic of being creative. It remains only to rank (or rate) a group of individuals on this characteristic and to devise measures of creativity that can be used with people at different levels of development.

Creativity tests have been developed and standardized by a large number of individuals for use with people of all ages (cf. Barron, 1969; Getzels and Jackson, 1962; Guilford, 1968; Torrance, 1965). Others have simply used creative-type tasks in their studies, such as story or object constructions (cf. Langevin, 1970). In the first instance one can compare different kinds of groups measured at different times in different places and suggest differences between them (e.g., creativity among urban 7th grade blacks vs. rural white 6th grade pupils). In the second instance, new tasks are developed that are convenient and applicable to the group or groups at hand.

This study is concerned with comparing the level of creative productivity of different groups. Furthermore, the pupils would be tested repeatedly

over a number of years. It is therefore most useful to develop a specific task for the situation at hand.

This author has argued that "creative production is not the prerogative only of unique individuals but is a potential characteristic which is normally distributed over the whole population and can be nurtured and developed under optimal conditions" (Day, 1968, p. 488). He has focused on the growing body of evidence which indicates that the creative personality is related to at least two characteristics: a high level of intelligence and of curiosity.

Thus to be creative, an individual must first be motivated to seek out and generate novel, complex, and ambiguous stimuli in the face of the inevitable accompanying uncertainty and tension. Secondly, he must have the ability to process the information he obtains so as to develop an original and appropriate product or idea, and, in so doing, to master and reduce his uncertainty and tension and intrinsically regard his information-seeking behaviour. While the greater the level of curiosity and intelligence, the more likely it is that an individual will be creative, but environmental conditions at school or at home may thwart the development of the creative potential in the formative childhood years.

Children with low levels of curiosity and intelligence likely have little potential for growth. Those with a high level of curiosity but low intellectual ability fail to find exploration intrinsically rewarding. Eventually they may diminish their risk-taking exploratory behaviour and withdraw or develop defensive coping mechanisms to reduce the high level of tension unrelieved by successful exploration.

The converse state of low curious but high intelligence children may often be found in traditional schools today. This system has been accused repeatedly of rewarding intellectual activity at the expense of stimulating diversive exploration or curiosity. Not only may potential curiosity development be thwarted but also, with maturation, the low level of curiosity may give little scope to developing the intellectual capacity to its fullest. Children high in intelligence and curiosity have probably the greatest potential for creativity but, as with children high in intelligence but low in curiosity, they too may fail to develop their potential if restrained in an environment that fails to reward or even actively opposes their creative explorations.

It would appear that open-plan schools should provide an environment far more hospitable to the development of curiosity-activated exploration, self-initiated learning, and creative production. Creative potential, randomly distributed through the school population, should, over time, be developed to a more noticeable extent in pupils in open-plan schools than in traditional schools emphasizing authoritarian teaching and academic achievement.

## METHOD

### Year 1 (Grade 2)

Four schools were selected from Ontario's York County Board of Education to participate in the project. Two of the schools were open-plan in construction and two traditionally designed. One each of the open-plan and traditional schools was rural, and the remaining two were located within two miles of each other in the suburbs of a town of 17,000 population.

All grade two children in the four schools were tested in the winter of 1971-72. The numbers of children tested by school type and location, as well as the numbers of classes and teachers involved, were as follows:

| | | |
|---|---|---|
| Open/Urban | 99 | 3 classes in 1 "house" area<br>3 teachers (female) |
| Traditional/Urban | 102 | 4 individual classrooms<br>4 teachers (female) |
| Open/Rural | 38 | 1 class in 1 "house" area<br>1 major teacher (female) |
| Traditional/Rural | 49 | 2 individual classrooms<br>2 teachers (female) |

No child was absent for all tests and the number of tests not administered due to absence was minimal.

Four types of tests were administered to all children, either individually or in groups:

A. CURIOSITY TESTS

1. Curiosity Box
2. Interest in Complexity (Polygon Slides)
3. Preference for Incongruity, Complexity and Novelty (Animal Slides)

B. CREATIVITY TESTS

1. Story Telling

2. Mosaic Construction

C. TEST OF ATTITUDE TO SCHOOLING

D. STANDARDIZED INTELLIGENCE AND ACHIEVEMENT TESTS

1. Canadian Cognitive Abilities Test, Primary II, Form 1 (1970)

2. Metropolitan Achievement Tests, Primary II (1970)

Tests A1-3 and Test 3 were administered primarily by one experimenter ($E_1$). He was assisted in Tests A1 and A2 by a second experimenter ($E_2$). A third experimenter ($E_3$) tested that small percentage of children repeatedly absent for the above tests during $E_1$'s testing period. $E_3$ also conducted Test B1. The classroom teachers collected the data for Test B2 after receiving instructions from $E_1$. The York County Board of Education administered Tests D1 and D2.

In addition to the above tests, another test was developed to assess the degree of openness of the open-plan and traditional test schools.

E. TEST OF SCHOOL OPENNESS (BASED ON HALL ACTIVITY)

A. 1. Curiosity Box (Individual Test)

The Curiosity Box held four objects: a pink-streaked, egg-shaped, polished piece of marble; a paper-mache Easter "egg"; a clear plastic, doll-sized human body, containing all major skeletal bones and lines representing veins and arteries ("The Visible Woman"); and a binary decision game, designed to be played in competition with the game itself or with other persons ("Dr. Nim").

Each child was tested individually in a small room, separate from his classroom. He was told that he would be given four objects, one by one,

to look at, handle, do with as he pleased. He was invited to ask as many questions as he wanted about each object, but was told that his questions would not be answered until he had finished examining all four objects. He was also told that his questions were going to be taped and he was given a chance to become familiar with handling the cassette-taperecorder microphone.

The objects were stored in a box which was kept closed except when an object was being removed. The E handed the child the four objects one at a time in a set sequence: marble egg, paper-mache egg, "Visible Woman", "Dr. Nim". All questions were taped and answered once all four objects had been examined. The time each child spent in exploring each object was noted in seconds. At the end of the session each child was asked not to talk about what had happened with his classmates until all had had a chance to explore the objects.

A. 2. Interest in Complexity (Group Test)

Fifteen pairs of slides, illustrating black polygons on white backgrounds, formed the basis for this test, developed by Crawford (1969). The members of each pair differed in their degree of complexity. The two slides of a pair were shown side by side at the same level on two standard-sized screens. The Kodak carousel projectors, equipped with zoom lenses and bulbs of equal brightness, were hooked up to operate in tandem so that each pair of slides was flashed onto the two screens simultaneously.

Each class was tested as a group in a room other than the usual classroom. The classroom teacher accompanied her pupils to help maintain order. The children sat together at large desks facing the two screens, the left screen marked "L" and the right screen marked "R". Each child was given

a score sheet (see Appendix A) and asked to write on it his name and school.

E told the children that they were going to be shown a series of two figures on the screens. They were to decide for themselves which of the two they found more interesting and circle on their score sheet either "L" or "R". They were to repeat this circling for each pair shown. E asked them not to talk amongst themselves because he wanted to know which of the figures each of them alone preferred, not what their neighbours preferred. E displayed each pair for approximately 10 seconds, adapting his pace to the speed of the children. An assistant to E moved about the children to ensure that they were correctly marking their score sheets, circling only one letter for a pair and omitting none of the pairs.

### A. 3. Preference for Incongruity, Complexity, and Novelty (Group Test)

This test, developed by Bulstein (1969), consisted of 24 pairs of colour pictures on white backgrounds, depicting animals or juxtaposed parts of different animals. The two members of each pair differed on one of the three dimensions of incongruity, complexity, or novelty. The two pictures of the pair were contained on a single slide, one picture above the other, and were shown on a standard-sized screen. The projector used was one of those used in Test A2.

This too was a group test, conducted during the same session as Test A2 but following it. The single screen had a "U" marked on its upper half and an "L" on its lower half. Each child was given a score sheet (see Appendix B) and asked to write on it his name and school as before.

E told the children that they were going to be shown another series of two pictures but that this time the pictures would be one on top of the

other on a single screen. They were asked to choose on their own, without their neighbour's help, which picture they preferred. If they preferred the upper picture, they were to circle "U" on their score sheet; if the lower picture was preferred, then they were to circle "L". Again E adapted his pace to that of the children. And again E's assistant quietly checked to make sure that the children were properly marking their score sheets.

B. 1. Story Telling (Individual Test)

Each child was tested individually on his ability to create, spontaneously and orally, a story to fit the title "Washed Up on the Beach". These stories were taped for later analysis of their originality and aesthetic quality.

Each child was tested in a room isolated from his peers and teacher and as free from noise and intrusion as possible. Each child was told that he was going to be given a title for a story, a story that he was to invent and tell to E and a taperecorder. He was told that once he had been given the title, he could take as much time as he wanted to make up his story. Once he was ready, he was to turn on the taperecorder and tell his story. And he could shut off the machine whenever he wished more time to think. Before a child was given the title, he had an opportunity to practice using the microphone of the cassette taperecorder.

B. 2. Mosaic Construction (Group Test)

Each child was asked to construct a picture or design on an 8 1/2" x 11" sheet of white bond paper with coloured gummed squares. All children took the test together in their classroom under the guidance of their teacher. E had previously supplied the teacher with the squares and explained

the purpose and procedure for the test. The children were told to use as many squares and as many of the six colours as they wished and to take as much time as they needed to make their pictures or design. Their teacher was to give them no assistance. The mosaics were then collected for analysis of their originality and aesthetic quality.

C. Test of Attitude to Schooling (Individual Test)

At the conclusion of the Curiosity Box test each child was asked several questions regarding his attitude toward schooling. E recorded his answers by hand. A copy of that test is reproduced in Appendix C.

D. 1. Canadian Cognitive Abilities Test, Primary II, Form 1 (1970)

This intelligence test was administered by the York County Board of Education to all of its grade two pupils in the spring of 1972. The scores for the experimental children were selected out and included in the data analysis of this study.

D. 2. Metropolitan Achievement Tests, Primary II (1970)

As with the Canadian Cognitive Abilities Test, this battery of achievement tests was administered by the Board to its entire grade two population in the spring of 1972. For the purpose of this study the scores obtained by the experimental pupils on the following items were included in the data analysis:

1. Total Reading
2. Word Knowledge
3. Word Analysis
4. Reading Comprehension
5. Total Mathematics
6. Mathematics Problem Solving

E. Test of School Openness (Based on Hall Activity)

This test was an adaptation of the tests of school openness developed by Metro Toronto's Study of Educational Facilities (1971) and Caswell and Campbell (1972). It was developed and applied by $E_3$ on the basis of observations made during the 1971-72 testings in all four experimental schools. A copy of the test can be found in Appendix D.

Year 2 (Grade 3)

All grade three children in the four experimental schools of Year 1 were tested in the winter of 1972-73. The number of children tested by school type and location and the number of classes and teachers involved were as follows:

| | | |
|---|---|---|
| Open/Urban | 108 | 3 classes in 1 "house" area<br>4 teachers (female) |
| Traditional/Urban | 99 | 3 individual classrooms<br>3 teachers (2 female, 1 male) |
| Open/Rural | 40 | 1 class in 1 "house" area<br>3 teachers (2 female, 1 male) |
| Traditional/Rural | 54 | 2 individual classrooms<br>2 teachers (female) |

Only the scores for those grade three children who had been tested in the same school the year previous were used for analysis. The attrition and the number of grade three pupils included in analyses were as follows:

| School | No. Tested in Year 1 | No. Tested in Year 2 | No. Analyzed in Year 2 | Loss of Expt. Ss. |
|---|---|---|---|---|
| Open/Urban | 99 | 108 | 89 | 10 |
| Traditional/Urban | 102 | 99 | 88 | 14 |
| Open/Rural | 38 | 40 | 26 | 12 |
| Traditional/Rural | 49 | 54 | 45 | 4 |
| | 288 | 301 | 248 | 40 |

Thus the number of Year 1 subjects lost through relocation in another school was 40, a drop from 288 to 248 experimental pupils.

Three types of tests were administered to all children, either individually or in groups:

A. CURIOSITY TESTS

1. Curiosity Box

2. Interest in Complexity (Polygon Slides)

B. CREATIVITY TESTS

1. Story Telling

2. Mosaic Construction

C. TEST OF ATTITUDE TO SCHOOLING

Test A1 was administered by two experimenters ($E_1$ and $E_2$) who divided the testing in each school on an approximate 50/50 basis. Test A2 was conducted by $E_2$ and Test B1 and C by a third experimenter ($E_3$). As in Year 1, Test B2 was administered by the classroom teachers after receiving instructions from $E_3$.

A. 1. Curiosity Box (Individual Test)

The Curiosity Box held five objects: a large green piece of mushroom coral; a bright red grinding mandrel, comprised of an 18" shaft, two bearing brackets, and two pairs of dual-purpose pulley-clamp assemblies; an ordinary kaleidoscope filled with pieces of broken plastic; another kaleidoscope filled with pieces of broken plastic which floated, however, in a viscous oil that caused the pieces to move very slowly; and a kaleidoscope fitted with a clear lens which distorted the appearance of whatever object the kaleidoscope was pointed at.

The children were tested individually as in Year 1, the objects being presented as ordered above with the exception that the three kaleidoscopes were handed simultaneously as a set to each child.

As in Year 1 the E's recorded not only the questions asked by each child but also the time spent in exploring each object.

A. 2. Interest in Complexity (Group Test)

This test was a replication of the Interest in Complexity Test (A2) used in Year 1.

A. 3. The Preference for Incongruity Test - was dropped because it was insensitive to the population tested.

B. 1. Story Telling (Individual Test)

This test differed from Year 1's Story-Telling Test (B1) only in the title given: "The Day I Grew Wings".

B. 2. Mosaic Construction (Group Test)

This test was a replication of the Mosaic Construction Test (B2) used in Year 1.

C. Test of Attitude to Schooling (Individual Test)

At the conclusion of the Story-Telling Test, each child was asked the same questions regarding his attitude toward schooling as in Year 1 (Test C). A copy of this test can be found in Appendix D.

Year 3 (Grade 4)

All the children in the same four experimental schools were tested in the winter of 1973-74. The number of Ss consistent in the same school over the three years was 198 while the total number of Ss tested in Year 3 was 281. A breakdown of the consistent Ss by schools is as follows:

| School | Year 1 | Year 2 | Year 3 | Consistent Ss |
|---|---|---|---|---|
| Open/Urban | 99 | 108 | 100 | 73 |
| Traditional/Urban | 102 | 99 | 91 | 66 |
| Open/Rural | 38 | 40 | 42 | 24 |
| Traditional/Rural | 49 | 54 | 48 | 35 |
| | 288 | 301 | 281 | 198 |

Thus the loss from Year 1 to Year 2 was 40 and from Year 1 to Year 3 was 83.

Three types of tests were administered to all children, either individually or in groups:

A. CURIOSITY TESTS

1. Curiosity Box
2. interest in Complexity (Polygon Slides)
3. Test of Specific Curiosity

B. CREATIVITY TESTS

1. Story Telling
2. Mosaic Construction

C. TEST OF ATTITUDE TO SCHOOLING

D. STANDARDIZED ACHIEVEMENT TESTS

1. Metropolitan Achievement Tests - Elementary Battery (Form F)

The A tests were administered by one male experimenter and the B and C tests were administered by two female experimenters working together and splitting the number of Ss tested from each school almost evenly. The

achievement tests were administered by the York County School Board.

E. DIMENSIONS OF SCHOOLING QUESTIONNAIRE (FORM V)

This questionnaire, developed by Traub and Weiss at the Ontario Institute for Studies in Education, is intended to measure the degree of openness in a school as seen by the teachers. The questions tend to be factual rather than attitudinal although there must obviously be a subjective component in the way the teachers view various situations in the school (e.g. who determines the general objectives).

Description of the Tests

A. 1. Curiosity Box

The Curiosity Box held three objects, a "Dyna-Diver" toy consisting of a plastic bottle filled with water and a diving bell that can be manipulated vertically by pressure on the walls of the bottle; a plastic sand sculpture consisting of a plastic oval containing blue, white and black granules that do not mix which can be tilted to produce different shapes; and a small shark's jaw bone.

Testing was done as in Year 1.

A. 2. Interest in Complexity

This was a replication of Year 1.

A. 3. Test of Specific Curiosity (Day, 1968)

This is a 36-item questionnaire measuring the level of curiosity trail.

B. 1. Story Telling

The title of this year's story was "The Secret Cave".

B. 2. Mosaic Construction (Group Test)

This test was a replication of the Mosaic Construction Test (B2) used in Year 1 and was administered by the teachers. However, following the completion of all data collection an experimenter retested all the students on the Mosaic Construction, this time instructing them to create as original and aesthetically pleasing pictures as they could.

C. Test of Attitude to Schooling (Individual Test)

At the conclusion of the Story-Telling Test, each child was asked the same questions regarding his attitude toward schooling as in Year 1 (Test C). A copy of this test can be found in Appendix D.

## RESULTS

### Year 1 (Grade 2)

Data on 19 variables were collected from 288 students in the four schools. Table 1 shows the number of Ss in each school and the mean scores for each of the variables. The variables were defined in the following ways.

1. The mosaic constructions were given to two Grade 2 teachers in different schools for judgement of originality and aesthetics. The instructions to the judges are in Appendix E.

Agreement of the teachers' ratings was then tested with a Pearson's product-moment correlation test and highly significant agreement among the judges was found ($r=.868$ for originality and $r=.728$ for aesthetic value). The ratings for the two judges were then added together to obtain the scores for each S.

2. Similarly the stories were given to the same two teachers with the same instructions and their judgements were compared with correlational tests ($r=.829$ for originality and $r=.691$ for aesthetic value). Again the ratings were added together to obtain the scores for each S.

3. Exploration time was measured for the number of seconds the students spent inspecting the four objects in the curiosity box. Elapsed time was measured by means of a stop-watch held inconspicuously by E. Because wide variance was obtained among the times Ss spent exploring, all the scores were transformed into Z scores and analyzed both as raw data and as transformed scores, but no significant differences were found and it was decided to leave the scores as raw data for final analysis.

TABLE 1

MEANS OF SCORES FOR THE FOUR SCHOOLS TESTED (YEAR 1)

| | Test | Meadowbrook (open-urban) (n=99) | Whitchurch (open-rural) (n=38) | Maple Leaf (trad-urban) (n=102) | Kettleby (trad-rural) (n=49) |
|---|---|---|---|---|---|
| | Mosaics | | | | |
| 1. | Aesthetic quality | 4.33 | 5.26 | 5.71 | 4.70 |
| 2. | Originality | 3.77 | 4.24 | 5.99 | 4.29 |
| | Story | | | | |
| 3. | Aesthetic quality | 4.73 | 4.34 | 4.61 | 4.45 |
| 4. | Originality | 5.37 | 4.92 | 5.43 | 5.20 |
| 5. | Exploration Time | 251. | 275. | 278. | 411. |
| 6. | Interest in complexity | 6.81 | 8.14 | 7.08 | 7.21 |
| 7. | Pref. for novelty | 9.20 | 10.0 | 10.4 | 7.92 |
| | Questions | | | | |
| 8. | SI factual | .848 | .649 | .388 | 1.143 |
| 9. | SI explanatory | .525 | .676 | .745 | 1.265 |
| 10. | YN factual | .758 | .946 | .816 | 1.551 |
| 11. | YN explanatory | .051 | .027 | .000 | .000 |
| 12. | Total | 2.18 | 2.30 | 1.95 | 3.96 |
| 13. | IQ | 105 | 111 | 104 | 107 |
| | Achievement | | | | |
| 14. | Math. total | 2.58 | 3.31 | 2.80 | 2.81 |
| 15. | Word Knowledge | 2.86 | 3.14 | 2.72 | 2.93 |
| 16. | Word analysis | 2.95 | 3.12 | 3.04 | 3.26 |
| 17. | Reading comp. | 2.69 | 2.98 | 2.43 | 2.72 |
| 18. | Total reading | 2.87 | 3.12 | 2.58 | 2.81 |
| 19. | Math. prob. solving | 2.60 | 3.85 | 2.88 | 2.95 |
| 20. | Attitude to School | 8.62 | 8.00 | 8.64 | 8.96 |

4. Preference-for-complexity scores were obtained for each S. However, because of a technical error only 12 of the 15 pairs of figures were scorable and so a maximum score was 12 instead of 15.

5. Preference for novelty scores were made up of the total number of preferences for the unusual animal in each pair. The maximum score was 24.

6. The taped questions of the 288 Ss had been recorded and were transcribed. Then two judges classified each question into one of four categories. Specific interrogation factual, Specific interrogation explanatory, Yes-No factual, and Yes-No explanatory. These categories, devised by Berlyne and Frommer (1966) were used also by Evans (1969) Langevin (1970) and Day and Langevin (1970). The results of these studies had shown that the number and type of questions sometimes reflected by curiosity and intellectual characteristics in the interrogator.

Each question was classified by each of two judges and when agreement was not obtained a decision was made by the principal investigator after discussion with the judges.

Number of questions rather than proportion was used in the analysis because of the paucity of some of the types of questions (most earlier studies had used older Ss or had actively encouraged questions).

7. Other testing had been done by York County's School Board and data for the 288 Ss were supplied.

The data were analyzed by means of a multivariate analysis of variance using a 2 x 2 type design (type and location of schools). Some multivariate Fs were significant ($F_{type}=6.263$, $p < .001$; $F_{location}=4.247$, $p < .001$; $F_{interaction}=4.946$, $p < .001$).

This showed that in total the groups were acting differently and that there was a need to examine the specific variables wherein these differences occurred. Since Ss had to be dropped from the multivariate analysis because of missing data individual 2 x 2 analyses of variance were performed on the data. The individual F ratios are presented in Table 2.

Examination of the F values and referring back to the group means in Table 1 it can be noted that some schools are significantly different in various measures from the others (e.g., Maple Leaf greatest and Meadowbrook least in mosaics originality; Kettleby greatest in exploration time; Whitchurch highest in Total Math and Math Problem Solving). However, three differences are not consistent and do not demonstrate a definite superiority of any one school.

The correlations among the 19 variables are presented in Table 3. It can be noted that the I.Q. and achievement scores are all significantly related (as usually found in classroom studies such as Day (1968), but that the curiosity measures (5,6,7,12) are barely or not at all related to them. Interestingly too, the story construction scores correlate significantly with I.Q. and with school achievement scores.

Analysis of attitude toward schooling data showed that the Whitchurch pupils had the least positive regard towards their school.

TABLE 2

F VALUES FOR THE ANOVAS FOR ALL THE TESTS USED IN THE FOUR SCHOOLS (YEAR I)

| | Test | Type (open vs. trad.) | Location (urban vs. rural) | Interaction (type x location) |
|---|---|---|---|---|
| | Mosaics | | | |
| 1. | Aesthetic quality | 3.77 | .039 | 22.05** |
| 2. | Originality | 29.42** | 8.70** | 26.94** |
| | Story | | | |
| 3. | Aesthetic quality | .0004 | 0.808 | 0.140 |
| 4. | Originality | .255 | 1.01 | 0.112 |
| 5. | Exploration Time | 22.01** | 20.14** | 9.83** |
| 6. | Interest in complexity | 1.23 | 6.02* | 4.07* |
| 7. | Pref. for novelty | .713 | 2.78 | 10.42** |
| | Questions | | | |
| 8. | SI factual | .006 | 1.77 | 5.23* |
| 9. | SI explanatory | 4.07 | 2.80 | 0.850 |
| 10. | YN factual | 1.55 | 3.00 | 1.05 |
| 11. | YN explanatory | 1.40 | 0.128 | 0.128 |
| 12. | Total | 2.27 | | |
| 13. | IQ | 1.06 | 4.00* | 0.182 |
| | Achievement | | | |
| 14. | Math. total | 2.86 | 18.60** | 17.55** |
| 15. | Word knowledge | 1.71 | 3.59 | 0.076 |
| 16. | Word analysis | 0.697 | 2.06 | 0.028 |
| 17. | Reading comp. | 3.73 | 4.83* | 0.000 |
| 18. | Total reading | 4.71* | 3.09 | 0.0157 |
| 19. | Math. prob. solving | 7.42** | 33.10** | 26.15** |
| 20. | Attitude to School | 13.51** | 1.29 | 12.34** |

* $p < .05$
** $p < .01$

TABLE 3

CORRELATION COEFFICIENT MATRIX OF THE 19 TESTS

ADMINISTERED TO FOUR SCHOOLS (DECIMAL POINTS OMITTED)

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2 | 713** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 3 | 115 | 041 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4 | 107 | 010 | 905** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | 027 | 014 | 203** | 205** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | 136 | 030 | 242** | 234** | 058 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | 030 | 013 | 026 | 015 | 155* | 015 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 8 | 009 | 004 | 094 | 147* | 269** | 045 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 9 | 066 | 011 | 052 | 067 | 372** | 078 | 024 | 255** | - | - | - | - | - | - | - | - | - | - | - |
| 10 | 023 | 033 | 138 | 122 | 453** | 054 | 031 | 236** | 138 | - | - | - | - | - | - | - | - | - | - |
| 11 | 056 | 037 | 135 | 132 | 324** | 110 | 101 | 183** | 028 | 304** | - | - | - | - | - | - | - | - | - |
| 12 | 022 | 028 | 152* | 172* | 554** | 090 | 021 | 689** | 585** | 754** | 315** | - | - | - | - | - | - | - | - |
| 13 | 173* | 074 | 364** | 322** | 063 | 223** | 101 | 093 | 036 | 122 | 093 | 133 | - | - | - | - | - | - | - |
| 14 | 141* | 026 | 358** | 298** | 063 | 173* | 070 | 132 | 038 | 114 | 095 | 146* | 624** | - | - | - | - | - | - |
| 15 | 118 | 062 | 354** | 262** | 003 | 197** | 074 | 031 | 021 | 062 | 045 | 043 | 529** | 549** | - | - | - | - | - |
| 16 | 115 | 097 | 279** | 232** | 031 | 122 | 049 | 025 | 077 | 013 | 091 | 056 | 482** | 525** | 671** | - | - | - | - |
| 17 | 116 | 070 | 442** | 362** | 088 | 191** | 073 | 072 | 072 | 137 | 183** | 153* | 566** | 643** | 799** | 697** | - | - | - |
| 18 | 114 | 052 | 404** | 310** | 054 | 200** | 055 | 052 | 016 | 103 | 095 | 095 | 574** | 597** | 930** | 668** | 919** | - | - |
| 19 | 117 | 017 | 272** | 194** | 995 | 097 | 057 | 061 | 036 | 073 | 119 | 092 | 489** | 805** | 510** | 462** | 588** | 557** | - |

* $p < .05$

** $p < .01$

Year 2 (Grade 3)

Data on 12 variables were collected from all the students in Grade 3 but because of the loss of 40 Ss from the classrooms, analysis was done on only 248 of the 288 students tested in the previous year.

Mosaic construction was the same as in Year 1, but the stories told were different. Judges were different but the instructions were the same as in the previous year (see Appendix E). Exploratory time raw data were again transformed and Z scores were obtained. But the differences were significant and only the raw scores were used for final analysis.

Means for the 248 Ss tested both years are presented in Table 4.

Repeated measures analyses of variance (2 x 2 x 2 design) were performed for each variable separately because some Ss were absent for some of the tests or failed to respond on some of them (e.g., some Ss did not create a story). The F values for the ANOVAS are presented in Table 5.

The time factor (Year) is not important since different tests and/or testers were used in the different years. The most important factor for this study is the Years x Type interaction because the study proposed to examine differences in slope (change from Year 1 to Year 2) for the different types of schools. Important too is the Years x Type x Location variable because this would indicate whether one of the two schools of one type changed significantly from Year 1 to Year 2.

Analyses wherein the Y x T x L interaction was significant are presented in the form of figures and appropriate tests of simple effects were performed (Winer, 1962).

TABLE 4

MEANS OF SCORES FOR THE FOUR SCHOOLS FOR YEARS 1 AND 2

| | Test | YEAR 1 (Grade 2) Mdbr. (n=89) | Whit. (n=26) | M.L. (n=88) | K. (n=45) | Mdbr. (n=89) | Whit. (n=26) | M.L. (n=88) | K. (n=45) |
|---|---|---|---|---|---|---|---|---|---|
| | Mosaics | | | | | | | | |
| 1. | Aesthetic quality | 5.44 | 4.42 | 4.48 | 4.75 | 6.19 | 5.67 | 5.33 | 5.67 |
| 2. | Originality | 6.16 | 5.08 | 5.43 | 5.64 | 6.30 | 6.21 | 5.37 | 6.06 |
| | Story | | | | | | | | |
| 3. | Aesthetic quality | 5.53 | 5.05 | 5.11 | 5.05 | 6.13 | 5.90 | 5.47 | 5.84 |
| 4. | Originality | 6.32 | 5.81 | 6.04 | 5.89 | 6.29 | 6.43 | 5.64 | 6.18 |
| 5. | Exploration time | 250 | 284 | 265 | 424 | 118 | 178 | 256 | 120 |
| [illegible]. | Interest in complexit | 6.66 | 8.15 | 6.78 | 7.18 | 11.38 | 12.62 | 9.92 | 11.98 |
| | Questions | | | | | | | | |
| 7. | S1 factual | .899 | .692 | .315 | .140 | .104 | .962 | .100 | .165 |
| 8. | S1 explanatory | .517 | .731 | .389 | .140 | .708 | .385 | .481 | .500 |
| 9. | YN factual | .787 | .100 | .833 | .177 | .382 | .462 | .519 | .450 |
| 0. | YN explanatory | .055 | .038 | .000 | .000 | .191 | .154 | .130 | .250 |
| 1. | Total | .226 | .246 | .154 | .457 | .233 | .196 | .213 | .285 |
| 2. | Attitude to school | 8.62 | 8.00 | 8.64 | 8.96 | 7.96 | 7.62 | 7.86 | 7.78 |

TABLE 5

F VALUES FOR THE ANOVAS

FOR ALL THE TESTS USED IN GRADES 2 AND 3 (YEARS)

IN 2 OPEN AND 2 TRADITIONAL SCHOOLS (TYPE), AND

2 URBAN AND 2 RURAL SCHOOLS (LOCATIONS)

| | Measure | F value | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Year | YxT | YxL | YxTxL | Type | Loc. | TxL | n |
| | Mosaics | | | | | | | | |
| 1. | Aesthetic quality | 147** | .264 | 9.24** | 14.2** | 5.21* | 2.73 | 10.7** | 246 |
| 2. | Originality quality | 203** | 10.4** | 29.3** | 11.2** | 8.23** | .512 | 12.6** | 246 |
| | Story | | | | | | | | |
| 3. | Aesthetic quality | 15.4** | .203 | 1.04 | .061 | 1.42 | .171 | 1.15 | 210 |
| 4. | Originality | .414 | .850 | 3.09 | .003 | .950 | .003 | .476 | 210 |
| 5. | Exploration time | 56.5** | 1.05 | 13.3** | 19.3** | 9.94** | 2.48 | .917 | 207 |
| 6. | Interest in complexity | 307** | 1.64 | 2.07 | 3.86 | 6.67* | 20.8** | .060 | 243 |
| | Questions | | | | | | | | |
| 7. | SI factual | 4.66** | .690 | .249 | .796 | 1.09 | 3.88 | 7.62* | 209 |
| 8. | SI explanatory | 4.38* | 2.01 | 11.0** | .980 | .477 | 2.18 | 3.34 | 209 |
| 9. | YN factual | 14.5** | 1.06 | 2.86 | 1.67 | 1.25 | 1.89 | .468 | 209 |
| 10. | YN explanatory | 12.7** | .537 | .326 | .626 | .098 | .118 | .842 | 209 |
| 11. | Total | 1.78 | .357 | 6.06* | 2.23 | 1.68 | 5.01* | 5.95* | 209 |
| 12. | Change in attitude | | | | | .061 | 3.45 | 1.91 | 246 |

* P <.05
** p <.01

In Table 6 are presented the results of the significant differences using the Newman-Keuls for testing significance.

Correlations of the 10 most important variables were done for Year 2 creativity and curiosity scores with some of the academic achievement scores and I.Q. from Year 1. The results are presented in Table 7.

The ratings of the schools on the openness scales are presented in Table 8. It can be seen that the so-called open-plan schools do indeed seem to be much more open-plan than the traditional schools.

TABLE 6

SIGNIFICANT "t" TEST RESULTS FOR SIMPLE EFFECTS

| Test | Comparison | t |
|---|---|---|
| Mosaics aesthetic judgement | trad. urban > o-p urban<br>o-p rural > o-p urban | 3.77**<br>2.26** |
| Mosaics originality judgement | o-p rural > o-p urban<br>trad. urban > o-p urban | 1.96*<br>4.37** |
| Questions total | trad. rural > trad. urban | 2.42** |
| Mosaics aesthetic judgemnt | trad. > o-p | |
| Mosaics originality judgement | trad. > o-p | |
| Exploratory time | trad. > o-p | |
| Interest in complexity | o-p > trad. | |
| " " " | rural > urban | |

* $p < .05$
** $p < .01$

TABLE 7

CORRELATION COEFFICIENT MATRIX OF THE 10 TESTS

ADMINISTERED TO GRADE 3 (DECIMAL POINTS OMITTED)

| | Test | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | I.Q. | - | | | | | | | | | |
| 2 | Total Math. | 60 ** | - | | | | | | | | |
| 3 | Total Reading | 58 ** | 56 ** | - | | | | | | | |
| 4 | Mosaic Aesthetic | 17 | 18 | 09 | - | | | | | | |
| 5 | Mosaic Originality | 22 * | 23 * | 10 | 68** | - | | | | | |
| 6 | Story Aesthetic | 25* | 20 | 33** | -01 | 01 | - | | | | |
| 7 | Story Originality | 23* | 15 | 26** | -10 | -01 | 59** | - | | | |
| 8 | Exp. Time | 07 | -02 | 01 | -01 | 04 | -08 | -06 | - | | |
| 9 | Interest in complexity | 20 * | 15 | 20* | 05 | 03 | 10 | 00 | -01 | - | |
| 10 | No. of Questions | 17 | 17 | 10 | 01 | -07 | 10 | 11 | 13 | 05 | - |

* $p < .05$
** $p < .01$

TABLE 8

RATINGS OF THE FOUR SCHOOLS ON OPENNESS

| | Meadowbrook (open-urban) | Whitchurch (open-rural) | Maple Leaf (trad-urban) | Kettleby (trad-rural) |
|---|---|---|---|---|
| I. Nature of Use | 3.25 | 3.0 | 1.0 | 1.0 |
| II. Frequency of Use | 4.0 | 4.0 | 1.0 | 1.0 |
| III. Distribution of Use | 4.0 | 4.0 | 0 | 1.0 |
| IV. Nature of Interaction | 2.75 | 2.25 | 0.25 | 1.0 |
| V. Atmosphere | 2.75 | 2.25 | 0 | 2.0 |
| VI. Degree of Supervision | 2.25 | 3.0 | 0 | 2.75 |
| VII. Degree of Time Pressure | 2.25 | 3.0 | 0 | 1.0 |
| Total | 21.25 | 21.50 | 2.25 | 9.75 |

Year 3 (Grade 4)

Data from 23 variables were collected from all 281 students in Grade 4 of the from schools. Scoring and judging was done as in the previous years. Untransformed exploratory time raw data were used in the analyses.

Two sets of analyses were performed: the first included data from all 281 students in Grade 4 and the second set included only the 198 Ss who were consistent from Year 1 of the study, i.e. those students who remained in the same school through the 3 years. Mean scores for the 281 students are presented in Table 9 and for the 198 Ss in Table 10.

Type x Location analyses of variance were performed for each of the 23 variables separately, because some Ss were absent for some of the tests. The F values are presented in Table 11

Examination of the F values shows some significant differences but no consistent trend in favour of a particular school emerged. One must expect, with large number of tests, some significant findings and should not exaggerate the significance of a unique finding.

A correlation coefficient matrix of all the tests for all the Grade 4 Ss is presented in Table 12. Of interest is that I.Q. is barely related to curiosity but significantly with creativity measures of both aesthetic quality and originality and with academic achievement scores. Academic achievement does not seem to relate significantly to any of the curiosity measures, relates slightly to the mosaic creativity scores and more strongly to aesthetic quality of the stories.

For the 198 consistent Ss repeated measures analyses of variance (Year x Type x Location) were performed for each of 12 variable separately. Some students missed some of the tests and so were dropped from those particular analyses leaving the degrees of freedom different for different analyses.

TABLE 9

MEAN OF SCORES FOR THE FOUR SCHOOLS TESTED (YEAR 3)

| | Test | Meadowbrook (open-urban) | Whitchurch (open-rural) | Maple Leaf (trad-urban) | Kettleby (trad-rural) |
|---|---|---|---|---|---|
| | Mosaics 1st pres. | | | | |
| 1. | Aesthetic quality | 6.54 | 5.85 | 5.91 | 6.77 |
| 2. | Originality | 6.53 | 6.42 | 6.15 | 6.79 |
| | Story | | | | |
| 3. | Aesthetic quality | 6.44 | 6.34 | 5.68 | 6.30 |
| 4. | Originality | 7.72 | 7.69 | 6.74 | 6.63 |
| 5. | Exploration Time | 160.71 | 236.07 | 216.61 | 203.47 |
| 6. | Interest in complexity | 12.55 | 12.84 | 11.89 | 12.22 |
| 7. | Test of Spec. Curiosity | 21.58 | 23.78 | 22.21 | 22.77 |
| | Questions | | | | |
| 8. | SI factual | 2.01 | 1.62 | 2.14 | 2.54 |
| 9. | SI explanatory | 1.59 | 1.86 | 1.63 | 1.24 |
| 10. | YN factual | 1.19 | 8.57 | 1.46 | 1.26 |
| 11. | YN explanatory | 2.04 | 2.62 | 3.33 | 1.52 |
| 12. | Total | 5.00 | 4.50 | 5.56 | 5.17 |
| 13 | IQ | 106.34 | 110.40 | 104.88 | 108.75 |
| | Achievement | | | | |
| 14. | Word knowledge | 4.93 | 4.43 | 4.36 | 4.77 |
| 15. | Reading | 4.69 | 4.52 | 4.05 | 5.09 |
| 16. | Total reading | 4.75 | 4.64 | 4.15 | 4.93 |
| 17. | Math. computation | 5.19 | 4.99 | 4.40 | 4.73 |
| 18. | Math. concepts | 4.76 | 4.61 | 4.24 | 4.86 |
| 19. | Math. prob. solving | 5.02 | 5.20 | 4.37 | 4.96 |
| 20. | Total Math. | 4.93 | 4.84 | 4.29 | 4.85 |
| 21. | Attitude to School | 7.88 | 7.90 | 7.69 | 7.69 |
| | Mosaics 2nd pres. | | | | |
| 22. | Aesthetic quality | 7.06 | 6.16 | 6.92 | 8.27 |
| 23. | Originality | 7.40 | 5.82 | 8.11 | 8.00 |

TABLE 10

MEAN OF SCORES FOR THE FOUR SCHOOLS FOR YEARS 1, 2 AND 3

| | TEST | NO. OF SUBJ - (n) MDBK | WHIT | MPLF | KBY | YEAR 1 (GRADE 2) MDBK | WHIT | MPLF | KBY | YEAR 2 (GRADE 3) MDBK | WHIT | MPLF | KBY | YEAR 3 (GRADE 4) MDBK | WHIT | MPLF | KBY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mosaics | | | | | | | | | | | | | | | | |
| 1. | Aesthetic quality | 66 | 22 | 58 | 33 | 4.30 | 5.05 | 5.88 | 4.67 | 6.10 | 6.86 | 6.78 | 7.85 | 6.61 | 5.72 | 5.91 | 6.55 |
| 2. | Originality | 66 | 22 | 58 | 33 | 3.64 | 4.14 | 6.02 | 4.03 | 6.12 | 7.27 | 6.41 | 7.70 | 6.65 | 6.05 | 6.19 | 6.73 |
| | Story | | | | | | | | | | | | | | | | |
| 3. | Aesthetic quality | 55 | 15 | 54 | 29 | 54.60 | 49.40 | 50.76 | 52.79 | 60.64 | 56.13 | 53.93 | 60.79 | 62.73 | 63.60 | 51.81 | 52.55 |
| 4. | Originality | 55 | 15 | 54 | 29 | 58.36 | 49.33 | 59.26 | 58.62 | 54.73 | 51.33 | 52.59 | 52.41 | 59.82 | 45.33 | 51.85 | 48.28 |
| 5. | Exploration time | 69 | 23 | 43 | 30 | 238 | 271 | 266 | 369 | 115 | 176 | 195 | 141 | 159 | 199 | 229 | 182 |
| 6. | Interest in complexity | 60 | 22 | 60 | 32 | 6.78 | 7.68 | 6.90 | 7.19 | 11.34 | 12.50 | 9.91 | 11.93 | 12.43 | 13.09 | 11.80 | 12.37 |
| | Questions | | | | | | | | | | | | | | | | |
| 7. | SI factual | 71 | 23 | 43 | 30 | .986 | .609 | .279 | 1.30 | 1.04 | 1.00 | .953 | 1.97 | 2.03 | 1.60 | 1.91 | 2.47 |
| 8. | SI explanatory | 71 | 23 | 43 | 30 | .479 | .696 | .372 | 1.70 | .521 | .435 | .558 | .600 | 1.56 | 2.65 | 1.35 | 1.43 |
| 9. | YN factual | 71 | 23 | 43 | 30 | .802 | 1.00 | .720 | 2.17 | .352 | .434 | .628 | .467 | .859 | .913 | 1.19 | .867 |
| 10. | YN explanatory | 71 | 23 | 43 | 30 | .070 | .043 | .000 | .000 | .197 | .173 | .116 | .233 | .154 | .217 | .209 | .100 |
| 11. | Total | 71 | 23 | 43 | 30 | 2.33 | 2.34 | 1.37 | 5.17 | 2.11 | 2.04 | 2.26 | 3.27 | 4.61 | 5.39 | 4.67 | 4.83 |
| 12. | Attitude to School | 73 | 23 | 62 | 35 | 8.55 | 8.00 | 8.61 | 8.97 | 7.93 | 7.65 | 7.85 | 7.80 | 7.89 | 7.91 | 7.50 | 7.51 |

TABLE 11

F VALUES FOR THE ANOVAS FOR ALL THE TESTS
USED IN THE FOUR SCHOOLS (YEAR 3)

| | Test | No. of Subs. (n) MDBK | WHCH | MPLF | KBY | Type open vs trad | Location urban vs rural | Interaction type x locatior |
|---|---|---|---|---|---|---|---|---|
| | Mosaics 1st pres. | | | | | | | |
| 1. | Aesthetic quality | 92 | 40 | 80 | 47 | .388 | .126 | 11.46** |
| 2. | Originality | 92 | 40 | 80 | 47 | .002 | 1.25 | 2.47 |
| | Story | | | | | | | |
| 3. | Aesthetic quality | 89 | 35 | 87 | 43 | 9.65 | .046 | .013 |
| 4. | Originality | 89 | 35 | 87 | 43 | 2.00 | .876 | 1.62 |
| 5. | Exploration time | 92 | 42 | 90 | 46 | .413 | 2.94 | 5.95* |
| 6. | Interest in complexity | 85 | 38 | 83 | 46 | 4.66* | 1.66 | .004 |
| 7 | Test of spec. curiosity | 92 | 37 | 84 | 47 | .090 | 4.68* | 1.72 |
| | Questions | | | | | | | |
| 8. | SI factual | 98 | 42 | 90 | 46 | 3.75 | .000 | 2.09 |
| 9. | SI explanatory | 98 | 42 | 90 | 46 | .742 | .037 | .971 |
| 10. | YN factual | 98 | 42 | 90 | 46 | 1.88 | 1.20 | .086 |
| 1. | Yn explanatory | 98 | 42 | 90 | 46 | .015 | .607 | 2.28 |
| 12. | Total Question | 98 | 42 | 90 | 46 | 1.04 | .498 | .000 |
| 13. | I.Q. | 73 | 23 | 63 | 35 | .332 | 2.15 | .001 |
| | Achievement | | | | | | | |
| 14. | Word knowledge | 94 | 39 | 86 | 47 | .301 | .046 | 4.99* |
| 15. | Reading | 96 | 39 | 85 | 47 | .022 | 3.70 | 7.14** |
| 16. | Total reading | 95 | 39 | 85 | 47 | .105 | 1.35 | 6.34* |
| 17. | Math. computation | 96 | 39 | 86 | 47 | 11.85** | .171 | 3.11 |
| 18. | Math concepts | 96 | 39 | 86 | 46 | .269 | 1.19 | 6.53* |
| 19. | Math. prob. solv. | 96 | 37 | 81 | 47 | 5.34* | 4.03* | 11.42** |
| 20. | Total Math. | 96 | 37 | 81 | 46 | 4.53* | 2.40 | 4.61* |
| 21. | Attitude to School | 98 | 42 | 90 | 46 | 1.13 | .004 | .003 |
| | Mosaics 2nd pres. | | | | | | | |
| 22. | Aesthetic quality | 96 | 38 | 78 | 41 | 11.57** | .578 | 15.08** |
| 23. | Originality | 96 | 38 | 78 | 41 | 22.32** | 7.76** | 5.80* |

*P<.05
**P<.01

TABLE 12

CORRELATION COEFFICIENT MATRIX OF THE 24 TESTS
ADMINISTERED TO FOUR SCHOOLS (DECIMAL POINTS OMITTED)

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2 | 0.01 | 1.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 3 | 0.12 | 0.18* | 1.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4 | 0.06 | 0.14* | 0.82** | 1.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | -0.04 | -0.01 | 0.25** | 0.15* | 1.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | 0.02 | -0.01 | -0.10 | -0.08 | -0.13 | 1.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | 0.03 | 0.01 | 0.10 | 0.12 | 0.13 | -0.02 | 1.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 8 | -0.07 | 0.00 | 0.11 | 0.07 | 0.16* | -0.09 | 0.01 | 1.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 9 | -0.05 | -0.09 | 0.16* | 0.17* | 0.09 | 0.05 | 0.05 | 0.18* | 1.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 10 | 0.05 | -0.01 | 0.18* | 0.20** | 0.14* | -0.04 | 0.09 | 0.08 | -0.04 | 1.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 11 | 0.10 | 0.07 | 0.10 | 0.15* | 0.16* | 0.02 | 0.06 | 0.02 | 0.07 | 0.38** | 1.00 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 12 | -0.03 | -0.05 | 0.25** | 0.25** | 0.22** | -0.03 | 0.09 | 0.64** | 0.69** | 0.51** | 0.36** | 1.00 | - | - | - | - | - | - | - | - | - | - | - | - |
| 13 | 0.19** | 0.30** | 0.31** | 0.21** | 0.09 | -0.15* | 0.15* | 0.06 | 0.09 | 0.08 | -0.05 | 0.11 | 1.00 | - | - | - | - | - | - | - | - | - | - | - |
| 14 | 0.12 | 0.26** | 0.27** | 0.16* | 0.03 | -0.06 | 0.11 | 0.02 | 0.06 | 0.13 | 0.08 | 0.11 | 0.52** | 1.00 | - | - | - | - | - | - | - | - | - | - |
| 15 | 0.15* | 0.20** | 0.26** | 0.16* | 0.04 | -0.04 | 0.12 | 0.05 | 0.03 | 0.18* | 0.13 | 0.14* | 0.53** | 0.79** | 1.00 | - | - | - | - | - | - | - | - | - |
| 16 | 0.14* | 0.22** | 0.27** | 0.17* | 0.05 | -0.07 | 0.13 | 0.04 | 0.05 | 0.16* | 0.11 | 0.14* | 0.56** | 0.92** | 0.95** | 1.00 | - | - | - | - | - | - | - | - |
| 17 | 0.10 | 0.18* | 0.06 | 0.05 | -0.11 | 0.04 | -0.00 | -0.02 | 0.10 | 0.02 | 0.02 | 0.09 | 0.41** | 0.50** | 0.49** | 0.52** | 1.00 | - | - | - | - | - | - | - |
| 18 | 0.13 | 0.19** | 0.18* | 0.14* | -0.02 | -0.06 | 0.03 | -0.07 | 0.11 | 0.19** | 0.10 | 0.13 | 0.46** | 0.67** | 0.69** | 0.70** | 0.66** | 1.00 | - | - | - | - | - | - |
| 19 | 0.23** | 0.18* | 0.24** | 0.22** | 0.01 | 0.02 | 0.07 | -0.10 | 0.03 | 0.17* | 0.05 | 0.05 | 0.48** | 0.61** | 0.64** | 0.66** | 0.63** | 0.77** | 1.00 | - | - | - | - | - |
| 20 | 0.16* | 0.21** | 0.19** | 0.14* | -0.02 | 0.01 | 0.05 | -0.06 | 0.08 | 0.19** | 0.06 | 0.11 | 0.52** | 0.69** | 0.69** | 0.71** | 0.83** | 0.90** | 0.90** | 1.00 | - | - | - | - |
| 21 | -0.15* | -0.10 | 0.08 | 0.12 | 0.01 | 0.10 | 0.13 | 0.03 | 0.12 | 0.01 | -0.02 | 0.10 | -0.07 | 0.04 | 0.03 | 0.04 | 0.06 | 0.01 | 0.02 | 0.03 | 1.00 | - | - | - |
| 22 | 0.79** | -0.05 | 0.21** | 0.09 | -0.01 | 0.07 | -0.01 | -0.01 | -0.03 | 0.03 | 0.07 | 0.00 | 0.21** | 0.11 | 0.18* | 0.16* | 0.05 | 0.11 | 0.17* | 0.12 | -0.13 | 1.00 | - | - |
| 23 | 0.73** | -0.05 | 0.16* | 0.06 | 0.03 | 0.03 | -0.05 | -0.04 | -0.04 | -0.03 | 0.09 | -0.04 | 0.16* | 0.07 | 0.10 | 0.08 | -0.01 | 0.04 | 0.11 | 0.04 | -0.19* | 0.89** | 1.00 | - |
| 24 | 0.82** | -0.20** | 0.11 | 0.12 | -0.00 | 0.04 | 0.07 | -0.06 | 0.02 | 0.04 | 0.09 | 0.01 | 0.00 | 0.07 | 0.11 | 0.10 | 0.03 | 0.07 | 0.15* | 0.08 | 0.25** | 0.70** | 0.65* | 1.00 |

*P<.05
**P<.01

The means of the scores for the Ss are presented in Table 10 and the summary of the analyses in Table 13. The analysis of mosaics was done using the first presentation of Year 3 because it had followed the same testing conditions as in previous years.

The Year x Type of School differences are the only ones of concern in this study and must be considered significant when the 3-way interaction is not significant. Two significant differences were found; the aesthetic quality of the stories and Attitude to School. The scores for these two tests are presented in Figures 1 and 2. Figure 1 shows a steady increasing ability to create aesthetically good stories in the open schools and Figure 2 shows a progressively negative attitude to school in the traditional schools.

Student "t" tests were performed to determine if there were any significant differences between consistent and inconsistent Ss in the four Grade 4 schools. The results are presented in Table 14 and although some are statistically significant no meaningful differences were established.

The mosaics had been administered twice, once, by the teacher as part of the classroom activities and once by the instructor with instructions to be original and to create aesthetically good mosaics. The "t" tests show that instructions are effective in raising the level of creativity ($t_{\text{aesthetic quality}} = 4.785$; $p < .001$; $t_{\text{originality}} = 5.867$; $p < .001$).

The O.I.S.E. tests for openness of the schools based on teachers' responses yielded the following average results:

| | |
|---|---|
| Meadowbrook (3 teachers) | .44 |
| Whitchurch Highlands (4 Teachers) | .45 |
| Maple Leaf (3 teachers) | .34 |
| Kettleby (2 teachers) | .39 |

TABLE 13

FOR ALL THE TESTS USED IN GRADE 2, 3 AND 4 (YEARS)

IN 2 OPEN AND 2 TRADITIONAL SCHOOLS (TYPE), AND

2 URBAN AND 2 RURAL SCHOOLS (LOCATIONS)

| Measure | F value | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Year | YxT | YxL | YxTxL | Type | Loc. | TxL | n |
| Mosaics | | | | | | | | |
| 1. Aesthetic quality | 63.36** | 2.52 | 6.77** | 13.06** | 6.85** | .924 | .02 | 179 |
| 2. Originality | 94.21** | 4.11* | 14.10** | 12.55** | 6.57** | .493 | .935 | 179 |
| Story Telling | | | | | | | | |
| 3. Aesthetic quality | 4.50* | 3.50* | .219 | .827 | 2.85 | .003 | 1.62 | 153 |
| 4. Originality | 1.51 | .856 | .728 | .212 | .06 | 3.51* | 1.82 | 153 |
| 5. Exploration time | 54.73** | 1.50 | 4.76** | 7.73** | 7.23** | 2.64 | 2.50 | 165 |
| 6. Int. in complexity | 231.17** | 1.21 | 2.35 | 1.03 | 5.19** | 11.70** | .011 | 174 |
| Questions | | | | | | | | |
| 7. SI Factual | 19.68** | .759 | .576 | .164 | 1.99 | 2.40 | 9.17 | 167 |
| 8. SI Explanatory | 16.93** | 3.71 | 1.79 | 2.90 | .07 | 4.52** | .034 | 167 |
| 9. YN Factual | 7.93** | .799 | 4.24** | 3.11** | 1.64 | .988 | .233 | 167 |
| 10. YN Explanatory | 6.43** | .119 | .322 | 1.39 | .410 | .004 | .000 | 167 |
| 11. Total | 25.58** | 1.40 | 2.50 | 4.53* | 1.03 | 4.50* | 2.49 | 167 |
| 12. Change in Attitude | 21.57** | 5.52** | .231 | 1.50 | .111 | .260 | 1.38 | 193 |

* P<.05
**P<.01

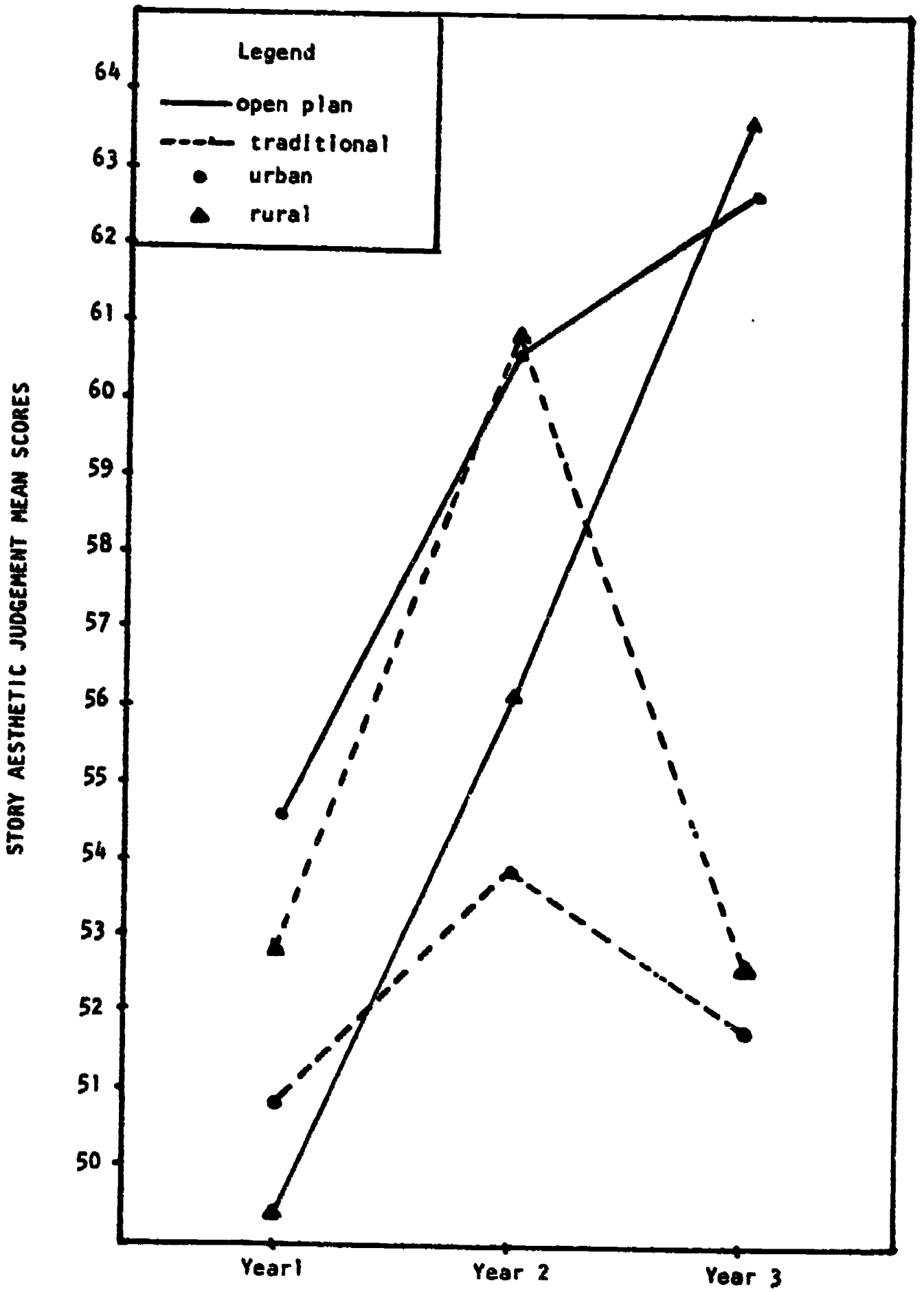


FIGURE 1

MEAN SCORES OF STORY AESTHETIC JUDGEMENT
IN 4 SCHOOLS OVER 3 YEARS

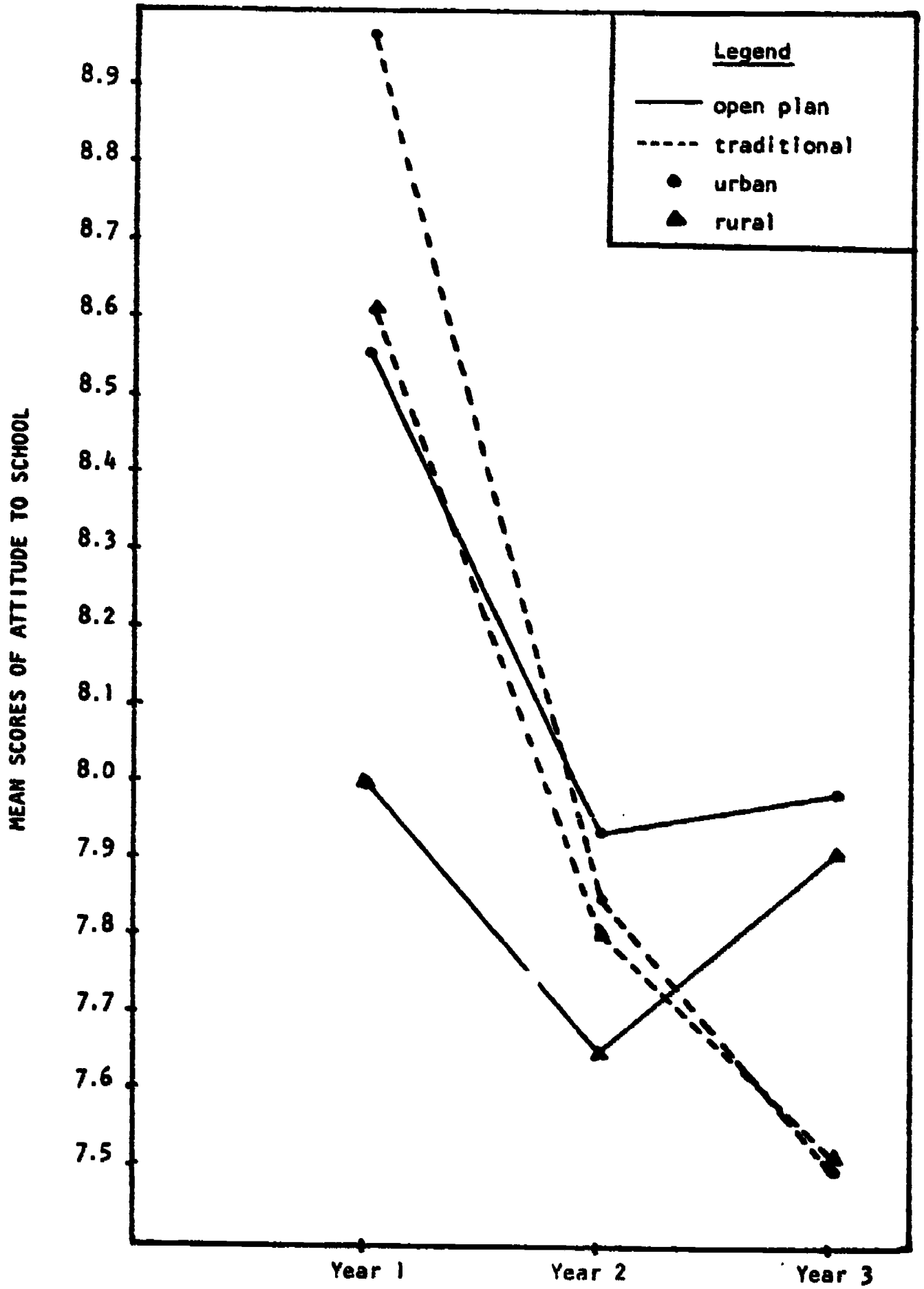


FIGURE 2

MEAN SCORES OF ATTITUDE TO SCHOOL
IN 4 SCHOOLS OVER 3 YEARS

TABLE 14

MEAN SCORES AND t VALUES FOR INCONSISTENT vs CONSISTENT SUBJECTS

| | Test | No. of Subj. | Mean Scores | | t Value |
|---|---|---|---|---|---|
| | | | Consistent | Inconsistent | |
| | Mosaics | | | | |
| 1. | Aesthetic quality | 259 | 6.26 | 6.33 | 1.15 |
| 2. | Originality | 259 | 6.42 | 6.49 | 1.20 |
| | Story | | | | |
| 3. | Aesthetic quality | 255 | 6.03 | 6.26 | .80 |
| 4. | Originality | 258 | 6.95 | 7.78 | 2.41* |
| 5. | Exploration time | 276 | 191.95 | 219.99 | 1.77 |
| 6. | Preference for complexity | 252 | 12.30 | 12.35 | 1.22 |
| 7. | Test of spec. complexity | 260 | 22.31 | 22.32 | 1.03 |
| | Questions | | | | |
| 8. | SI factual | 276 | 2.17 | 1.88 | 1.15 |
| 9. | SI explanatory | 276 | 1.71 | 1.30 | 2.49* |
| 10. | YN factual | 276 | 1.05 | 1.69 | 1.79 |
| 11. | YN explanatory | 276 | .20 | .36 | 1.48 |
| 12. | Total | 276 | 5.12 | 5.22 | 1.02 |
| | Mosaics - 2nd presentation | | | | |
| 13. | Aesthetic quality | 253 | 6.98 | 7.32 | 1.28 |
| 14. | Originality | 253 | 7.42 | 7.63 | 1.13 |
| 15. | Attitude to School | 278 | 7.71 | 7.98 | 1.54 |

* p .05

## DISCUSSION

A number of things can be stated fairly clearly after examination of the scores of the students in the four schools over three years. However, one must treat the results of this study, as one would the results of other studies, with caution.

The original purpose of the study was to discover whether a group of children continuing in open-plan schools over a period of three years would be distinguishable from a comparable group of students spending the same three years in traditional schools in various tests. Two schools, designated by the York County School Board as open-plan, were chosen for the study and these were matched with two traditional schools on features such as size, location and socio-economic background of parents. One of the two open-plan schools was urban-suburban and one rural with pupils being bussed to the school.

The schools were t[illegible]d twice for their degree of openness, once on a scale devised for thi[illegible]tudy (Year 2) and once on a scale designed by researchers at O.I.S.E. On both scales, the designated schools were found to be more open than the "traditional" schools.

Longitudinal studies of a quasi-experimental design must hope that intitially the subjects in the two groups are at approximately the same points with the hypothesis that divergence from the original similarity might be accounted for by the treatment conditions, i.e. the differences in school philosophy and methods. It is important in such a design to use more than one school within a group, so that no single school can create significant between-group differences because of some idiosyncratic conditions within the school. Even so, between-group differences can be exaggerated to some extent by an extreme score from one school (e.g. in the second presentation of the mosaics, Whitchurch Highlands pupils had comparatively poor scores in

originality, so that significant differences were found both in type and group means as well as in their interaction). In examination of the data therefore, one must not be distracted by idiosyncratic differences but focus on those conditions that were of original concern to the study.

Indeed, any differences that were found in the original Year 1 data were not consistent and so the assumption that the pupils in the two groups started at approximately the same position can be considered as valid. This allows us to examine comparative changes through Year 3.

One of the first expectat'-ns in the study was that the students in the open-plan schools would not become deficient in the usual academic areas by Grade 4. Examination of the grade level scores (Table 9) indicates that the averages are all at the fourth and fifth grade level with minor differences among schools (e.g. Kettleby and Meadowbrook appear to have achieved higher in most of the achievement tests). Therefore we can conclude that type of school does not seem to affect academic achievement.

On the other hand, it was hypothesized that students in the open-plan schools would thrive because of the conditions in their schools in the areas tapped by the creativity and curiosity tests. Interestingly, one significant difference was found in comparing Grade 4 pupils viz. the open-plan pupils showed a greater interest in complex visual stimulation over the three years. However, this does not appear to be a trend but rather a prevailing condition that remained fairly consistent over time. Thus one must conclude that different educational methods did not affect curiosity and creativity differentially.

Changes within children over time is not a meaningful variable because different testing material was used in different years and different teachers and experimenters collected the data each year.

Comparison of students consistently within the same school with those who had changed schools during the three years of the study showed no consistent significant differences, neither in academic achievement scores, nor in curiosity and creativity scores.

The one area where different trends were discovered was in Attitude to School. The questions asked of the students were simple and direct with the expectation that pupils in the early grades would respond openly and honestly. The results as shown in Figure 2 suggest that there is a steady deterioration of positive attitude towards school in the traditional schools. This deterioration is less manifest in the open-plan schools. It must be remembered that more than one classroom was tested in each of the schools and when one considers that attitude to school in the primary grades is mainly a response to the teacher and classroom conditions the data must be seen as fairly consistent and trustworthy.

The reasons for the failure to discover significant differences between the two types of schools needs to be examined. It could be argued that the differences had not yet appeared but, given sufficient time, would become salient. This argument is in line with the Wilson et al (1969) study that showed that differences can appear among pupils in open schools depending on the length of time they had spent in the school. However, that study was of pupils in Grade 6 rather than Grade 4. Moreover, there do not seem to be any trends that might suggest a consistent increasing separation of the two groups.

A gnawing question is whether open schools are open and traditional schools traditional. While there is reason to reject the notion of extreme differences between the school types, on two occasions differences of openness were found in favour of the open-plan schools. The first test was in the feelings and attitudes that objective observers established in the halls

and corridors of the schools and the second was based on the responses of the teachers in the schools.

One is therefore forced to conclude that there may not be significant differences between the two types of schools in their effect upon academic achievement, curiosity and creativity. Yet, Haddon and Lytton (1968, 1971) show evidence that in England differences were found. Whether the differences between the Haddon and Lytton studies and the Ontario studies (e.g., Wilson, et al., 1969; Halton County, 1969, Day, 1972) including this one are due to the differences in school systems, populations, pupils, or tests used is not known. It is, however, interesting that here repeated testing has failed to establish differences.

One must therefore conclude that the two school types do not affect academic achievement, curiosity and creativity differentialiy but that traditional schools "turn off" students in the primary grades more than open schools.

An additional interesting finding is that instructions to be creative is an effective way of increasing the creativity level of pupils. Many individuals have attempted to devise complex systems for enhancing creativity in schools (e.g., Arnold 1962; Covington et al 1969; Gordon 1961; Torrance 1962). Yet Ward et al (1972) have shown that one can increase creativity by simple instruction and an offer of reward. Here too this study has demonstrated that creativity can be enhanced with simple instructions to be original and creative.

APPENDIX A

Score Sheet for Interest in Complexity Test

NAME _____

SCHOOL _____

1. L R

2. L R

3. L R

4. L R

5. L R

6. L R

7. L R

8. L R

9. L R

10. L R

11. L R

12. L R

13. L R

14. L R

15. L R

## APPENDIX B

Score Sheet for Preference for Incongruity, Complexity, and Novelty Test

NAME_____

SCHOOL_____

| | | | | | |
|---|---|---|---|---|---|
| 1. | U / L | 12. | U / L | 23. | U / L |
| 2. | U / L | 13. | U / L | 24. | U / L |
| 3. | U / L | 14. | U / L | | |
| 4. | U / L | 15. | U / L | | |
| 5. | U / L | 16. | U / L | | |
| 6. | U / L | 17. | U / L | | |
| 7. | U / L | 18. | U / L | | |
| 8. | U / L | 19. | U / L | | |
| 9. | U / L | 20. | U / L | | |
| 10. | U / L | 21. | U / L | | |

APPENDIX D

Rating Scale for Test of School Openness (Based on Hall Activity

I. NATURE OF HALL USE

0 used solely for transportation and discipline
1 rarely used for purposes other than transportation and discipline (e.g., work or legitimate socializing)
2 sometimes used for work and/or legitimate socializing
3 often used for work and/or legitimate socializing
4 an integral part of the classroom for working and legitimate socializing

II. FREQUENCY OF HALL USE

0 no movement except at break (e.g., recess, lunch, closin or class-change times
1 little "off-time" movement
2 some "off-time" movement
3 much "off-time" movement
4 constant movement in halls at all times

III. DISTRIBUTION OF HALL USE

0 only specified areas or routes in halls to be used by students
1 few "free" hall areas
2 some "free" hall areas
3 few restricted hall areas
4 no restricted hall areas

IV. NATURE OF ADULT INTERACTION WITH STUDENTS

0 for supervision/discipline purposes only
1 mostly for supervision/discipline purposes
2 50/50 supervision/discipline and work assistance/ socializing
3 mostly for purposes of work assistance and socializing
4 solely for purposes of work assistance and socializing

V. ATMOSPHERE

0 always tense
1 rarely relaxed
2 sometimes relaxed
3 rarely tense
4 always relaxed

## APPENDIX C

## Score Sheet for Test of Attitude to Schooling

NAME_____

SCHOOL_____

1. Do you like school? Why?

2. What's your favorite school subject? Why?

3. Do you like your teacher?

4. Would you go to school if you didn't have to?

VI. DEGREE OF STUDENT SUPERVISION (Commands, rule enforcement, negative comments issued personally or via loudspeakers by adults)

0 always supervision
1 rarely without supervision
2 50/50 supervision/no supervision
3 rarely supervision
4 never supervision

VII. DEGREE OF TIME PRESSURE (Adult-spoken orders or bells)

0 always time limits
1 rarely without time limits
2 50/50 time limits/no time limits
3 rarely time limits
4 never time limits

## Appendix E

## PROCEDURES FOR SCORING STORIES AND MOSAIC DESIGNS

The procedure to be followed in scoring both the paragraphs and mosaic designs is essentially one of sorting the items into 6 categories. For both products independent sorting should be done on each of two criteria aesthetic quality and originality.

### Criteria

1. Aesthetic quality: This is your own evaluation of the beauty, sensitivity or artistic quality of the products. With the designs, factors such as balance, symmetry, organization, etc. will be of concern. With the stories, similar literary qualities will enter into your judgment. However, basically the criteria you use are the ones, however defined, you would typically use in judging the aesthetic quality of such items.

2. Originality: From your experience with the work of children of this age, your grouping of the items will reflect your judgment of how fresh, independent, different and distinctive you find each of them to be.

### Categorizing

As noted above, sorting on the two criteria should be done independently. This means that the items should be shuffled before each sort.

Each item should be rated on one of 6 categories the lowest (1) being the least original (or of least aesthetic quality) and (6) being the highest.

The scores should be entered on the attached sheets by placing the subject numbers in the appropriate columns. No marks should, of course be placed on the items which might influence the scoring done by other judges.

## REFERENCES


Arnold, J. E. Useful Creative Techniques. In A Source Book for Creative Thinking. Parnes and Harding, 1962.

Ausubel, D. P. Creativity, General Creative Abilities and the Creative Individual. Psychology in the Schools. 1, pp. 344-347. 1964.

Barron, F. The Creative Person and the Creative Process. New York: Holt Rinehart & Winston, 1969.

Berlyne, D. E. Conflict, Arousal and Curiosity. Toronto: McGraw-Hill, 1960.

Berlyne, D. E. Motivational problems raised by exploratory and epistemic behavior. In Psychology - A Study of a Science. (ed.) S. Koch. Vol. 5, pp. 284-364. New York: McGraw-Hill, 1963.

Berlyne, D. E. Curiosity and Education. In Learning and the Educational Process. J. D. Krumboltz (ed.) Chicago: Rand McNally, 1965.

Berlyne, D. E. Arousal and reinforcement. In Nebraska Symposium on Motivation 1967. (ed.) D. Levine. pp. 1-110. Lincoln, Nebraska: University of Nebraska Press, 1967.

Berlyne D. E., & Frommer, Frances. Influence of collative variables and age on children's questions. Child Development. 37, pp. 177-189. 1966.

Bruner, J. S. The Process of Education. Cambridge, Mass.: Harvard University Press, 1960.

Bulstein, Rochelle. A Developmental Investigation in Preference for Collative Variability. Unpublished M.A. Dissertation, University of Toronto, 1969.

Burnham, Brian. A Day in the Life: Case Studies of Pupils in Open Plan Schools. Aurora, Ontario. Research Office, Division of Planning and Development, York County Board of Education, 1970.

Canadian Cognitive Abilities Test Primary 1. Thomas Nelson and Sons, (Canada) Ltd., Toronto, 1970.

Carbonari, Joseph P. Report of an Evaluation Study of an Open Concept School. Educators Report and Fact Sheet, 5, 1-2. 1971.

Caswell, Judy and Campbell, John. Play: Its Relationship to Open Plan Education and Its Effect on Creativity, Cognitive Ability, and Academic Achievement. Unpublished B.A. (Hon.) Dissertation, York University, 1972.

Cheek, Robert Edward. The Opinions of Teachers Teaching in Selected Open-Space Elementary Schools. Ph.D. Dissertation, Wayne State University, 1970.

Covington, M. V., Crutchfield, R. S. and Davies, L. B. The Productive Thinking Program. Columbus, Ohio: Charles E. Merrill, 1969.

Crawford, G. A Developmental Investigation of Changes in Response to Visual Complexity. Unpublished M.A. Dissertation, University of Toronto, 1969.

Day, H. I. A Curious Approach to Creativity. The Canadian Psychologist. 9, pp. 485-497. 1968.

Day, H. I., Langevin, R., Block, R. & Noble, W. Characteristics of student questions and questioners. Paper read at OERC Conference, Toronto. December 4, 1970.

Day, H. I., Berlyne, D. E. & Hunt, D. E. Intrinsic Motivation: A New Direction in Education. Toronto: Holt Rinehart & Winston, 1971.

Day, H. I. and Langevin, R. Curiosity and intelligence: two necessary conditions for high level of creativity. The Journal of Special Education. 3, pp. 263-268. 1969.

Day, H. I. The measurement of innovative behavior. Unpublished Manuscript, 1972.

Dellas, M. and Gaier, E. L. Identification of creativity: The individual. Psychological Bulletin. 73, pp. 55-73, 1970.

Evans, D. R. Conceptual complexity, arousal and epistemic behavior. Unpublished Ph.D. Thesis, University of Toronto, 1969.

Fowler, G. W. An Evaluation of Open Area Schools in the Calgary Public School District. Calgary: Calgary School Board, 1970.

Getzels, J. W. and Jackson, P. W. Creativity and Intelligence. New York: Wiley, 1962.

Golann, S. Psychological study of Creativity. Psychological Bulletin. 60, pp. 548-565, 1963.

Gordan, W. J. J. Synetics: The Development of Creative Capacity. New York, N.Y.: Harper, 1961.

Guilford, J. P. Creativity. American Psychologist, 5, pp. 444-454, 1950.

Guilford, J. P. Intelligence, Creativity and their Educational Implications. San Diego: Knapp, 1968.

Haddon, F. A., and Lytton, H. Teaching approach and the development of divergent thinking abilities in primary schools. British Journal of Educational Psychology. 38, pp. 171-180, 1968.

Haddon, F. A. and Lytton, H. Teaching Approach and Divergent Thinking Abilities: Four Years On. British Journal of Educational Psychology. 41, pp. 136-147, 1971.

Hall-Dennis et al. Living and Learning: Report of Provincial Committee on Aims and Objectives of Education in the Schools of Ontario. Ontario Department of Education, 1968.

Halton County Board of Education. West Education Centre Evaluation Committee of the Innovations Council, Final Report, Oakville, Ontario, 1969.

Holt, John. How Children Fail. New York, N.Y.: 1964.

Kennedy, V. J. and Say, Michael W. Comparison of the effects of Open-Area vs. Closed-Area Schools on the Cognitive Gains of Students. Educators Report and Fact Sheet. 4, pp. 1-4, 1971.

Killough, Charles Kyle. An Analysis of the Longitudinal Effects that a Nongraded Elementary Program, Conducted in an Open Space School had on the Cognitive Achievement of Pupils. Houston, Texas: Bureau of Educational Research and Services, College of Education, University of Houston, 1971.

Langevin, R. A study of curiosity, intelligence and creativity. Unpublished Ph.D. dissertation, University of Toronto, 1970.

McRae, B. C. The Effect of Open-Area Instruction on Reading Achievement. Vancouver: Board of School Trustees, Department of Research and Special Services, 1970. (Research Report, pp. 70-73)

Metropolitan Achievement Tests Primary 1 Battery. Harcourt, Brace, Jovanovich, 1970.

Metropolitan Toronto School Board, Study of Educational Facilities. Academic Evaluation: An Interim Report. Draft. Toronto, Ontario: Metropolitan Toronto School Board, 1971.

Metropolitan Toronto School Board, Study of Educational Facilities. Annotated Bibliography of Research on Open Plan Schools. Revised. Toronto, Ontario: Metropolitan Toronto School Board, 1972. Mimeographed

Mister, Denise and McCann, Lynda. Survey of Teachers' Assessments of Open Area Schools. Toronto: Ontario Teachers' Federation, 1971. Mimeographed.

Ontario Department of Education. Living and Learning. Report of the Provincial Committee on Aims and Objectives of Education in the Schools of Ontario. Toronto, Ontario: Ontario Deparment of Education, 1968.

Open Space School Project Bulletin. School Planning Laboratory, School of Education, Stanford University, No. 1, 1970.

Sackett, John W. A Comparison of Self-Concept and Achievement of Sixth Grade Students in an Open-Space School, Self-Contained School and Departmentalized School. Unpublished Ph.D. dissertation, University of Iowa, 1971.

Sears, P. S. and Hilgard, E. R. The teacher's role in the motivation of the learner. In Theories of Learning and Instruction, 63rd Yearbook of NSSE. (ed.) E. R. Hilgard, pp. 182-209. Chicago: University of Chicago Press, 1964.

Smart, R. G. Trapped administrators and evaluation of social and community development programs. Addictions. 19(4), pp. 46-57, 1972.

Sudbury Board of Education. Open Schools Project. Sudbury, Ontario Institute for Studies in Education, Midnorthern Centre, 1972.

Torrance, E. P. Rewarding Creative Behavior. Englewood Cliffs: Prentice-Hall, 1965.

Ward, W. C., Kogan, N. and Pankove, E. Incentive effects in children's creativity. Child Development. 43, pp. 669-676, 1972.

Warner, Jack B. A Comparison of Students' and Teachers' Performance in an Open-Area Facility and in Self-contained Classroom. Ed.D. dissertation, University of Houston, 1970.

Wilson, F. S., Langevin, R. and Stuckey, T. Are Pupils in the Open Plan School Different? A paper presented to the Seventh Canadian Conference of Educational Research, Victoria, B.C., January, 1969.

Winer, B. J. Statistical Principles in Experimental Design. Toronto: McGraw-Hill, 1962.

York County Board of Education, Division of Planning and Development, Research Office. Reading and Mathematics Achievement of Grade I Pupils in Open Plan and Architecturally Conventional Schools. Aurora, Ontario, 1971. (Studies of Open Education, No. 5)