THE PERCEPTIONS OF NEWFOUNDLAND AND LABRADOR JUNIOR HIGH SCIENCE TEACHERS CONCERNING THE GRADE SEVEN SEARCHING FOR STRUCTURE PROGRAM

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BY

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ABSTRACT

The innovative grade seven junior high science program Searching For Structure had been taught for six consecutive years. Within this period of time the program had matured and could be expected to be defended on its own merits. The researcher considered that no one was more aware of the problems of this existing program in Newfoundland and Labrador schools than the teachers who were in daily contact with the students.

Typically, teachers' views on the educational process have been neglected. The teacher point of view is indeed important, and this study was an attempt to give teachers an opportunity to express their views or perceptions.

The need for the study lay in two major considerations: (1) the value of understanding the way teachers perceived the science curriculum as compared to the prescribed or formal curriculum, and (2) knowledge of the process of curriculum development as it actually occurred.

The researcher sent a self administered Likert style questionnaire to every grade seven science teacher in Newfoundland and Labrador. The statements and items on the questionnaire were designed to elicit information regarding the following six basic questions:

1. Is the professional preparation perceived by junior high school teachers in agreement with the requirements of the Newfoundland Department of Education?

2. Are the goals and objectives perceived by the junior high school science teachers in agreement with those stated in the science curriculum?
3. Do teachers perceive the techniques recommended in the science curriculum as appropriate for the achievement of the prescribed goals and objectives?
4. Do teachers perceive the facilities available for teaching science in the junior high school as adequate?
5. Do teachers perceive the equipment and supplies available for teaching science in the junior high schools as adequate for the development of the activities prescribed in the curriculum?
6. Do teachers perceive a need for a revision of the junior high school science curriculum?

A Pearson Product Moment Correlation was run on the VAX computer system. Appropriate correlation statements were selected by the researcher to be correlated with all possible statements and items on the questionnaire. The correlations can probably be best summed up with reference to how the teachers responded to the question regarding course revision. Generally, those teachers who taught the "prescribed curriculum" disagreed, whereas those who were unable to teach the "prescribed curriculum" agreed that a search should begin for a more appropriate course.

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STATEMENT AND DEFINITION OF THE PROBLEM

Social scientists claim that behavior and learning are products of the perception of the individual. The conceptions which persons have of themselves, and of the things related to their lives, have implications concerning what is and what should be. These conceptions affect their performance as individuals and as leaders. If this is accepted as true, then this principle would have important implications for teachers, the curriculum, and students as well. The study reported here will draw from these principles to study grade seven junior high school science teachers in an effort to infer the nature of their perceptions of the junior high school science curriculum in Newfoundland and Labrador schools, and compare these with the prescribed curriculum.

The growth of scientific and technological knowledge within the Canadian framework is increasing at an accelerating rate. The development of our diverse economic sectors calls for a society aware of the importance of scientific discoveries. Moreover, it requires the development of attitudes, interests, and skills which enable the individuals to cope with the ongoing changes. For this reason, it is of utmost importance to assess the science curricula of our schools to determine if they are effectively preparing our young people to take their rightful place in the development of this great country.

In an effort to conceptualize the apparent distinctly different curricula for purposes of a project in studying curriculum practice, Goodlad and his colleagues (Goodlad, 1979) depicted five different domains:

1. Ideological curricula - defined as curricula which emerge from idealistic planning processes. The content of ideological curricula is determined by examining textbooks, workbooks, teachers' guides, and the like.
2. Formal curricula - defined as curricula which gain official approval by state and local school boards and adoption by choice or fiat, by institutions and teachers. These curricula consist of written documents such as curriculum guides, syllabi, adopted texts, and units of study.
3. Perceived curricula - defined as curricula of the mind, or what others (e.g., parents and teachers) perceive the curricula to be. What parents, teachers and students think their schools teach constitutes the perceived curricula.
4. Operational curricula - defined as what goes on, hour after hour, day after day in schools and classrooms. The activities carried out by

teachers and students in the school environment make up the operational curricula.

5. Experimental curricula - defined as the curricula experienced by the students. What students derive from and think about the operational curricula.

Based on these concepts, Goodlad concludes that there are many curricula perceived simultaneously by different individuals and groups. If this is true, there is likely to be discrepancy between the perceptions of curriculum makers and the perceptions of the practitioners.

This study focuses on two of Goodlad's concepts: the formal curricula and the perceived curricula. More specifically, the purpose of this study is to address the following question: Does what has been officially approved as the junior high school science curriculum (the formal curriculum) harmonize with the perceptions of junior high school science teachers (the perceived curriculum) in the Newfoundland and Labrador schools?

This study is concerned with the way junior high school science teachers in Newfoundland and Labrador schools see several aspects of the science curriculum for that level. This study seeks to determine the degree of agreement or disagreement between teachers' perceptions of the curriculum and what is prescribed in the curriculum. For the purpose of this study, prescribed curriculum is defined as all the guidelines issued by the Newfoundland Department of Education concerning the teaching of science in the junior high schools of the province. Perceived curriculum is defined as what teachers think of the curriculum as it presently exists.

This study seeks to answer the following questions:

1. Is the professional preparation perceived by junior high school science teachers in agreement with the requirements of the Newfoundland Department of Education?
2. Are the goals and objectives perceived by the junior high school science teachers in agreement with those stated in the science curriculum?
3. Do teachers perceive the techniques recommended in the science curriculum as appropriate for the achievement of the prescribed goals and objectives?
4. Do teachers perceive the facilities available for teaching science in the junior high school as adequate?
5. Do teachers perceive the equipment and supplies available for teaching science in the junior high schools as adequate for the development of the activities prescribed in the curriculum?

6. Do teachers perceive a need for a revision of the junior high school science curriculum?

It should be made clear at the outset that this study is of an exploratory nature. The concerns of the study are mainly two:

1. to reveal the pictures teachers carry in their minds of the junior high school science curriculum, and
2. to find out if teachers think there is a need for a revision of the junior high school science curriculum.

OVERVIEW OF THE STUDY

Lippman (1961) related public opinion and the pictures which people carry in their minds with the behavior of individuals. Day, 1969; Fried, 1974; Bruner and Anglin, 1974; Dember and Warm, 1979; and Goodlad, 1979 agree that the reactions of individuals to persons and things are shaped by the cognitive map of reality they maintain. Their reactions or behavior are in accordance with their interpretations of the world and the meanings attached to them. If the behavior of persons is determined to a great degree by their particular views and their own cognitive world, conflict may be found between teachers' perceptions of the curriculum and the perceptions of curriculum makers. If so, this should be taken into consideration by those concerned with the planning and development of the curricula.

The development and prescription of basic courses of study is the responsibility of the Government of this province. The Division of Instruction within the Department of Education is responsible for all courses of study (except religion) for elementary and secondary schools of the province. The content of each course at each grade level is specified so that students receive appropriate sequences of learning experiences as they progress through their grades. Through curriculum consultants, the division advises and assists schools in implementing authorized programs. It provides media support services through film, filmstrip, video and audiotape production and distribution, and through library consultation.

The province of Newfoundland and Labrador has a Denominational Education System. Under this arrangement, responsibility for education is shared between the Provincial Government through the Department of Education and the major Christian churches through the Denominational Education Councils. There are three such councils: (a) the Roman Catholic Education Council; (b) the Integrated Education Council which comprises Anglican, Moravian, Presbyterian, Salvation Army and United Church; and (c) the Pentecostal Assemblies Education Council.

The Seventh Day Adventist also operates a school system, but has relatively few students and is not part of the Denominational Education Council arrangement.

The Government's Role

The basic responsibility of the Government is to see that the Province offers the best possible educational services, designed to meet the needs of all students.

The Church's Role

The churches are represented in the educational system through their particular Denominational Council.

The role of these Councils includes:

1. Determining how and where money will be spent for new school buildings, extensions, and equipment.
2. Recommending to Government the establishment and alterations of School District boundaries.
3. Recommending to Government the appointment of school board members.
4. Recommending the initial certification of teachers.
5. Developing and prescribing Religious Education programs.

School Boards

There are 35 school boards throughout the province to administer all matters pertaining to the day-to-day operations of schools. School boards are, therefore, responsible for such things as the organization of schools within their districts, the fixing of attendance zones, the repair and maintenance of school buildings, the employment of teachers and other staff, and arranging for pupil transportation.

With this type of organization, one would expect discrepancies between the perceptions of the curriculum practitioners and what is prescribed.

History of the Junior High Science Program

In September, 1971, the Newfoundland Department of Education introduced the program Exploring Science Stages I, II and III in grades 7, 8 and 9. This Program was highly activity oriented, with minimal content, reflecting the more current approach in science education. The program which Exploring Science replaced was a traditional one, having mainly content with suggestions for verification type activities. Because of the nature of Exploring Science, with inadequate inservicing of teachers and many schools having minimal or no equipment, the program encountered great difficulties. Any program with similar philosophy and approach would probably have encountered the same difficulties. However, according to Wayne Oakley, the provincial science consultant, 1978, the program itself had a number of limitations.

1. The text was too activity oriented. Each lesson was an activity, with little content given for the student resulting in a need for a great deal of supplementing from other sources.
2. The reading level of the program was too high in many units within each grade level.
3. Some of the concepts dealt with in each text were too difficult for the grade level, e.g., electricity was dealt with in grade 7 before magnetism, and before any introduction to atoms, electrons, etc.
4. The teacher guidebook was inadequate. Although the guide gave good direction to the teacher regarding philosophy and teaching strategy, it did not give the teacher adequate "content" to make him/her feel confident and competent to teach the program. As teachers phrased it: "there were too many questions and too few answers".

There were other problems put forth by teachers as being "problems with Exploring Science", such as lack of equipment, more material than could be covered, impossible to evaluate student progress, not enough preparation time, and too many students per class.

IDENTIFICATION OF POTENTIAL SOLUTIONS

The Department of Education had recognized for some time the difficulties which existed with the Exploring Science program. In 1975-76 a committee was established to deal with the junior high problem. This committee developed a course description for junior high science. This description included the following: (a) objectives of science generally, (b) objectives of junior high science specifically, (c) philosophy of instruction, (d) evaluation, (e) topics to be taught at each grade level, and (f) texts, ancillary and resource materials available.

During 1977-78 two programs were piloted in grades 7 and 8 in twenty schools in the province, with ten schools piloting the Searching For Structure program and ten piloting the Exploring Science, 2nd Edition program which was very different from the 1st Edition. Approximately 350 students were involved in each program. The pilot was established using an experimental design of control and pilot classes at the grade 7 level, where an individual school had a pilot class (one of the new programs) and a control class (one using the Exploring Science, 1st Edition program). Within each of the ten Districts two schools were designed as School Type A (fairly well equipped with a teacher with some background in science) and School Type B (poorly equipped school with an underqualified teacher). Experimental programs were randomly assigned to each type of school.

During 1978-79 both programs were continued in grades 7 and 8, and extended to grade 9. Evaluation consisted of the following: (a) science processes pre- and post- tests for students; (b) teacher evaluation form, and (c) student achievement, which became the responsibility of the respective individual teachers.

Results - Year 1, 1977-78
(Department of Education Files)

(1) Science Processes Tests - The data from the pre and post processes tests indicated that there was a slight gain in science process skill development between classes using the Searching For Structure program and control classes. However, there was no significant difference between either of the programs piloted and their corresponding control classes.

(2) Teacher Evaluation Forms - Individual teachers using the same program were quite varied in their assessment. The majority of teachers using the Searching For Structure program rated the program as "better" or "much

better" than the old program on each of the following: (a) balance of content and number of activities, (b) level of concepts, (c) provision for low and high ability students, (d) reading level, (e) teacher guidebook, and (f) illustrations and diagrams in text. The majority rated student interest and choice of topics for the year the same as the old program. The majority of teachers using the Exploring Science, 2nd Edition program rated the program as "better" or "much better" than the old program on the following: (a) balance of content and number of activities, (b) reading level, (c) teacher guidebook, (d) student interest, and (e) illustrations and diagrams in text. The majority rated the following as "same" or "worse" than the old program: (a) level of concept, (b) provision for low and high ability students, and (c) choice of topics for the year.

For both programs the majority of teachers indicated that the program suffered to the extent that laboratory facilities and equipment were in short supply or non existent. The teachers of both programs stated emphatically that the program would not be much of an improvement over the old program if facilities and equipment were not upgraded.

The results obtained from piloting teachers indicated that the Exploring Science, 2nd Edition program was not suitable as a replacement for the program that was currently in use. It was decided that the Searching For Structure program would be made available to those schools who wished to use it beginning in September, 1980. The program was phased in beginning with grade 7 in the first year, grade 8 in the second year, and grade 9 the following year. The 1979-80 school year was spent in preparing a course description and conducting inservice sessions to familiarize teachers with the new program. Schools who decided not to use the new program were permitted to continue using the program that they were presently using.

The Junior High Science Working Group consisting of Wayne Oakley (Provincial Science Consultant) and three science teachers; Harvey Baker, Robert Pittman and Richard Coombs combined efforts to produce a Junior High Science Curriculum Guide.

SEARCHING FOR STRUCTURE PROGRAM

The Searching For Structure program is an activity oriented program. The degree of activity is very similar to the Exploring Science program. However, the Searching For Structure program differs in that the activities are well delineated, structured, and usually sequenced within a unit. The core activities for each unit are identified, with provision for enrichment activities (both vertical and horizontal). The teacher guidebook was written for

Newfoundland and Labrador, according to provincial specifications. The first 25-30 pages of the guide deal with such topics as the nature of the program, conceptual schemes on which the program is based, science processes, format of the text, out-of-classroom learning, learning strategies, integration, the Metric System, slow learners, evaluation, and the changing role of the teacher and student. The remainder of the guidebook provides content background, methodological aspects, equipment lists, and appendices elaborating on some of the topics dealt with in the introductory section of the guidebook.

The activity orientation of the program required a major emphasis on the laboratory aspect of the program. It was recognized that many of the schools in the province were deficient in this area.

To help alleviate the burden on districts to implement this new program, the Department of Education provided a subsidy of 50% for new equipment purchased to a maximum of $1000 for each school in the districts using the Searching For Structure program in grade 7. To qualify for this subsidy, schools had to order equipment included in the Equipment List found in the new Junior High Science Curriculum Guide.

REGIONAL WORKSHOPS

During April, 1980, four Regional Workshops for Junior High Science Inservice were scheduled at Wabush, St. John's, Corner Brook and Gander, respectively. Each workshop was of a one day duration and each district was asked to send a supervisor and one teacher, who could then be used to help the supervisor when doing the district inservice.

The objectives of the Regional Workshops were:

1. To provide leadership in the area of inservice for junior high science.
2. To provide supervisors and other key people from districts exposure to the philosophy and objectives, instructional strategies and evaluation procedures for junior high science.
3. To provide participants with an opportunity to become familiar with the new Junior High Science Curriculum Guide and the new text, Searching For Structure.
4. To allow participants the opportunity to discuss aspects related to the implementation of the new program in their district.

JUNIOR HIGH SCIENCE INSTITUTE

To aid the transition to this new program, a six-credit institute focusing on science in the junior high school was offered by Memorial University. The first three courses (Level I) were offered in 1980 and 1981, and the remaining three courses (Level II) were offered in 1981, 1982 and 1983.

The purpose of the Institute was to provide teachers with:

1. The philosophy, rationale and objectives of science education, especially at the junior high level.
2. The major conceptual framework of science, appropriate to grades 7, 8 and 9.
3. An appreciation of the interdisciplinary nature of junior high sciences.
4. Methodology required to teach scientific processes, content and attitude.
5. Sufficient factual knowledge for confidence in teaching at this level.

Level I of the Institute consisted of studies in Chemistry - Physics - Science Methods, while Level II consisted of studies in Biology - Earth Science - Science Methods. A teacher could do either section during one summer and obtain three credits. The Institute was planned primarily for teachers who had very little formal training in Science. It was strongly recommended that the districts would do everything possible to encourage such teachers to attend.

It had been evident for some time by the Department of Education that the problems which plagued the junior high science were as follows:

1. underqualified teachers in the science area,
2. poor facilities and equipment, and
3. program.

The Department was convinced that the "teacher variable" was the greatest problem plaguing the junior high science area. It was hoped that the program change would initiate improvement in the other two areas, and that with a concerted effort by all concerned parties such improvement would be forthcoming.

NEED FOR THE STUDY

This innovative grade seven program (Searching For Structure) has now been taught for six consecutive years. Within this period of time the program has matured and can be expected to be defended on its own merits. I consider that no one is more aware of the problems of this existing program in Newfoundland and Labrador schools than the teachers who are daily in contact with the students.

Typically, teachers' views on the educational process have been neglected. The teachers' point of view is indeed important, and this study is an attempt to give teachers an opportunity to express their views or perceptions.

Because teachers are a vital element in the educational process, it is of great importance to learn about their perceptions concerning the junior high school science curriculum. Anderson (1970) states that teachers are the greatest of all influences in the curriculum, and that their views of curriculum content, of the children, and of their own values are the major determiners of the classroom experiences, and that these experiences of the children are, basically, the curriculum.

The views of the Newfoundland and Labrador junior high school science teachers, with respect to the different aspects of the science curriculum, may be highly significant. The way that they perceive the various aspects of the science curriculum may well be key determining factors for the success or failure in achieving the goals and objectives of the junior high school science program.

The need for this study lies in two major considerations: (a) the value of understanding the way teachers perceive the science curriculum as compared to the prescribed or formal curriculum, and (b) knowledge of the process of curriculum development as it actually occurs. This understanding and knowledge should result in recommendations for the improvement of the junior high school science curriculum.

The intent of the researcher is to bring the results of this study to the attention of educators in Newfoundland and Labrador who deal with the design and implementation of the junior high school science curriculum. If this science program is to attain success, it is crucial that the suggestions and ideas of those who are teaching the program be taken into account. Constructive criticisms from these teachers could provide invaluable information for recommendations towards the improvement of this program for Newfoundland and Labrador students.

DEFINITION OF TERMS

Goals refers to long range expectations or aims of the science program.

Curriculum as used in this study refers to all experiences in which students become involved, within the school environment as well as outside the school, under the direction and guidance of the teachers, who will be considered as a vital element of the curriculum themselves.

Equipment and supplies refers to all materials needed for laboratory or demonstration activities, which include laboratory apparatus, glassware, preserved or live specimens, and any other pertinent hardware.

Facilities refers to the physical structures available such as the classroom, laboratory, etc.

<u>Objectives</u> refers to the immediate or short term expectations of the program.

<u>Perceptions</u> as used in this study refers to the personal opinions and ideas of the teachers, with respect to different aspects of the curriculum.

<u>Professional preparation</u> refers to university courses on content and methodology required for teacher certification.

<u>Techniques</u> refers to the body of methods used by the teachers to accomplish the goals and objectives of the science program.

<u>Prescribed curriculum</u> refers to all guidelines issued by the Newfoundland Department of Education concerning the teaching of junior high school science.

<u>Perceived curriculum</u> refers to what teachers think of the curriculum as it presently exists.

Chapter 2

RELATED RESEARCH

INTRODUCTION

In various studies that have been carried out in the past regarding innovative science curricula, the teacher variable has been identified as greatly influencing the success (or failure) of many programs. Teachers are one of the essential constituents of the educational process, and therefore it is important to learn about their perceptions regarding various aspects of the curriculum. Teachers' perceptions may be of great significance in determining the success of any particular program, or even of the whole educational system of a country. Knowing how the teachers perceive themselves and the different components of a curriculum could be very valuable when determining goals and curricular activities in a cooperative process. This chapter will discuss the following factors as they relate to teachers' perceptions concerning science curricula: (a) perceptions, (b) development of science curriculum, (c) science teachers' perceptions, (d) importance of teachers in curriculum, (e) importance of science laboratories (f) philosophy and objectives for science education in Newfoundland schools, and (g) Newfoundland junior high science evaluation report. The last section will present a summary and overview of the literature and general comments on research related to the study.

Perceptions

The origin of the theory of perceptions is not within the scope of this study, but some ideas about perceptions seem to be important to understand their role in educational research.

Jerome Bruner was one of the chief architects of a tradition in the study of perceptual identification that came to be called the New Look in perception. His approach diverged from more traditional approaches to the study of perception in at least three ways. First, a basic tenet of the work of Bruner, his collaborator Leo Postman, and their fellow co-workers, Gardner Murphy, Nevitt Sanford, Muzafer Sherif, George Klein, and others is that perception is not an isolated independent system but rather one that interacts with a host of other psychological systems. Perception, according to this view, is not only a product of autochthonous or stimulus determinants but also of experiential, motivational, personal, and social factors as well. Second, in the tradition of Egon Brunswick, Bruner has underlined the functional nature of perception. The perceiver is not seen as a passive and indifferent organism but rather as one who actively selects information, forms perceptual hypotheses, and, on occasion, distorts the input in the service of reducing surprise and of attaining valued objects. Third, Bruner has argued that perception is an activity that is fundamentally of the same nature as concept attainment and the other mental processes. Thus perception can be viewed as an act of categorization which, though possibly silent or unconscious, is based upon an inferential leap from cue to class identity which appears to be the product of a strategy comprised of a series of decisions. (Bruner and Anglin, 1974, p. 3).

Perception can be defined in many ways. One of the most general definitions, and one which indicates how other aspects of psychology could be considered to be subsets of perception, terms it the "study of the relation between stimulus input and behavioral output". (Fried, 1974, p. 2).

Historically, systematic thought about perception was the province of philosophy. More specifically, it emerged from that branch of philosophy known as epistemology, which asks whether a real, physical world actually does exist independently of our experience and, if so, how we can come to know its properties, and how the truth or accuracy of that knowledge can be determined. (Dember and Warm, 1979, p. 2).

Workers in the philosophy of science have made the interesting observation that the growth of a particular field of science does not come solely from the gradual accumulation of empirical facts; it comes also from periodic changes in the ways of looking at or approaching the phenomena of interest (Conant, 1974; Kuhn, 1962; Leeper, 1972). This point is nowhere more evident than in the historical development of the study of perception (Boring, 1942; Pastore, 1971; Woodworth and Sheehan, 1964).

The study of perception is not clearly distinguishable from the study of learning, motivation, or individual differences in behavior. Maintaining contact with events may change with practice (i.e., may be learned), exhibit individual differences, and depend upon the organism's motivational state. Much of the study of perception is closely tied to the study of the learning process, the range and determinants of individual differences in behavior, and motivational states. (Day, 1969, p. 2).

In this explication of the domain of the curriculum, Goodlad (1979) stated that "Perceived curricula are curricula of the mind. What has been officially approved for instruction is not necessarily what various interested persons and groups perceive in their minds to be the curriculum. ...the most significant perceptions are those of the teachers." (p. 61).

Development of Science Curriculum

The question of what should be included in the school curriculum is a continuing one. It is a question to which each generation must find its own answer, drawing upon the past for what is appropriate and making changes to reflect contemporary needs. Curriculum planners today must reassess the curriculum with reference to the kind of world in which our children will live in the latter part of this century and the early years of the next.

A variety of forces have converged to create a demand for reassessment of the school curriculum. These forces include the revolution of science and technology, changes in our economic system and conflicts between differing value systems. They also include the explosion of knowledge and the growth of expectations.

In North America, the approach of science education up to the 1950's was to teach students the cumulative information, concepts, and theories which had been developed by scientists over the past 2000 years. While development of mental abilities was given as a major objective, the usual teaching procedures were giving information, explaining ideas, and demonstrating standard preparations. The usual student activities were listening to, reading and memorizing information and, where possible, replicating standard laboratory exercises. In many ways these were useful and effective procedures; however, they neglected vital areas of science and produced results which were generally unsatisfactory.

The unsatisfactory nature of the results came to light with the close scrutiny given American science education in the aftermath of the dramatic launching of the space age by the first satellite - "Sputnik".

It appeared that science education was:

1. Becoming an elitist activity in a society where every citizen required an understanding of science.
2. Failing to provide the students who did take it with either an understanding of how scientists operate or an understanding of the nature of scientific knowledge. (Newfoundland Junior High Science Curriculum Guide, 1980, p. 10).

Following the "Sputnik" era, educators began to take a closer look at science within the curriculum. It was this idea that led to the Woods Hole Conference. In September, 1959, some 35 scientists, scholars, and educators gathered at Woods Hole on Cape Cod to discuss how education in science might be improved in the primary and secondary schools. After lengthy discussion by various groups, a first draft of the Chairman's Report was completed and copies were sent to all members for comment and criticism. The final report, The Process of Education, reflected Bruner's "sense of the meeting" rather than a consensus.

The Process of Education (1960) was one of the most influential books dealing with the structure of knowledge and the nature of learning. Bruner claimed that each subject has an essential structure of its own, which may be expressed in terms of a relatively small number of central concepts. In his view any student who achieves a firm grasp of these central concepts will have achieved a useful understanding of the subject in question, an understanding which will not fade, even if he forgets the details of the poems he has read or the formulas he has memorized. Secondly, it was Bruner's contention that "any subject can be taught effectively in some intellectually honest form to any child at any stage of development." Bruner's third major point was that the structure of a subject can best be learned through emulating the behavior of practitioners in that field of study.

Although Bruner brought the attention of the education establishment to the problem of structure, it is Joseph Schwab who has explicated and extended the concept most significantly for science education. Bruner had advocated teaching the structure of a discipline as a defence against the explosion of informational minutia and as a guarantor of future relevance. Hence for him the importance of structure is based less on philosophy than on psychology.

In contrast, for Schwab (1969) "the structure of a discipline consists, in part, of a body of imposed conceptions which define the investigated subject matter of that discipline and control its enquiries." Thus the structure not only precedes the facts of a discipline, it even determines what will be considered a fact.

Schwab was a penetrating thinker who had published highly regarded science papers and had a fairly great impact on science curriculum. Schwab declared that there was a distinction between stable and fluid science. Stable science is science that comes from an accumulation of knowledge or learning of facts, whereas fluid science would be "discovering" through one's own intellectual efforts and the developing of skills, rather than being lectured to. He said that we have not been presenting science correctly and warned that we had better be careful in saying that these are "the" facts.

Fluid enquiry is hard to come by but students can even develop it within their own work. Schwab says that many students are capable of fluid enquiry. He states that there are two aspects of science: (1) the syntax and (2) the substance. It is the substance that we have typically been teaching, and Schwab says that the two can be combined. To develop fluid enquiry in science a person would not have to go beyond present knowledge (what they already know, not what is known).

During the past twenty years, research, curriculum development, and instruction in science education have been influenced by various science educators. The present junior high school science curriculum is the product of varying degrees of emphasis on specific aspects of philosophy in science education. The process approach is the major emphasis of the Searching For Structure program. Although many science educators have written about science processes, the view established by Gagné has probably been the most influential.

The philosophical premise upon which Gagné's views of science is based is that knowledge develops inductively from sensory experience. There are two parts to this premise, one related to empiricism, the other to induction.

The empiricists claim that individuals attain meaningful knowledge only from experience with the physical environment. The writings of Hume best describe this view. The major tenets of his philosophy are the cornerstones of the positivist and logical empiricist schools of philosophical thought. Gagné (1970) indicates that learning science concepts must proceed from discrimination of the sensible characteristics of objects and events to the formation of concepts. He argues that the "the physical characteristics of objects need to be observed and discriminated with systematic thoroughness using all the externally oriented senses" and that "all the differential attributes of objects previously learned as discriminations need to be used for establishing concepts." (p. 256).

Gagné's view of science processes includes a commitment to induction. This commitment is evident in Gagné's (1973) description of scientific enquiry as a matter of solving problems by "unrestrained inductive thinking" (p. 153) and in his description of how concepts are formed.

The classical view of induction as the method of science was proposed by Francis Bacon in 1602, Robert in 1672, and Sir Isaac Newton in 1687 (Burtt, 1949). The basic tenets of induction are that science enquiry consists of four stages:

1. observation and the collection of facts,
2. analysis and classification of these facts,
3. inductive derivation of generalizations from the facts, and
4. further testing of the generalizations.

Gagné's view of science as inductive is consistent with these classical positions. According to his view, the logic of scientific discovery would be comparable with inductive logic.

One of the key objectives in any science program is that the program should present an accurate view of the nature of science. Analysis of the literature available on the philosophy of science indicates that there has been much controversy among educators regarding this issue as science curriculum has developed. Kuhn and Popper have been two such educators with distinctly different points of view regarding how science progresses.

Paradigms, as coined by Kuhn (1970), were "universally recognized achievements that for a time provide model problems and solutions to a community of practitioners." To be accepted as a paradigm, a theory must seem better than its competitors, but it need not, and in fact never does, explain all the facts with which it can be confronted. Probably the single most prevalent claim advanced by the proponents of a new paradigm is that they can solve some of the problems that have led the old one to a crisis. Kuhn's hypothesis is a summary of what we know.

Popper (1972) firmly rejects the induction premise that the making of a hypothesis is a logical process. He explains how the logical, objective aspects of science come into play in the critical examination of experimental work, in accurate observation, and in the rigour of honest attempts to lay one's hypothesis open to disproof rather than to shelter it. Popper considers that science is the growth of knowledge through criticism and inventiveness. Popper's hypothesis is a plan for action, for testing.

It is likely that in exploiting the process of science for students, we shall make use both of the "paradigm" view of science which Kuhn offers and of the skills described by Popper, creating falsifiable hypotheses and devising experiments intended to disprove rather than to verify. Whatever balance is decided upon, there remains the vital need for science to be an activity which students enjoy and a tool which they can apply in other situations.

Thus, we have the opportunity of influencing the kind of task. We can leave a pupil in an open situation with the task of exploration, or we can offer a problem which calls upon skills and experience, and the task is one of application, leaving considerable scope for student initiative. (Squires, 1978).

The prevailing philosophy pertinent to the activity approach to science is that this approach is absolutely essential if students are to master the science concepts and process skills, develop correct attitudes, develop psychomotor skills - indeed, gain any correct impression of what science really is. It maintains that science is both a process and a product. It is a process of enquiry involving certain thinking abilities and mental attitudes, and a body of knowledge containing facts, laws and theories.

According to Bruner two of the major claims of the discovery approach were that: (1) there was an increase in intellectual potency, and (2) it was self rewarding. As the student discovered how to discover for himself, the process became self rewarding.

Ausubel stated that these claims were too extreme and that there wasn't sufficient evidence to support them. What about the students who did not discover? It was eventually found that there were a lot of these. For those who discovered it was a joy, but for those who didn't, it was a torment.

It appears that the enthusiasm for the merits of the process approach back in the 1960's has mellowed to a much more conservative attitude at present. However, the grade seven <u>Searching For Structure</u> program places as much emphasis on the processes of science as it does on the mastery of content. These processes range from simple to complex and are supposedly practiced in each successive grade so that facility grows according to the developmental level of the student.

<u>Science Teachers' Perceptions</u>

This study deals with science teachers' perceptions of the junior high school science curriculum presently being taught in Newfoundland and Labrador schools. During the last decade or so, the contribution that teachers can make to curriculum development has become increasingly recognized. Curriculum developers cannot assign, let alone account for, the full range of teaching situations that arise. It is here that the teachers' experience and knowledge can enter into curriculum planning in a way that cannot adequately be replaced.

The following are examples of the problems and concerns of science teachers that have been revealed by various studies:

Webber (1966) found that many of the junior high school science teachers he studied had no pre-service preparation for science teaching at any level and that curricula were expanding to include subjects in which they had little pre-service preparation.

In a study of teaching problems of beginning junior high science teachers in a Texas school, Bailey (1965) showed that two thirds of all teachers in the study had majored in subjects other than science, and that a large percentage of the teachers felt that the inadequacy of texts and facilities was a source of instructional difficulties.

In his study of the difficulties of beginning junior high school science teachers, Walker (1973) found that teachers in Arkansas were not adequately prepared to teach science at that level and that they were hindered by the lack of reading materials, equipment, and adequate physical facilities.

A study made by Faber (1974) on the preparation of junior high school science teachers in Southwestern Michigan, showed that science teacher preparation programs were not as extensive and specific as professional educators indicated these should be.

In a survey of Wisconsin public high school teachers relative to teacher perception of various aspects of the science curriculum, Melko (1974) found that Wisconsin science teachers were nearly equally divided in expressions of satisfaction and dissatisfaction with the science curriculum. Changes proposed by the teachers were primarily in the area of adaptation of existing courses and curricula, rather than in the area of innovation.

Al-Mayzed (1975), in his research on teacher and student perceptions of science education in Saudi Arabia, found that the academic preparation of science teachers was weak. The majority of the teachers in the study described most of the characteristics of textbooks as poor, and described laboratory facilities and supplies as inadequate or non-available.

An examination of priority discrepancies between developers and teachers using a science unit, by Sabar and Ariav (1980) involved the two developers of the unit and 15 teachers who were receiving in-service training in the use of the new curriculum. A list of 36 objectives of the unit was presented; the developers were requested to state the degree of importance of each objective as they perceived it during the development of the unit; the teachers were asked to state the degree of importance for each item as perceived by them on the basis of their acquaintance with the unit presented in their in-service training. Comparing the teachers and the developers, they were in full agreement on one third of the objectives without having any major disagreement. The majority of the teachers rated nearly 90% of the objectives as "of great importance" and the rest as "of at least moderate importance" whereas the developers rated about 39% of the objectives as very important and an additional 39% as moderately important.

In a study of the concerns of science teachers regarding an implementation of the Intermediate Science Curriculum Study, (ISCS) James and Hall (1981) sampled teachers who had attended National Science Foundation sponsored ISCS implementation institutes at Kansas State University from 1972-1974 and all of the junior high science teachers in a large midwestern city. The specific research questions that were asked in the study were:

1. What are the concerns of junior high school teachers who are implementing ISCS?
2. How do the concern profiles for users of ISCS differ from non-users?
3. How do those concerns vary among teachers with different amounts of experience teaching ISCS?

Based on these outcomes and other research studies, six recommendations were made:

1. Teachers approaching the adoption of an innovation such as ISCS can be expected to need a milieu of personal support as well as orientation information about the innovation. Further, at these initial stages, it would be best if leaders do not dwell on the innovation's impact on

students. At this time, teachers are more apt to be concerned about what the innovation means to them personally.

2. Over emphasis on management aspects to first use may be counter-productive. The in-service activity ought to be extended over the first year of use rather than concentrated in a short, indepth process workshop.

3. Teachers involved in implementation of science programs can be expected to have a wide variety of concerns and these concerns will affect the success of the implementation process. Leaders will do well to recognize this fact and to attend to the most intense concerns of each individual or group at the time those concerns are manifested.

4. Teachers using an innovation can be expected to show a pattern of change in concerns over time. Again, this should imply that those responsible for management of the implementation process will need to change their strategies as individual and group users' concerns shift.

5. These outcomes suggest that the typical "one shot" pre-school workshop will not adequately support the implementation process. In-service programs for teachers should take place over an extended

period, with attention given to the appropriate concerns.

6. Researchers in science education would do well to consider these results when evaluating the outcomes of science curricula implementation. It has been hypothesized that teachers at varying concern stages would have impact on student outcomes. In particular, it seems wise to delay evaluation of implementation until the personal and management concerns of teachers have been resolved.

Five groups of science educators representing faculty at graduate institutions, graduate students, teachers, supervisors, and leadership conferees were surveyed by Gallagher and Yale (1981) concerning their perceptions of current problems facing science education. A total of 144 participants provided an average of 4.7 responses. The responses were tabulated using an emergent set of categories that resulted in six major groupings, i.e., conceptual, organizational, teacher related, university and societal. The category with the most problems identified was in the area of conceptual problems. University related problems and organizational problems were the next two most frequently mentioned categories for problems. Specific problems in all categories most often cited include the following:

1. confusion and uncertainty in goals and objectives,
2. lack of vision and leadership in schools and universities,
3. absence of a theoretical base for science education,
4. poor quality teacher education programs,
5. inappropriate avenues for continuing education of teachers,
6. limited dialogue between researchers and practitioners,
7. declining enrollments,
8. poor quality teaching and counselling,
9. insufficient programs in science for the wide spectrum of students, and
10. public and parental apathy towards science.

The purpose of a study by Barnette and Thompson (1979) was to examine teacher perceptions of the effects of program evaluation, teacher evaluation, and student evaluation on improving instruction. A random sample of Instructional and Professional Development (IPD) chairpersons in a northeastern state of the United States were asked to participate in the study. IPD chairpersons were full-time elementary and secondary classroom teachers elected by the local association of the state education association. The final sample consisted of 208 secondary school teachers. The data for the study was generated by the sample's responses to a four part questionnaire consisting of 15 items.

The survey results provided preliminary evidence that secondary school teachers seem to improve aspects of their instruction more frequently as a result of teacher evaluations of students (student performance evaluation) or as a result of evaluations of school or district programs (program evaluation).

Student evaluation appears effective in improving instruction, while teacher and program evaluation appear to be not as effective. Student performance evaluation, as a facilitator of instructional change, seems to be real and positive. The findings of this area of evaluation lead us to believe that the majority of teachers are reviewing, modifying, and revising their instruction to meet the needs of their students, whereas we cannot conclude that the same impetus for change is generated from program or teacher evaluation.

Importance of Teachers in Curriculum

The search for new programs and methods of instruction is a continuing one. The era of the 1950's and 1960's saw a large and sustained effort to reform curriculum and instruction. It was regarded by many educators as an era that would transform the schools. However, measured against these expectations, actual classroom activities fell disappointingly short. The key question that has to be confronted is "What went wrong?"

The reform movement of the era was summed up by Charles Silberman as "techniques to increase efficiency which left the content of curriculum and the process of instruction untouched." The reformers were mainly university scholars "with little contact with the public schools ... and they also tended to ignore the harsh realities of classroom and school organization." To a large extent the reformers' expectations were unrealistic. They expected that all students would want to learn and know how to learn; they expected unfailingly dedicated and competent teachers. They failed to consider that teachers perceived their problems differently and frequently did not see the reformers' answers as relevant, however elegantly packaged. In the reformers' view all that was needed was to show teachers new material, and by its very nature students would learn it in the prescribed manner. Needless to say, this is a highly idealistic view of the educational process. (Ornstein, 1982, p. 280).

During the last decade or so, the contribution that teachers can make to curriculum development has become increasingly recognized. Their participation was solicited when it was realized that so many of the new curricula were poorly implemented or ineffective in the classroom and that teachers themselves were not meeting the developers' expectations. After recognizing the classroom teachers' experiences, lacked by the external specialists, curriculum development centers began to seek ways to increase the role of the teacher. This trend was well articulated by Connelly: "The strength and major contributions of a developer are that he works with and can translate involved ideas into a useful form for teachers and students. However, the developer cannot assign, let alone account for, the full range of teaching situations that arise. It is here that the teachers' experience and wisdom enter into curriculum planning in a way that cannot adequately be replaced." (Sabar and Miron, 1980, p. 205).

The teaching profession can neither demand nor expect teachers to be able to construct curriculum materials without the appropriate training and released time from regular classroom assignments. But, there is no substitute for their contribution to curriculum development, for their special knowledge of pupils and first-hand experience which may be used to obtain feedback data of great importance. An invaluable contribution of teachers to curriculum development can be gained by having them react, comment, and make recommendations regarding a particular curriculum immediately after its field tests. It may be concluded that such increased involvement of teachers in the formative evaluation process does result in better curricula. (Sabar and Miron, 1980, p. 207).

Taba in the early sixties (1962) argued for training so that teachers would not be merely recipients of directives, but would discuss real school problems and would react to innovation by contributing their own experience and translating them into practical learning materials.

Emphasis needs to be put on the involvement of the teachers' initiative, ability and desire to define their needs, and their gift of enthusiasm and creativity in the course of the ongoing implementation of a new curriculum. (Zuzovsky and Orpaz, 1981, p. 203).

Three main tasks need to be performed: first, to unearth and identify those aspects of the teaching situation about which the teachers feel either worried, frustrated and hostile, or satisfied and confident. Then to ascertain how common these concerns are amongst teachers, and finally to assess the opinions of the teachers regarding these issues. (Dreyfus, Jungwirth and Tamir, 1982, p. 87).

In a report of several studies conducted by the Institute for Development of Educational Activities, Inc. (IDEA), Goodlad (1973) stated that: "...no matter what the aims of a program, the materials provided, or the theoretical justification, the responsibility for the success or failure of any method lies primarily with its interpreter - the teacher." and that "regardless of the curriculum, regardless of how detailed its theoretical formulation, it is what the teacher actually does that has an effect on the child." (p. 57).

Discussing the role of the teacher as curriculum planner, Harnack (1968) stated that "planning emphasizes that the entire staff (administrators and teachers) focus their thinking on the cooperative venture of creating a better environment for learning. The teacher in this context is considered a vital link in the chain of suggested improvement. The teacher is considered a professional worker who has the enthusiasm, knowledge, and a sense of obligation to improve an instructional program." (p. 70).

The characteristics and needs of individual pupils are basic considerations for the human dimensions within a curriculum, but equally important are the needs and characteristics of each teacher, especially the manner in which his/her competences are utilized.

The best planned curriculum will be impotent if it is not implemented by visionary teachers loaded with talent and energy to make learning meaningful for all pupils. In the final analysis, the teacher is the curriculum, and there have never been enough good teachers to go around. (Trump and Miller, 1968, p. 32).

Anderson (1970) stated that "Teachers are the greatest of all influences in the curriculum, and that their view of curriculum content, of the children, and of their own values are the major determiners of the classroom experiences, and that these experiences of the children are, basically, the curriculum." (p. 143).

Importance of Science Laboratories

The history of laboratory work as an integral part of school science learning has roots in the 19th century. The laboratory in the science classroom has long been used to involve students in concrete experiences with objects and concepts. In 1892 Griffin wrote: "The laboratory has won its place in school; its introduction has proved successful. It is designed to revolutionize education. Pupils will go out from our laboratories able to see and do". (cited by Rosen, 1954). In the years following 1910, the progressive education movement had a major impact on the nature of science teaching in general, and on the role of laboratory work in particular. John Dewey, leader of the progressive education movement, advocated an investigative approach and "learning by doing". During this period, textbooks and laboratory manuals began to acquire a more applied, utilitarian orientation. Nevertheless, even while the progressive education movement was gaining momentum, debate about the proper role of laboratory work also was developing. The arguments raised against extensive student laboratory activities included:

1. Few teachers in secondary schools are competent to use the laboratory effectively.
2. Too much emphasis on laboratory activity leads to a narrow conception of science.
3. Too many experiments performed in secondary schools are trivial.
4. Laboratory work in schools is often remote from, and unrelated to, the capabilities and interests of the children.

Following World War I, laboratory activities came to be used largely for confirming and illustrating information learned from the teacher or the textbook. This orientation remained relatively unchanged until the "new" science curricula of the 1960s, which resulted in several departures from tradition in the role of laboratory work. In "the new curricula which stress the processes of science and emphasize the development of higher cognitive skills, the laboratory acquired a central role, not just as a place for demonstration and confirmation, but as the core of the science learning process" (Shulman and Tamir, 1973). Contemporary science educators (e.g., Hurd, 1969; Lunetta and Tamir, 1978; Schwab, 1962) have expressed the view that uniqueness of the laboratory lies principally in providing students with opportunities to engage in processes of investigation and inquiry. According to Ausubel (1968) the laboratory "gives the students appreciation of the spirit and method of science, ... provides students with some understanding of the nature of science".

In a review of the literature, Shulman and Tamir (1973) proposed a classification of goals for laboratory instruction in science education:

1. To arouse and maintain interest, attitude, satisfaction, openmindedness and curiosity in science.
2. To develop creative thinking and problem solving ability.
3. To promote aspects of scientific thinking and the scientific method (e.g., formulating hypothesis and making assumptions).
4. To develop conceptual understanding and intellectual ability.
5. To develop practical abilities (e.g., designing and executing investigations, observations, recording data, and analyzing and interpreting results). (Hofstein and Lunetta, 1982, p. 203).

The growing body of literature concerning the role of the laboratory in science teaching (Dreyfus, 1983; Fuhrman, Lunetta and Novick, 1982; Lunetta and Tamir, 1979, 1981) suggests among other things, that there is a need to gain more understanding of the dynamics of laboratory instruction. This is because such knowledge may provide an insight into a problem that has been perennially puzzling for science teachers - the problem of how best to organize laboratory instruction.

The need becomes particularly accentuated when it is acknowledged that the laboratory plays a central role in science teaching (Welch, Klopfer, Aikenhead and Robinson, 1981).

The relationship between science laboratory behavior strategies of students and performance in, and attitude to, laboratory work was investigated in an observational study of 160 laboratory sessions involving 600 eleventh grade biology students.

Two findings deserve note:

1. Behavior categories with similar domains as the practical skills measures were found to exhibit strong positive correlations with such practical skills. This draws attention to the fact that if science teachers desire the acquisition of positive attitudes towards laboratory work and practical skills such as manipulating, observation and recording of data in students, they must provide them with opportunities to exhibit such behaviors as manipulating equipment and observing experiments in progress during laboratory activities.

2. It was shown that such behaviors as transmitting information, listening and non-lesson-related behaviors of students had relatively low correlations with the acquisition of practical skills and attitude to laboratory work. This finding lends support to the view that students acquire process skills in the laboratory when they are engaged in hands-on, task-related activities (Fuhrman, Lunetta and Novick, 1982).

In what is perhaps its major finding, this study indicated that many of the behaviors exhibited by students were associated with low level practical skills such as manipulating, observing, and recording data. The high level practical skills such as interpretation of data and ability to make inferences from data to suggest explanations (Lunetta and Tamir, 1980) had low correlations with most of the behavioral strategies exhibited by students. This finding accords well with those of Kyle et al. (1979) who, although they did not correlate behaviors with outcome measures, found that students were performing "cookbook-like" laboratories and not learning the process skills of science but were only learning scientific facts.

The behavior variable that correlated strongly with the high level was asking questions. Perhaps the clarification received by asking questions or the inspiration provided by engagement in the question-asking process (Redfield and Rousseau, 1981) may explain the strong association of the questioning behavior of the students with their performance in high level practical skills. Such clarification or inspiration may likely provide greater insight into the problem under investigation and enable the student to acquire the data necessary to make more meaningful interpretations. This does suggest that students should be given ample opportunity to ask questions and seek clarifications about experimental procedures during laboratory activities if the desire is to enable students to go beyond "cookbook-like" laboratories. (Okebukola, 1985).

Raghubir (1969) found that a laboratory-investigative approach, in which science instruction is composed of laboratory investigations rather than textbook assignments, leads to superior cognitive and affective outcomes. This result is consistent with the predictions that follow from the model of memory structures proposed by Gagne and White (1978) (White, 1980, p. 359).

The 1980-81 Board of Directors of the National Science Teachers Association unanimously adopted the following statement regarding the place of the laboratory in science education:

> The National Science Teachers Association endorses the necessity of laboratory experiences for teaching and learning in science. Adequate

> support for materials, equipment, and teacher time must be available for schools to maintain quality science instruction. Such a quality program is critical in today's age of science and technology. (Klein, Yager and McCurdy, 1982, p. 20).

Philosophy and Objectives for Science Education in Newfoundland Schools

A provincial government document entitled "Philosophy and Objectives for Science Education in Newfoundland Schools, K - 11" was authorized by the Minister of Education on April of 1978. The document had undergone a number of drafts from its inception in 1974. Members of the Provincial Science Curriculum Committee reacted to two drafts before the document was ready for wider review. The third draft was distributed for examination to each School Board in the province, as well as to each committee under the Science Council of the Newfoundland Teachers' Association. The document in its present form was produced considering the information received from all examiners. After further examination by the Provincial Science Curriculum Committee, the document was recommended to be adopted as official policy for science education in this province.

In this document science is defined as "the human enterprise, including the on-going process of seeking explanations and understanding of the natural world, and also including that which the process produces - man's storehouse of knowledge".

The document is comprised of eight basic guiding principles called Premises and six general Objectives of science education. They are:

Premise 1

Science ought to be taught to all students in grades K - 11.

Premise 2

Science courses ought to be designed so that students find them intrinsically rewarding.

Premise 3

Students ought to be given exposure to each of the major fields of science at the elementary and junior levels before pursuing a specialized science program at a high school level.

Premise 4

Science programs ought to encourage students to function at the highest cognitive, affective, and psychomotor levels appropriate for their stage of development.

Premise 5

Laboratory work ought to form an integral part of all science courses. To be consistent with the nature of science, investigative rather than illustrative laboratory experiences ought to be stressed.

Premise 6

Science is both a process and a product. It is a process of enquiry involving certain thinking abilities and mental attitudes and a body of knowledge containing facts, laws and theories. Science programs should stress both of these aspects of Science.

Premise 7

The science teacher should encourage students to become independent learners and thinkers. To accomplish this, the role of the Science Teacher will frequently change from a dispenser of knowledge to a critic of student reasoning.

Premise 8

Science programs ought to be sufficiently extensive and flexible to satisfy a variety of individual stduent interests and abilities.

Objective 1

The aggregate of a students K - 11 science experience should include study of the major products of science.

Objective 2

A students K - 11 science experiences should include performance of the various processes of science.

Objective 3

Science programs should reflect and foster scientific attitudes.

Objective 4

Science programs should present an accurate view of the nature of Science.

Objective 5

Science programs should treat a representative sample of the technological applications of science including those found frequently in everyday life.

Objective 6

Science programs should portray an accurate image of the scientific community.

The Philosophy and Objectives for Science Education in Newfoundland Schools states the aims and goals of the science curriculum for this province. This document is fundamental in the establishment of the "prescribed curriculum".

Junior High Science Evaluation Report

An Evaluation Report of the Junior High Science in Newfoundland and Labrador was released by the provincial government in June of 1984. In September, 1980, a new science program was introduced at the grade seven level in the schools of this province. The introduction of grade eight followed in 1981, and the grade nine in 1982. The Junior High Science Curriculum Guide, authorized in January 1980, and the Searching For Structure text materials reflected the emphasis on activity science in the development of skills and the acquistion of science content. A maximum government grant of $1000 per school, to be matched by a school board grant of $1000, was offered for the purchase of non-consumable items required in the program. Inservice was conducted, a Junior High Science Institute was introduced at Memorial University, and a revitalization of science at the junior high school level was supposed to take place.

In order to make modifications to the program and to plan further inservice, a questionnaire was distributed to one teacher per grade level per school district. The following represents some of the data received from the report:

General Information

- The average class size for grade 7 and 8 was between 25 to 30 students, with most classes at the grade 9 level being in the 30 to 35 range.
- Teacher information background indicated that 50% of teachers at the grade 7 level, up to a high of 75% of teachers at the grade 9 level, had an acceptable background for teaching the Searching For Structure program.
- The majority of respondents enjoyed teaching the course and felt comfortable with the program with the exception of the Earth Science components at grades 7 and 8. (The concern was with the lack of background information available to the teacher via the prescribed materials).
- The percentage of teachers who actively pursued the various instructional strategies on a regular basis were:

	Teacher/ Lecture	Demonstration	Student/ Activities	Field Trips
Grade 7	25%	50%	75%	60%
Grade 8	30%	15%	50%	5%

Program Information

Junior High Science Curriculum Guide

- The majority of teachers had access to the Curriculum Guide, but a high proportion did not use it regularly beyond the first year.
- Lab Safety, Evaluation section and the Instructional Strategies were considered most useful while information regarding philosophy, objectives and AV references were considered least useful. (Some teachers suggested that the AV references needed to be updated.)
- Topics to be expanded were: Lab Safety, Conceptual Schemes, Evaluation, Resource Materials and further information and hints regarding field trips.

Teacher's Guide

- 60% of teachers perceived the Teacher's Guide very useful and unlike the Curriculum Guide, continued to be a useful teacher resource.
- Approximately 75% of the teachers perceived the information in "An Introduction to the Program" very helpful.

Students' Texts

- 75% of grade seven teachers perceived the reading level to be appropriate. In excess of 90% of grade eight and nine teachers perceived the reading level as appropriate. (A few respondents noted the reading level as being too high for weak students.)
- Approximately 50% of teachers perceived the text information as well defined, explained and clearly understood by students. Areas that had presented difficulty for teachers were:
  - not enough information for students
  - in some cases the vocabulary was too difficult
  - Ecology and Geology sections presented some difficulties.
  - 75% of the grade seven and eight teachers completed the core activities as specified in the Curriculum Guide.

Equipment and Facilities

- The overall response was that 50% of science classes were conducted in a lab setting.
- In excess of 75% of the respondents suggested that their science areas had the following pieces of equipment:

eye wash - laboratory tables (work surfaces) - fire extinguisher (90%) - gas - running water - storage space - first aid kits (75%) - adequate non-consumable materials.

- 50% or less replied that they did not have a fire blanket.
- 75 to 80% of teachers at grade seven and eight had no problem in obtaining consumable materials.

Evaluation

- There continued to be a heavy weighting on formal, knowledge-recall type of exams.
- One possible reason for the above situation may be the traditional emphasis by "educators in general" on the content versus the process development components of science courses.
- There was a definite move by some districts and schools to increase the emphasis placed on the evaluation of laboratory work, projects, field trips and processes of science.
- The majority of respondents replied that they referred regularly to unit objectives when constructing test items.

- Teachers consistently stated the need for standardized tests, test packages and more section tests for the current science program.

Inservice/Preservice

- 65% of the respondents stated that they had received inservice in preparation for this course.
- The majority replied that the inservice consisted of a one day workshop.
- 50% perceived the need for further inservice.
- The areas of greatest need as determined by teachers were:
  - (a) evaluation techniques,
  - (b) specific core activities (as identified)
  - (c) more background information in the areas of Geology/Earth Science, Chem/Physics and Genetics, and
  - (d) laboratory safety.

Future Consideration

- Most perceived there was an appropriate balance between Earth, Physical and Life Science. A significant number suggested an additional Earth Science component for grade nine.

- Areas of science and technology which should be taught in junior high (as perceived by teachers) were:
    (a) science and society issues,
    (b) oil and energy,
    (c) overfishing/overhunting,
    (d) ecology, and
    (e) computers.

This Evaluation Report revealed pertinent information regarding the "perceived curriculum" of the junior high school science program in our Newfoundland and Labrador schools.

However, the researcher hopes to reveal the "perceived curriculum" of the grade seven Searching For Structure program in more detail, as the study is narrowed in scope to only grade seven science teachers.

Summary

The ideas and theories which guide this research have been expresed before. The concept of perception drawn from the works of Bruner and Anglin, Fried, Goodlad and others helps to clarify the assumption that perceptions are the product of the interpretation of the environment, and that these affect the person's behavior.

Bruner, Schwab, Ausubel and others give historical, philosophical, and conceptual insight into the struggle of science curriculum development.

After reviewing the ideas of Webber, Sabor and Ariav, Gallagher and Yale, and other educators, the assumption that curriculum could be perceived by teachers in a different way from that of curriculum makers is strengthened.

The studies made by Ornstein, Taba, Goodlad, and others show that science teachers' perceptions of different aspects of the curriculum are not only varied, but that teachers can make important contributions to curriculum development. The analyses made by these and other educators interested in the role of the teacher as an active participant in curriculum planning and development, shows not only that teacher involvement is a vital factor in the process, but also that teacher involvement in such planning may lead to a definition of teachers' needs and responsibilities.

Griffin, Dreyfus, Okebukola, Gagne, and others give emphasis, insight and endorsement to the importance of laboratories in science education.

The Philosophy and Objectives for Science Education in Newfoundland Schools which gives a broad insight into the "prescribed curriculum" of the junior high school science program, Searching For Structure, is of special interest as it is directly related to the present study being undertaken by the researcher. The greatest resource of this country, its human resource, is the major responsibility of our country's teachers. If this invaluable resource is to reach maximum efficiency, then the creativity, imagination, resourcefulness, and problem solving ability of the teachers must be harnessed. To achieve excellence, we must strive for excellence, and the "perceived curriculum" can only reach the status of "ideal curriculum" when curriculum developers and evaluators explore teachers' perceptions of the different aspects of the curricula.

Chapter III
DESIGN OF THE STUDY

This study was designed to answer questions related to the ways in which teachers view six aspects of the junior high school science curriculum in Newfoundland and Labrador schools. This chapter will deal with the nature and characteristics of the sample, the instrument used, and how the data were used.

The Sample

The overall population consists of all grade seven science teachers teaching the Searching For Structure program in Newfoundland and Labrador schools. A letter was sent to each of the science coordinators working with the 35 school boards within the province. This letter explained the nature of the study, requested the number of grade seven science teachers teaching the Searching For Structure program in each school board district, and asked if these coordinators would be willing to distribute and collect the questionnaires within their respective school board district. The science coordinators were unanimous in agreeing to help with the study.

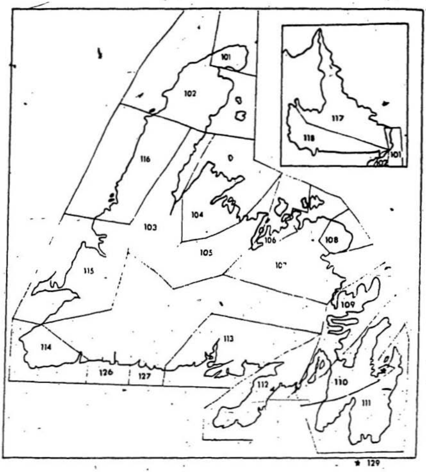
Since four hundred and fifty science teachers were teaching the grade seven Searching For Structure program, this number of questionnaires were posted to the respective science coordinators within the province. Of the total amount sent out, one hundred and sixty three (163) were completed and returned. Several coordinators had changed their minds and sent back their total allotment, with the addresses of the grade seven science teachers, so that I could send them out individually. Other coordinators did not return any questionnaires.

The sample used in this research consisted of 163 of the 427 junior high school science teachers (38%) working in the 35 school board districts of Newfoundland and Labrador during the 1985-86 school year. The maps in Figures 1 and 2 show the geographical distribution of the sample. The legend shows the particular school board districts represented by the numbers on the maps.

The following are the respondents from the Integrated School Boards presented as a ratio and percentage of the total number of grade seven science teachers with each board:

101	Vinland	12:12	100%
102	Straits of Belle Isle	3:7	43%
103	Deer Lake	2:6	33%
104	Green Bay	8:16	50%
105	Exploits Valley	6:8	75%
106	Notre Dame	0:12	0%
107	Terra Nova	11:16	69%
108	Cape Freels	4:6	67%
109	Bonavista-Trinity-Placentia	1:18	6%
110	Avalon North	13:22	59%
111	Avalon Consolidated	7:14	50%

MAP OF INTEGRATED SCHOOL DISTRICTS



101	Vinland	102	Straits of Belle Isle
103	Deer Lake	104	Green Bay
105	Exploits Valley	106	Notre Dame
107	Terra Nova	108	Cape Freels
109	Bonavista-Trinity-Placentia	110	Avalon North
111	Avalon Consolidated	112	Burin Peninsula
113	Bay D'Espoir	114	Port Aux Basques
115	Bay of Islands-St. Georges	116	St. Barbe South
117	Labrador East	118	Labrador West
126	Burgeo	127	Ramea
129	Conception Bay South		

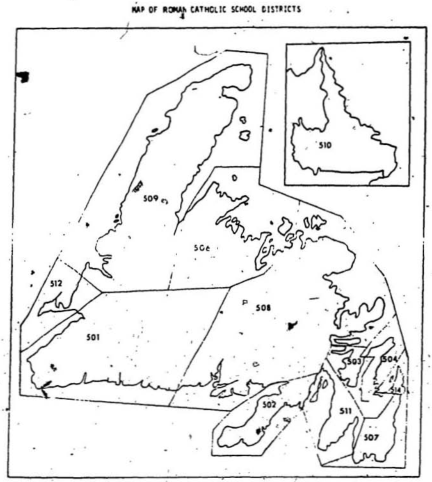
Figure 1

112	Burin Peninsula	5:9	56%
113	Bay D'Espoir	7:10	70%
114	Port aux Basques	4:10	40%
115	Bay of Islands-St. Georges	7:13	54%
116	St. Barbe South	9:9	100%
117	Labrador East	9:13	69%
118	Labrador West	4:4	100%
126	Burgeo	0:3	0%
127	Ramea	2:2	100%
129	Conception Bay South	0:1	0%

The total percentage of respondents from the Integrated School Boards was 54%.

The following are the respondents from the Roman Catholic School Boards presented as a ratio and percentage of the total number of grade seven science teachers with each board.

501	Bay St. George	0:6	0%
502	Burin Peninsula	0:28	0%
503	Conception Bay Centre	0:2	0%
504	Conception Bay North	0:7	0%
506	Exploit's-White Bay	5:7	71%
507	Ferryland	6:6	100%
508	Gander-Bonavista-Connaigre	8:25	32%
509	Humber-St. Barbe	16:25	64%



501	Bay St. George	502	Burin Peninsula
503	Conception Bay Centre	504	Conception Bay North
506	Exploits-White Bay	507	Ferryland
508	Gander-Bonavista-Connaigre	509	Humber-St. Barbe
510	Labrador	511	Placentia-St. Mary's
512	Port au Port	514	St. John's

Figure 2

510	Labrador	3:8	38%
511	Placentia-St. Mary's	8:12	67%
512	Port au Port	0:6	0%
514	St. John's	0:55	0%

The total percentage of respondents from the Roman Catholic School Boards was 25%.

There were 0:23 respondents from the Pentecostal Assemblies Board for a total response percentage of 0%, and 1:6 respondents from the Seventh Day Adventist School Board for a total response percentage of 16.6%.

This study selected the largest sample possible, the total population; all of the grade seven science teachers in Newfoundland and Labrador teaching the Searching For Structure program. Each grade seven science teacher had an equal opportunity of being a part of this study.

However, the total number of respondents represented only 38% of the total population and this generated a grave concern as to whether this could be considered a reasonably representative sample of the province. Therefore, a comparison was made with provincial government statistics. The following are the researcher's percentages of enrolment by board, by grade, by school, as compared with those of the provincial statistics for school year 1985-86 in the province of Newfoundland and Labrador.

Enrolment	Research %	Provincial Statistics %
less than 100	16	21.6
100-200	27.2	24.6
201-300	19.8	16.6
301-400	14.8	16.3
greater than 400	22.2	20.6

Obviously there are problems with the sample because of an uneven response rate. This uneven response rate was the result of a combination of factors including communications problems, lack of interest, and occasional non-cooperation of teachers and coordinators.

But the comparison above reveals a fairly high degree of correlation, and is used as evidence in the present study to indicate that the respondents are indeed a "reasonable" representation of the total provincial population of grade seven science teachers, teaching the <u>Searching For Structure</u> program.

Assumptions and Research Questions

In order to conduct research one must begin with the basic assumptions. This study deals with teachers' perceptions. The origin of such perceptions is not a concern of this study. So, for the purpose of this study, the first assumption is the validity of self expression. It was assumed that the respondents were free to express their feelings about what was asked.

The second assumption is that perceptions of the respondents were based on their experiences as teachers and their knowledge about the junior high school science curriculum in the schools of Newfoundland and Labrador.

The third assumption is the validity of the direct approach which the study makes use of in a structured questionnaire.

The nature of this study is exploratory, so six questions were selected to serve as a basic framework. However, statements on the structured questionnaire were not restricted specifically to these six basic aspects of the curriculum; other statements which were deemed appropriate for a greater understanding of the teachers' "perceived curriculum" were added.

The six questions were:

1. Is the ideal professional preparation perceived by junior high school science teachers in agreement with the requirements of the Newfoundland Department of Education?
2. Are the goals and objectives perceived by the junior high school science teachers in agreement with those stated in the Science Curriculum Guide?
3. Do teachers perceive the techniques recommended in the science curriculum as appropriate for the

achievement of the prescribed goals and objectives?

4. Do teachers perceive the facilities available for teaching science in the junior high schools as adequate?
5. Do teachers perceive the equipment and supplies available for teaching science in the junior high schools as adequate for the development of the activities prescribed in the curriculum?
6. Do teachers perceive the need for a revision of the junior high school curriculum?

The Questionnaire

The questionnaire was designed and constructed by the researcher after an indepth study into various aspects of concern regarding the grade seven Searching For Structure program. Redesign was initiated after scrutiny by, and constructive criticisms from, various professionals in the field of science education at Memorial University. A piloting of the questionnaire was conducted with ten junior high school science teachers who were attending the Memorial University Junior High Science Institute. Constructive criticisms and comments from this group resulted in the final draft of the questionnaire.

The questionnaire (Appendix A) was comprised of sixty (60) statements soliciting information. The first ten (10) related to personal information from the teachers concerning the following: (1) age, (2) sex, (3) teaching certificate, (4) years of teaching experience, (5) junior science grades presently teaching, (6) number of university science courses taken, (7) branch of university science courses taken, (8) number of university science methods courses taken (9) enrolment size of school, and (10) average junior science class size.

The main body of the questionnaire was comprised of fifty (50) statements which were designed to assess the teachers' perceptions of various aspects of the grade seven Searching For Structure program. The teachers responded to this Likert style questionnaire by indicating the extent to which they agreed or disagreed with each statement by placing a check mark in the appropriate block.

Comment space was provided beneath each statement to enable the teachers to add clarification for certain statements, and to expand on others that particularly concerned them.

Scoring of the Questionnaire

On the questionnaire used in this study two types of items were used; those requiring the respondent to make judgements, express opinions, or give attitudinal responses to some statements, and those that required the respondent to give purely factual information. Most of the items on this questionnaire required Likert type responses. These could be scored on the five point scale of (1) strongly agreeing, (2) agreeing, (3) neutral, (4) disagreeing, and (5) strongly disagreeing. The other items required specific answers.

The scoring procedure for the questionnaire was a clerical task carried out by the researcher. Each statement from the questionnaires was considered individually, and the data were transferred to coding forms and processed by computer.

Basic questions and related statements

The six basic questions addressed in the study and their related statements on the questionnaire are: (The various categorized statements were randomly placed in the questionnaire so that the respondents would be more apt to concentrate on each individual statement, rather than to be unduly influenced by adjacent similar statements).

1. Is the professional preparation perceived by junior high school science teachers in agreement with the requirements of the Newfoundland Department of Education?

   (1A) Teaching certificate.

   (1B) Number of university science courses taken.

   (1C) Branch of university science courses taken.

(1D) Number of university science methods courses taken.

(1E) I feel confident that I know the goals of science education in the Searching For Structure program.

(1F) There is a strong need to improve my professional standing for the teaching of this course.

(1G) I have received an inservice or workshop session for the teaching of this course.

(1H) I attended the Memorial University Junior High Science Institute.

(1I) My subject coordinator has been helpful regarding the teaching of this course.

(1J) I rate myself as a qualified professional science teacher of this course.

(1K) The Memorial University Junior High Science Institute was helpful for the teaching of this course.

2. Are the goals and objectives perceived by the junior high school science teachers in agreement with those stated in the science curriculum?

(2A) This course is extensive and flexible enough to satisfy a variety of individual student interests and abilities.

(2B) This course permits students to acquire an increasing independence of the teacher.

(2C) The language level of this course is appropriate for my grade seven students.

(2D) The ratio of content to activities is appropriate.

(2E) The degree of difficulty of the majority of concepts in this course is suitable for the average grade seven student.

(2F) The illustrations and diagrams in the text are appropriate.

(2G) I consider outdoor activities very important to the teaching of this course.

(2H) The majority of activities in this course were completed as "hands-on" by the students.

(2I) The questions at the end of the chapters are quite relevant to the material covered in the chapter.

(2J) This course provides a balanced content selection.

(2K) The activities in the course are very practical for Newfoundland students.

(2L) This course encourages students to function at the highest cognitive levels appropriate for their stage of development.

3. Do teachers perceive the <u>techniques</u> recommended in the science curriculum as appropriate for the achievement of the prescribed goals and objectives?

(3A) Audio-visual resources are often used in the teaching of this course.

(3B) Lecture-discussion is the method I use most frequently in the teaching of this course.

(3C) I insist on formal activity reports from my students for this course.

(3D) The teacher guidebook provides sufficient help regarding methodology and techniques.

(3E) The guidebook offers sufficient information regarding the evaluation procedures for the course.

(3F) The percentage of evaluation for this course that I allocate to the activity report is ________.

(3G) I often use the test at the end of a chapter as the main guide for my chapter test.

(3H) I use laboratory tests to evaluate the process abilities of the students.

(3I) The teacher guidebook provides sufficient help in the content areas.

(3J) The appropriate ratio of content to activities should be ________.

(3K) My method/methods for assessing student progress in this course involves.

(3L) Percentage allocated to each method of assessment.

(3M) Demonstration of activities is the method I use most frequently in the teaching of this course.

(3N) Evaluation techniques constitute a major problem in the teaching of this course.

(3O) Long answer type questions constitute the major percentage of my tests.

4. Do teachers perceive the facilities available for teaching science in the junior high schools as adequate?

(4A) Our school has adequate laboratory facilities for the teaching of this course.

(4B) I am teaching this course in a ______.

(4C) The location of our school poses serious problems for the efficient teaching of outdoor activities in this course.

5. Do teachers perceive the equipment and supplies available for teaching science in the junior high schools as adequate for the development of the activities prescribed in the curriculum?

(5A) There is a "reasonable" amount of science equipment available in our school.

(5B) The lack of a "reasonable" amount of science equipment is creating serious problems in my teaching of this course.

6. Do teachers perceive the need for a revision of the junior high school science curriculum?

(6A) A search should begin for a more appropriate course for grade seven.

7. Additional perceived variables concerning the grade seven Searching For Structure program.

(7A) Age of teacher.

(7B) Sex of teacher.

(7C) Years of teaching experience.

(7D) Junior science grades presently being taught by me.

(7E) Enrolment size of school.

(7F) Average junior science class size.

(7G) I am highly satisfied with this science course.

(7H) My workload is higher for this course than for most courses I have taught previously.

(7I) The majority of my students seemed to enjoy the course.

(7J) On a scale of 1-10 I would rate the danger level of the activities in this course as ________.

(7K) I would rate the percentage of impractical activities in this course as ________.

(7L) How many years (including the present) have you taught this course?

(7M) I gain a high degree of satisfaction from teaching this course.

Validity and Reliability

In spite of the disadvantages of the questionnaire method of research, it has the advantage that a large amount of data can be gathered from widely scattered respondents with a minimum of effort and expense, in a fairly valid and reliable manner.

The validity of the study is dependent to the highest degree on the premise that the teachers responded to all statements in an "open and honest" manner.

No reliability studies of this instrument were carried out, but several identical response items were included to provide an indication of the consistency of responses. Significant correlations between these identical response items, as shown in Table 1 indicate that teachers responded very consistently on these items. It has been assumed that the consistency applies to all items used in the instrument.

Table 1

Pearson correlation of identical response items

I am highly satisfied with this science course	p = .000
I gain a high degree of satisfaction from teaching this course	sign. ***

<u>Limitations of the Study</u>

Because of the design of the study, several limitations were unavoidable. These limitations included the following:

(1) A problem that the researcher had to face when performing analysis was that of missing data. Unfortunately, this problem seems to be the rule and rarely the exception, especially in large-scale experiments or field studies. Thus, in this study certain school boards are eliminated as samples because there wasn't a single respondent. School boards with a low number of respondents were included.

(2) The questionnaire was designed by the researcher, and may contain flaws and ambiguities that might have been revealed by more professional scrutinization and testing.

(3) The role of the district science coordinator as distributor and collector of the questionnaires may have influenced the responses to some of the statements.

Analysis of the Data

The data were computer analyzed using the facilities of the Institute for Educational Research and Development. Analysis included the following:

(1) The information from the sample was summarized by frequency distributions. Frequency histograms were constructed for each item to provide comprehensive "pictures" of the sample.

(2) The Pearson Product Moment Correlation Coefficient was used to measure the closeness of the linear relationship between responses to the various items. According to Cohen and Cohen, (1983) this coefficient is the standard measure of the linear relationship between two variables and has the following properties:

(i) It is a pure number and independent of the units of measurement.

(ii) Its absolute value varies between zero, when the variables have no linear relationship and 1, when each variable is perfectly predicted by the other. The absolute value thus gives the degree of relationship.

(iii) Its sign indicates the direction of the relationship. A positive sign indicates a tendency for high values of one variable to occur with high values of the other, and low values to occur with low. A negative sign indicates a tendency for high values of one variable to be associated with low values of the other.

(3) The organization of teacher comments pertaining to each of the individual items.

In Section I of Chapter IV each item of the questionnaire is analyzed individually with regard to (1) frequency distributions, and (2) teachers' comments.

In Section II eight statements serve as a focus for significant Pearson product moment correlations.

CHAPTER IV

ANALYSIS OF THE DATA

This research is based on the theory that perceptions influence behavior, that what teachers see influences the way they feel and act, and that their perceptions may not necessarily be the same as those of the curriculum makers. Therefore, in the methodology used, data had to be analyzed in such a way as to disclose the conceptions of the teachers in relation to the six particular aspects of the junior high school science curriculum prescribed for the Newfoundland and Labrador schools. Moreover, the analysis will reveal the general opinion junior high school science teachers have of the curriculum and their attitudes toward it.

In analyzing the data, the Junior High Science Curriculum Guide as authorized by the Newfoundland Department of Education was taken as the prescribed curriculum. The Philosophy and Objectives for Science Education in Newfoundland Schools, Grades K-11, authorized by the Department of Education on April, 1978 provided foundational statements regarding the purpose and nature of Science Education. Searching For Structure, Book 1 published by Holt, Rinehart and Winston of Canada Limited was the prescribed textbook which was accompanied by a Teacher's Guidebook.

The curriculum guide consists of a basic statement on philosophy and objectives for science in general and junior high science specifically; instructional strategies; the role of the teacher; evaluation; field trips; laboratory safety; the laboratory notebook; audio-visual resources; facilities and equipment; and government publications. The appendices contain information on science process skills and a supplement for Searching For Structure.

The adherence by the respondents to the guidelines contained in the Junior High Science Curriculum Guide was studied. Other sources used as the "prescribed curriculum" were the Philosophy and Objectives for Science Education in Newfoundland Schools, and the Searching For Structure Teacher's Guidebook.

The information from the teacher questionnaire was computer programmed and the frequency of responses tabulated. Additional comments from the teachers were compiled and are placed in Appendix B. A Pearson Product Moment Correlation revealed significant correlations of statement responses, and are placed in Appendix C.

The accumulated information obtained is analyzed in this chapter in two sections. In Section I it is analyzed with reference to the six basic questions which serve as a focus for this study:

1. Is the professional preparation perceived by junior high school science teachers in agreement

with the requirements of the Newfoundland Department of Education?

2. Are the goals and objectives perceived by the junior high school science teachers in agreement with those stated in the science curriculum?
3. Do teachers perceive the techniques recommended in the science curriculum as appropriate for the achievement of the prescribed goals and objectives?
4. Do teachers perceive the facilities available for teaching science in the junior high school as adequate?
5. Do teachers perceive the equipment and supplies available for teaching science in the junior high schools as adequate for the development of the activities prescribed in the curriculum?
6. Do teachers perceive the need for a revision of the junior high school science curriculum?

In Section I a frequency histogram is drawn for each statement from the questionnaire, and the responses are discussed with reference to frequencies, teacher comments, and other relevant information.

In Section II the following eight statements reveal significant Pearson Product Moment correlations with other items on the questionnaire:

C1. I feel confident that I know the goals of science education in the Searching For Structure program.

C2. There is a strong need to improve my professional standing for the teaching of this course.

C3. I attended the Memorial University Junior High Science Institute.

C4. Our school has adequate laboratory facilities for the teaching of this course.

C5. The majority of my students seemed to enjoy the course.

C6. I really enjoyed teaching this course.

C7. I am highly satisfied with this science course.

C8. A search should begin for a more appropriate science course for grade seven.

The Pearson product moment correlation coefficient, r, was invented by Karl Pearson in 1895. This coefficient is the standard measure of the linear relationship between two variables. It is a pure number, independent of the units of measurement, and its absolute value varies between zero when the variables have no linear relationship, and one, when each variable is perfectly predicted by the other. Its sign indicates the direction of the relationship. A positive sign indicates a tendency for high values of one variable to occur with high values of the other and low values to occur with low. A negative sign indicates a tendency for high values of one variable to be associated with low values of the other.

A figure is drawn for each of the eight correlated statements showing the level of significance with each of the correlated items.

Teachers' Perceptions of Professional Preparation

Statements 1A to 1K were designed to elicit information related to basic question number 1: Is the professional preparation perceived by junior high school science teachers in agreement with the requirements of the Newfoundland Department of Education?

A frequency histogram is drawn for each statement, and the responses are discussed with reference to frequencies, teacher comments, and other relevent data.

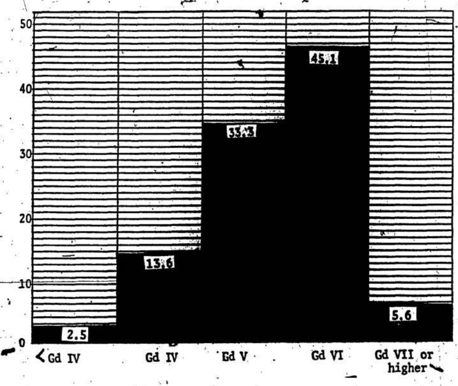
(1A) Teaching certificate

As shown in Figure 1A, 5.6% of the teachers have achieved a teaching certificate of grade VII or higher, 45.1% have a grade VI, 33.3% have a grade V, 13.6 have a grade IV and 2.5% have less than a grade IV certificate.

These frequencies indicate that the majority of teachers are extremely well qualified on the educational certification scale.

Figure 1A

Teaching certificate

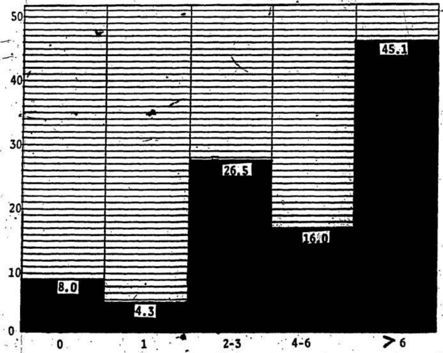


(1B) As shown in Figure 1B, 45.1% of the teachers have taken more than 6 university science courses, 16% have taken 4-6, 26.5% have taken 2-3, 4.3% have taken only 1, and 8.0% have not taken a single university science course.

These frequencies indicate that there is much room for improvement with regard to all of the grade seven teachers acquiring a strong academic background in science.

Figure 1B

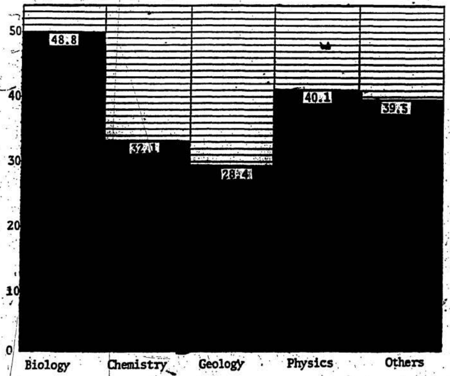
Number of university science courses taken



(1C) As shown in Figure 1C the branch of university science courses taken, rank from a high of 48.8% for Biology, 40.1% for Physics, 39.5% for others, 32.1% for Chemistry, and a low of 28.4% for Geology.

Figure 1C

Branch of university courses taken

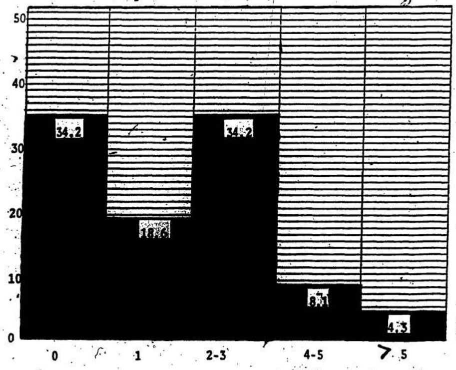


(1D) As shown in Figure 1D, 34.2% of the teachers had not taken a single university science methods course, 18.6% had taken 1, 34.2% had taken 2-3, 8.1% had taken 4-5, and only 4.3% had taken more than 5.

These frequencies indicate a serious lack of science methods courses by the teachers.

Figure 1D

Number of university science methods courses taken (not including science institute courses)



(1E) I feel confident that I know the goals of science education in the Searching For Structure program.

As shown in Figure 1E, 87.7% of the teachers felt confident that they knew the goals of science education in the Searching For Structure program.

Figure 1E

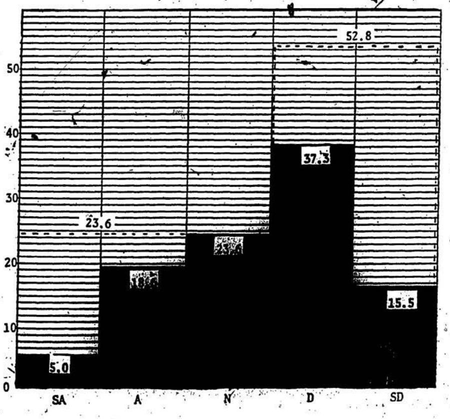
I feel confident that I know the goals of science education in the Searching For Structure program

(1F) There is a strong need to improve my professional standing for the teaching of this course.

As shown in Figure 1F 23.6% of the teachers feel that there is a strong need to improve their professional standing for the teaching of this course.

Figure 1F

There is a strong need to improve my professional standing for the teaching of this course

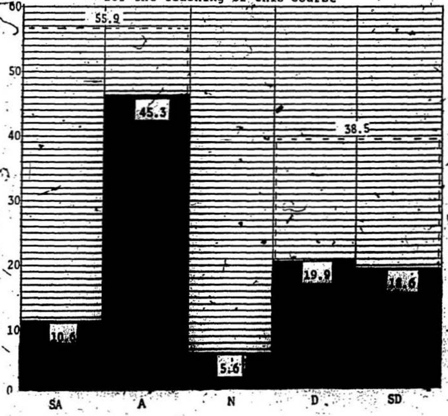


(1G) I have received an in-service or workshop session for the teaching of this course.

An activity oriented course such as this would surely merit an in-service or workshop session. Yet the study indicates, as shown in Figure 1G that 38.5% of the teachers have not received an in-service or workshop. The responsibility for this aspect of the curriculum would

Figure 1G

I have received an in-service or workshop session for the teaching of this course



surely have to rest on the shoulders of the respective science coordinators.

(1H) I attended the Memorial University Junior High Science Institute.

The Memorial University Junior High Science Institute was designed especially for the Searching For Structure program, and the teachers involved in the teaching of this program. It seems rather strange that 23.6% would indicate that there was a strong need to improve their professional standing for the teaching of this course, and yet only 8.1% (Figure 1H) attended the Junior High Science Institute.

(1I) My subject coordinator has been helpful regarding the teaching of this course.

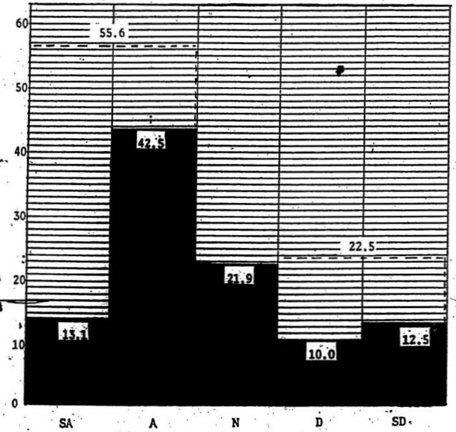
It is indeed significant that 22.5% of the teachers would perceive that their subject coordinator has not been helpful regarding the teaching of this course. It is the role of the subject coordinator to organize in-services and workshops for the teaching of the various courses, and to offer assistance and guidance to the various teachers in their specific field of responsibility.

(1J) I rate myself as a qualified professional science teacher of this course.

Figure 1H
I attended the Memorial University Junior High Science Institute

Figure 1I

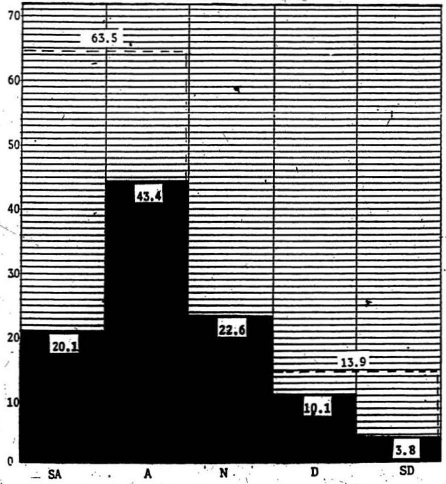
My subject coordinator has been helpful regarding the teaching of this course



As shown in Figure 1J, only 13.9% did not rate themselves as qualified science teachers of this course.

Figure 1J

I rate myself as a qualified professional science teacher of this course



Comments from various teachers regarding this statement were:

(a) In certain areas.

(b) My knowledge of Geology is very limited.

(c) In teaching Life Science, I feel I'm qualified professionally.

(d) Experience!!! I've learned a lot from a co-worker who is a senior high science teacher as well.

(1K) The Memorial University Junior High Science Institute was helpful for the teaching of this course.

As shown in Figure 1K, 12.8% agreed that the Science Institute was helpful for the teaching of this course. There surely must have been some misunderstanding with regard to this question. In hindsight the question should have specified the following: (to be only answered by those who attended the Science Institute). The responses are especially questionable when the study has revealed that only 8.1% of the respondents attended the Science Institute.

Comments regarding this statement were:

(a) I did not attend such an institute, but I feel it would be very valuable.

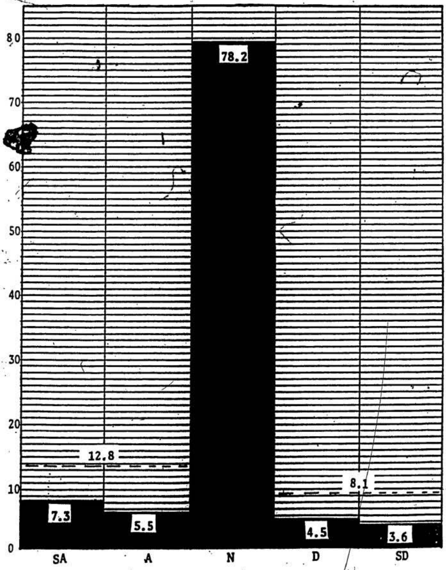
(b) I was lucky enough to have a good science background before doing the institute, but I still found it useful.

(c) It was probably the best course I did at university, as it relates to teaching. I would very highly recommend it to anyone teaching science in grades 7, 8, and 9.

(d) I would have had to rate myself as an unqualified, unprofessional science teacher of this course if not for this institute.

Figure 1K

The Memorial University Junior High Science Institute was helpful for the teaching of this course



SUMMARY

The study shows that 84% of the grade seven science teachers have a grade V teaching certificate or higher. This indicates that the majority of teachers are extremely well qualified generally.

54.8% of the teachers have taken less than seven university science courses. This indicates that the majority of the grade seven teachers are not science majors and do not have a strong academic science background.

With reference to the branches of university science courses taken, frequencies range from a high of 48.8% for Biology, 40.1% for Physics, 39.5% for others, 32.1% for Chemistry, and a low of 28.4% for Geology.

52.8% of the teachers have taken less than two university science methods courses, and 34.2% have not taken a single methods course. This indicates a serious lack of university science methods courses by the majority of teachers.

A large majority of the teachers (87.7%) felt confident that they knew the goals of science education in the Searching For Structure program.

The majority of teachers (52.8%) perceived that there wasn't a strong need to improve their professional standing for the teaching of this course.

Only 55.9% of the teachers had received an in-service or workshop session for the teaching of this course. This area of concern would surely be looked at closely by the science coordinators.

A minimal 8.1% of the teachers had attended the Memorial University Junior High Science Institute. This would indicate an opportunity missed on the part of those teachers who perceive themselves academically underqualified.

The majority of teachers (63.5%) rated themselves as qualified professional science teachers of this course.

Teachers' Perceptions of Goals and Objectives

Statements 2A to 2L were designed to elicit information related to basic question number 2: Are the goals and objectives perceived by the junior high school science teachers in agreement with those stated in the science curriculum?

(2A) This course is extensive and flexible enough to satisfy a variety of individual student interests and abilities.

The teacher guidebook states that "This program, with its core activities, interest activities, and bibliography, provides the opportunity for a student to move at his or her own rate, and, due to the choice in interest activities, provides a chance for different depths. Thus faster-moving students are not being held up by slower ones and the slower-moving students in turn, need not attempt more than they can accomplish. This makes for a healthier learning atmosphere for all."

As shown in Figure 2A, 75.6% of the teachers perceived that the course was extensive and flexible enough to satisfy a variety of individual student interests and abilities.

(2B) This course permits students to acquire an increasing independence of the teacher.

As shown in Figure 2B, 52.5% of the teachers perceived that the course permits students to acquire an increasing independence of the teacher. Premise 7 of the prescribed curriculum states that "The science teacher should encourage students to become independent learners and thinkers."

(2C) The language level of this course is appropriate for my grade seven students.

The teacher guidebook states that "The authors have striven for a language level at least one grade level lower than that for which the text is intended."

As shown in Figure 2C, 71.5% of the teachers perceived that the language level of this course was appropriate for their grade seven students.

Figure 2A

This course is extensive and flexible enough to satisfy a variety of individual student interests and abilities

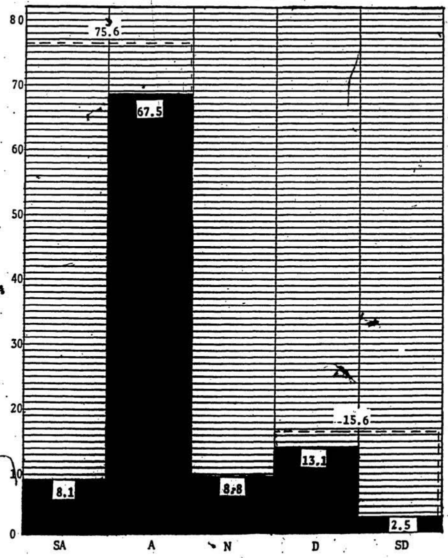


Figure 2B

This course permits students to acquire an increasing independence of the teacher

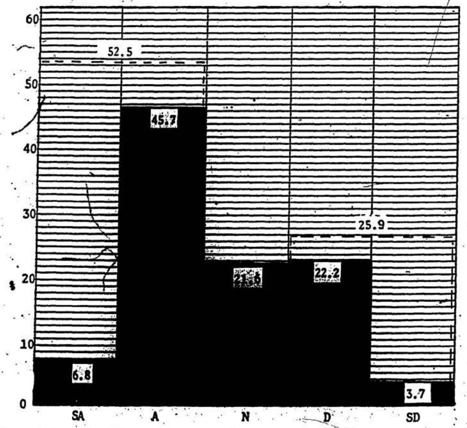
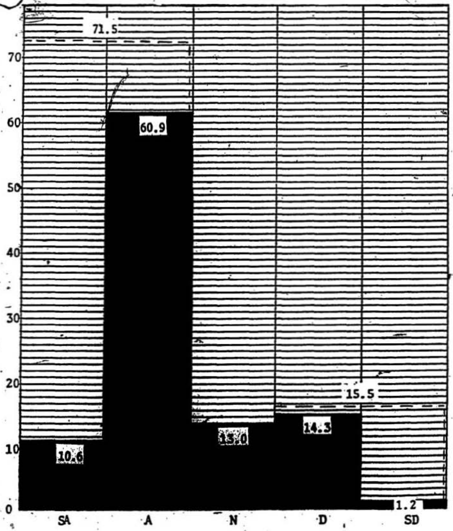


Figure 2C

The language level of this course is appropriate for my grade seven students



(2D) The ratio of content to activities is appropriate.

As shown in Figure 2D, 47.6% of the teachers disagreed, whereas 46.2% of them agreed that the ratio of content to activities was appropriate.

Comments from teachers regarding this statement were:

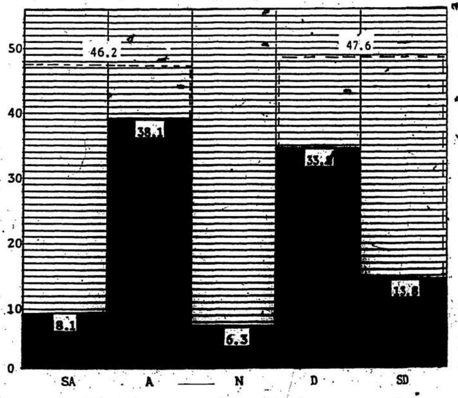
(a) Although I agree with the activity oriented approach to science, I feel that much more content is necessary so that the students can have more background information.

(b) More content would be appropriate in the sections on ecology and earth science. I think the section on ecology should be supplemented with a handbook on flowers and plants of Newfoundland which all students should have.

(c) Any extra content can be supplied by the teacher from the excellent guidebook.

Figure 2D

The ratio of content to activities is appropriate

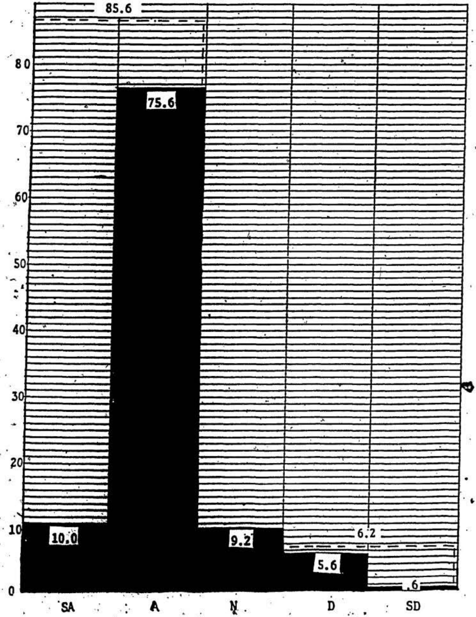


(2E) The degree of difficulty of the majority of concepts in this course is suitable for the average grade seven student.

As shown in Figure 2E, 85.6% of the teachers perceived that the degree of difficulty of the majority of concepts in this course was suitable for the average grade seven student.

Figure 2E

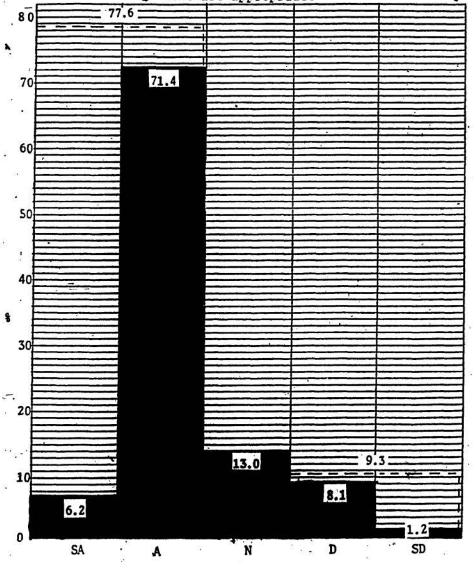
The degree of difficulty of the majority of concepts in this course is suitable for the average grade seven student



(2F) The illustrations and diagrams in the text are appropriate.

Figure 2F

The illustrations and diagrams in the text are appropriate



As shown in Figure 2F, 77.6% of the teachers perceived that the illustrations and diagrams in the text were appropriate.

(2G) I consider outdoor activities very important to the teaching of this course.

The teacher guidebook states that "One of the important inclusions in this program is the provision for a wide variety of out-of-classroom learning experiences. This practice recognizes that not all science can or should be performed in the classroom or laboratory. Furthermore, to take students away from the classroom is an important teaching strategy. Students enjoy such studies and find much to motivate them for their related classroom work; and they benefit from the break in routine."

In agreement with the guidebook philosophy, Figure 2G shows that 71.2% of the teachers consider outdoor activities very important to the teaching of this course.

Figure 2G
I consider outdoor activities very important
to the teaching of this course

(2H) The majority of activities in this course were completed as "hands-on" by the students.

The approach used in the Searching For Structure is based on the belief that students learn best when they are actively involved with materials in a "hands-on" situation. Therefore, as shown by Figure 2H, the 19.2% of teaching situations where the students did not complete the majority of activities as "hands-on" are not teaching this course as it was designed.

(2I) The questions at the end of the chapters are quite relevant to the material covered in the chapter.

As shown in Figure 2I, 82% of the teachers perceive the questions at the end of the chapters as quite relevant to the material covered in the chapters. These questions are based on the behavioral objectives for the unit, and their high degree of relevancy is essential.

(2J) This course provides a balanced content selection.

As Figure 2J shows, 21.4% of the teachers perceived that this course does not provide a balanced content selection. The following are some of the teachers' comments:

(a) Content topics are balanced, but text content on these topics is poor.

(b) Sufficient content in the various sciences that help a student make a choice in high school.

(c) The content in some cases is only sufficient to cause confusion.

(d) May be balanced in appearance, but I find that the Life Science section is very time consuming, very difficult to do, and the section which I feel the most uncomfortable with.

Figure 2H

The majority of activities in this course were completed as "hands-on" by the students

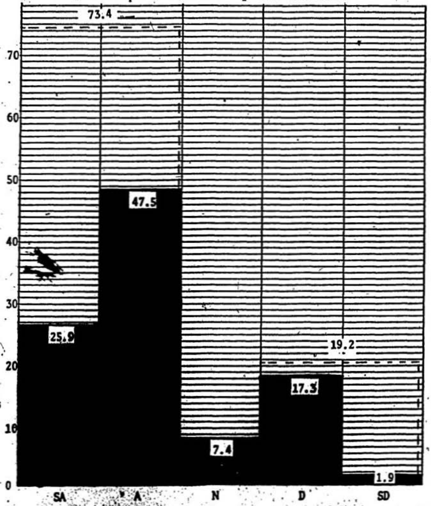


Figure 2I

The questions at the end of the chapters are quite relevant to the material covered in the chapters

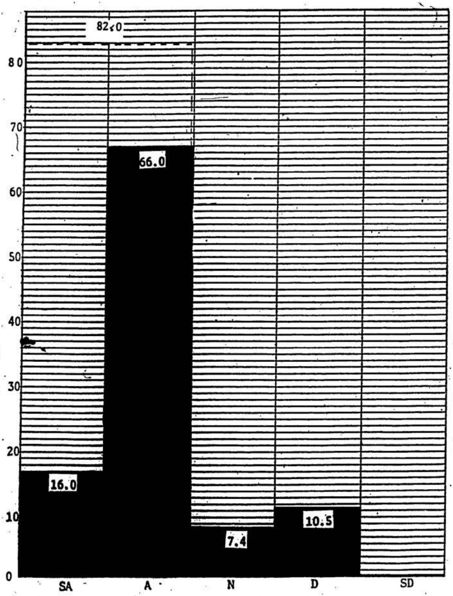
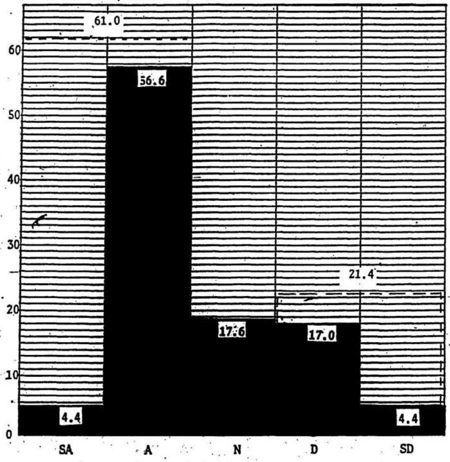


Figure 2J

This course provides a balanced content selection



(2K) The activities in the course are very practical for Newfoundland students.

Figure 2K shows that 27.9% of the teachers perceived that the activities in the course are not very practical for Newfoundland students. Some of their comments were:

(a) Most are practical, but some could be modified for local areas.

(b) I would like to see more activities directed towards some of our concerns with the environment, i.e. acid rain, I also think time should be allotted for science fairs.

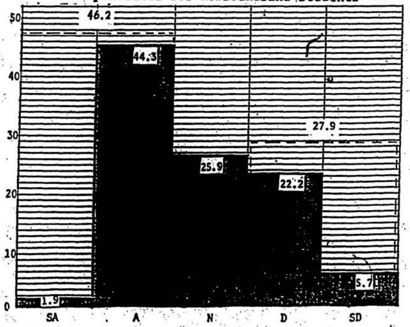
(c) The Life Science unit requires much revision to make it practical here, i.e. acid rain and endangered species.

(d) Ecological activities are not practical.

(e) Life science activities, especially outdoors, are totally inappropriate for Western Labrador.

Figure 2K

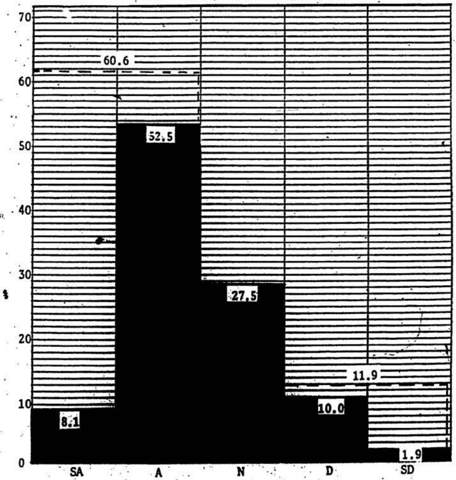
The activities in the course are very practical for Newfoundland students



(2L) This course encourages students to function at the highest cognitive levels appropriate for their stage of development.

Figure 2L

This course encourages students to function at the highest cognitive levels appropriate for their stage of development



The Searching For Structure guidebook states that this program "with its core activities, interest activities, and bibliography, provides the opportunity for a student to move at his or her own rate, and, due to the choice in interest activities, provides a chance for different depths. Thus faster-moving students are not being held up by slower ones, and the slower-moving students, in turn, need not attempt more than they can accomplish. This should make for a healthy learning atmosphere for all."

Premise 4 of the Philosophy and Objectives states that "Science programs ought to encourage students to function at the highest cognitive, affective, and psychomotor levels appropriate for their stage of development." However, Figure 2L shows that 60.6% agreed whereas 11.9% disagreed that this particular course accomplishes this. Some of the teacher comments were:

(a) Under ideal conditions.

(b) Students can reach beyond the core concepts to depths that encourage full development.

(c) Only at a very low teacher-student ratio.

(d) With the help of course, of appropriate teacher methodology.

(e) I have observed that many students are not ready for the reasoning required to draw conclusions from some activities.

SUMMARY

The majority of teachers (75.6%) perceived that the course was extensive and flexible enough to satisfy a variety of individual student interests and abilities.

52.5% of the teachers perceived that the course permitted students to acquire an increasing independence of the teacher.

The majority of the teachers (71.5%) perceived that the language level of this course was appropriate for their grade seven students.

The teachers were fairly evenly divided with reference to the ratio of content to activities. The larger percentage (47.6%) disagreed, whereas 46.2% agreed that the ratio of content to activities is appropriate.

A large majority of the teachers (85.6%) perceived that the degree of difficulty of the majority of concepts in this was suitable for the average grade seven student.

The large majority of the teachers (77.6%) perceived that the illustrations and diagrams in the text are appropriate.

The majority of teachers (71.2%) considered outdoor activities very important to the teaching of this course.

73.4% of the teachers agreed that the majority of activities in their course were completed as "hands-on" by the students.

The large majority (82%) perceived the questions at the end of the chapters as quite relevant to the material covered in the chapters.

The majority of teachers (61%) perceived that the course provided a balanced content selection.

46.2% of the teachers perceived that the activities in the course were very practical for Newfoundland students, whereas 27.9% disagreed with this statement.

The majority of teachers (60.6%) perceived that the course encouraged students to function at the highest cognitive levels appropriate for their stage of development.

These high percentages of agreement place a positive stamp of approval to basic question number two. The goals and objectives perceived by the majority of junior high school science teachers are indeed in agreement with those stated in the science curriculum.

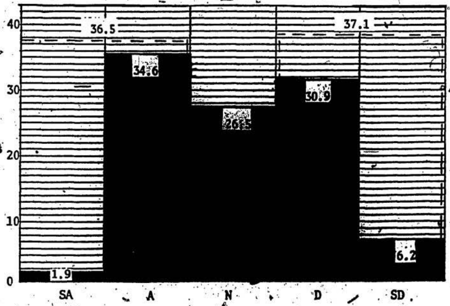
Teachers' Perceptions of Techniques Recommended

Statements 3A to 3O were designed to elicit information related to basic question number 3: Do teachers perceive the techniques recommended in the science curriculum as appropriate for the achievement of the prescribed goals and objectives?

(3A) Audio-visual resources are often used in the teaching of this course.

The teacher guidebook suggests to teachers "consult the Media Centre of your Department of Education and/or your local School Board Media Centre for available films, filmstrips, etc." However Figure 3A reveals that 37.1% of the teachers do not often use audio-visual resources in the teaching of this course.

Figure 3A
Audio-visual resources are often used in the teaching of this course



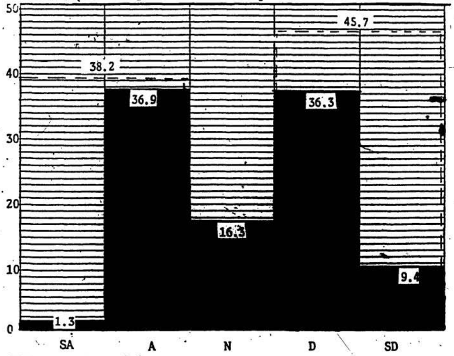
(3B) Lecture-discussion is the method I use most frequently in the teaching of this course.

The approach used in the Searching For Structure program is based on the belief that students learn best when they are actively involved with materials in a "hands-on" situation. Thus, there are many activities with just enough textual material to cement them together. It is the program's belief that student contact with real apparatus in real situations should constitute the first level of a program, and that it is in these situations, whether in the classroom or in the field, that the student develops initial interest and derives pleasure. Furthermore, it is their belief that it is these first level activities which create the desire in the student to pursue second level studies with texts and other reference materials. These references, as well as answering the questions raised during an investigation, prepare the student to return to investigating, and thus the interest cycle begins again.

Contrary to the philosophy of this course, Figure 3B shows that 38.2% of the teachers use lecture-discussion as the method they use most frequently in the teaching of this course.

Figure 3B

Lecture-discussion is the method I use most frequently in the teaching of this course



(3C) I insist on formal activity reports from my students for this course.

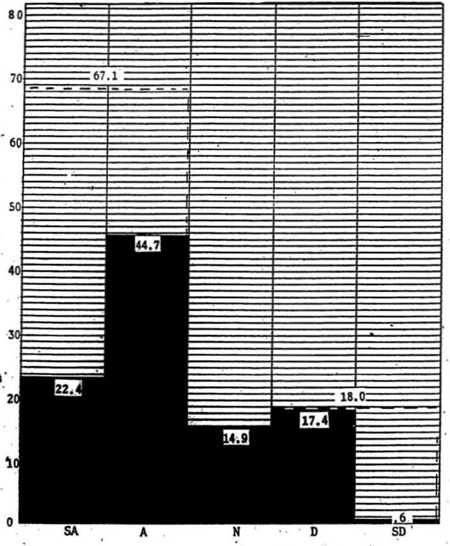
The teacher guidebook states that "An activity-oriented, student-centered program such as this offers an admirable opportunity for continuous evaluation. It is suggested that a high proportion of marks be allocated to the activity reports handed in regularly by each student".

Figure 3C shows that 67.1% of the teachers insist on formal activity reports from their students in this course.

Figure 3C

I insist on formal activity reports from

my students for this course



(3D) The teacher guidebook provides sufficient help regarding methodology and techniques.

Figure 3D shows that only 7.6% of the teachers perceived that the guidebook did not provide sufficient help regarding methodology and techniques. This certainly adds a firm stamp of approval for the guidebook in this regard.

(3E) The guidebook offers sufficient information regarding the evaluation procedures for the course.

The Searching For Structure guidebook states that "an activity-oriented, student-centred program such as this offers an admirable opportunity for continuous evaluation. It is suggested that a high proportion of marks be allocated to the activity reports handed in regularly by each student. At the end of each unit is a self-test, made up of questions which are based on the behavioral objectives. Each test is a learning tool to enable the student to discover how successful he or she has been with a unit, and find where he or she needs additional help or remedial work. Such tests should be written after a student has finished a unit and reviewed it. When possible they should be marked by the student from a marking scheme, and should not count towards his or her grade. These tests are not teachers' rating devices and the students must be assured of this, or the tests will be of little or no value to them. You may wish simply to record that the test has been done. Thus the students are

Figure 3D

The teacher guidebook provides sufficient help regarding methodology and techniques

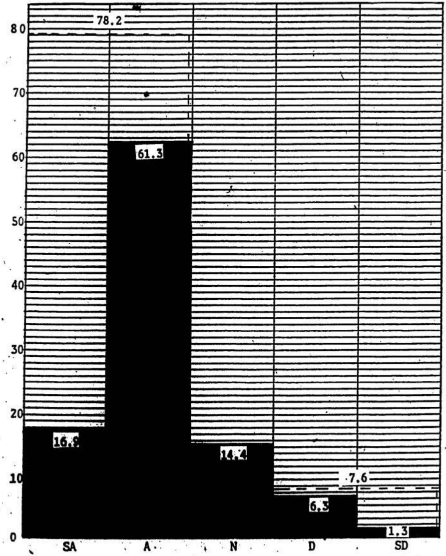
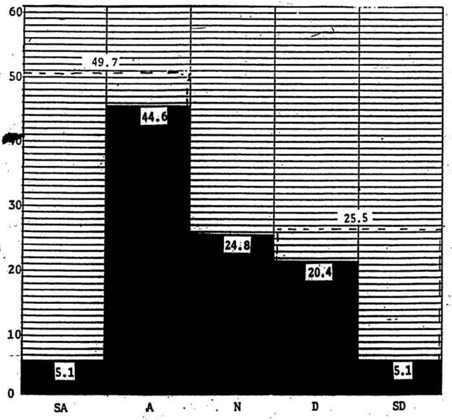


Figure 3E

The guidebook offers sufficient information regarding the evaluation procedures for the course



rated on their daily work, with the tests being used as tools to help them improve their performance.

Some teachers may wish to include term tests and exams with the kinds of evaluation already described. It is important to continue to take into account the program objectives - that it is process oriented, while helping the student learn content and develop manipulative skills. Thus the student should be tested on his/her process abilities - observing, describing, classifying, inferring, predicting, hypothesizing, controlling variables, interpreting data, designing experiments, formulating models, etc.

Questions should be written to test for all three of knowledge, comprehension, and application. Appendix C gives examples of test questions for the following: the process; knowledge, comprehension, and application; some manipulative skills."

The guidebook states that the test questions may be essay type, multiple choice, matching type, true-false, or completion. It then lists the advantages and disadvantages of each type of test.

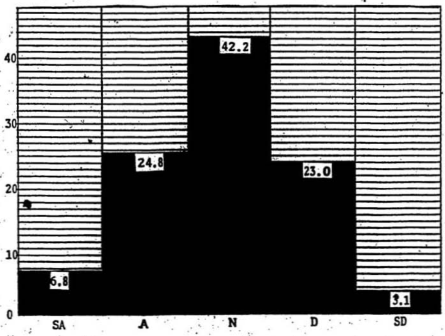
However, as shown by Figure 3E, 25.5% of the teachers perceive that the guidebook does not offer sufficient information regarding the evaluation procedures for the course.

(3F) The percentage of evaluation for this course that I allocate to the activity reports is ________.

The teacher guidebook suggests that a high proportion of marks be allocated to the activity reports handed in regularly by each student. Figure 3F shows 73.8% of the teachers allocate less than 26%, and even 6.8% of them allocate a minimal 5% to these reports.

Figure 3F

The percentage of evaluation for this course that I allocate to the activity report is

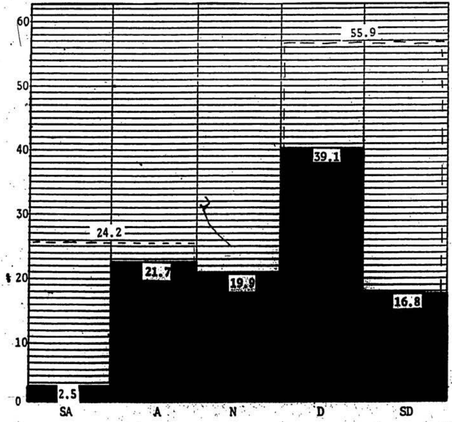


(3G) I often use the test at the end of a chapter as the main guide for my chapter test.

The teacher's guidebook suggests that "These tests are not teachers' rating devices and the students must be assured of this, or the tests will be of little or no value to them." Each test is meant to be a learning tool to enable the student to discover how successful he or she has been with a unit, and find where he or she needs additional help or remedial work. However, Figure 3G shows that 24.2% of the teachers use this test at the end of the chapter as the main guide for their chapter test.

Figure 3G

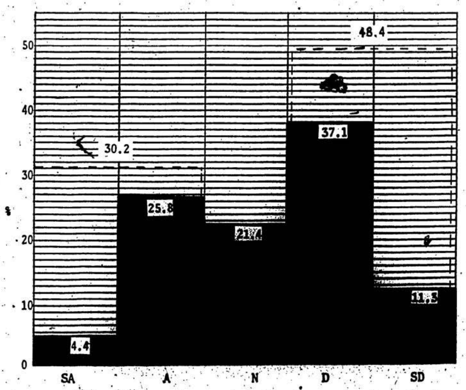
I often use the test at the end of a chapter as the main guide for my chapter test



(3H) I use laboratory tests to evaluate the process abilities of the students.

It is important to take into account the program objectives - that it is process oriented, while helping the student learn content and develop manipulative skills. Thus the student should be tested on his or her process abilities. An ideal way to do this is with laboratory tests. However, as shown by Figure 3H, 48.4%

Figure 3H
I use laboratory tests to evaluate the process abilities of the students



of the teachers do not use laboratory tests to evaluate the process abilities of the students.

(3I) The teacher guidebook provides sufficient help in the content areas.

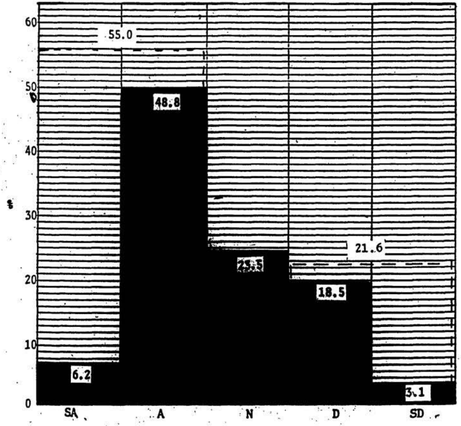
The teacher guidebook states that "Because of the very large and rapidly expanding body of scientific knowledge, and the impossibility of learning more than a small fraction of it, some basis for the intelligent selection of content is required.

Students of intermediate age are very curious about their world, but most educators agree that they are not ready to settle down into a detailed study of a particular science discipline. Therefore, the content selected should encourage them to delve into the wide variety of topics available in science. Such an approach contributes to an enriching view of their world, widens their interests, and, in their later secondary school years, enables them to choose intelligently among the science disciplines. There should of course, be sufficient basic content to prepare the students for in-depth study in the disciplines in the senior years".

Figure 3I shows that 21.6% of the teachers perceive that the teacher guidebook does not provide sufficient help in the content areas.

Figure 3I

The teacher guidebook provides sufficient help in the content areas

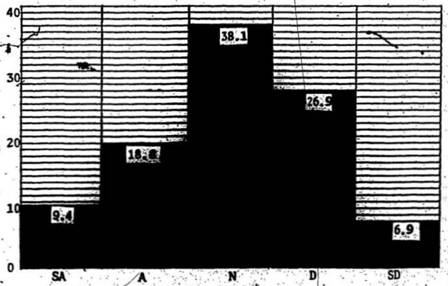


(3J) The appropriate ratio of content to activities should be.

Figure 3J shows that the greater percentage of teachers, (38%), perceived that the appropriate ratio of content to activities should be 1:1. 33.8% agreed to a higher rating of content, whereas 28.2% preferred a higher rating of activities.

Figure 3J

The appropriate ratio of content to activities should be



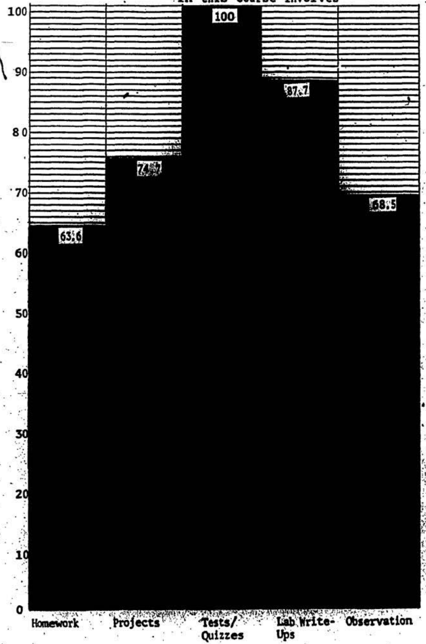
(3K) My method/methods for assessing student progress in this course involves.

As Figure 3K shows, the large majority of teachers use a variety of methods for assessing student progress, which include homework, projects, tests/quizzes, lab writeups and observation.

Figure 3K

My method/methods for assessing student progress

in this course involves



(3L) Percentage allocated to each method of assessment.

It is obvious from Figure 3L that teachers use a wide variety of evaluation schemes for the Searching For Structure program. The percentages allocated to each method of assessment range from 0-40% for homework, 0-40% for projects, and 0-40% for observation.

Some school boards have a uniform system of evaluation for the teachers within their jurisdiction, whereas other school boards have no district policy and the evaluation allocations are left to the discretion of the individual teachers.

(3M) Demonstration of activities is the method I use most frequently in the teaching of this course.

The approach used in the Searching For Structure program is based on the belief that students learn best when they are actively involved with materials in a "hands-on" situation. Figure 3M shows that 32.3% of the teachers use demonstration of activities as the most frequent method in the teaching of this course. Such teaching methodology conflicts with the philosophy behind this particular program.

Figure 3L

Percentage allocated to each method of assessment

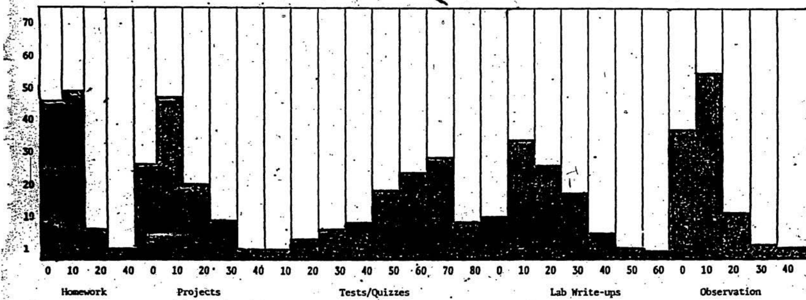
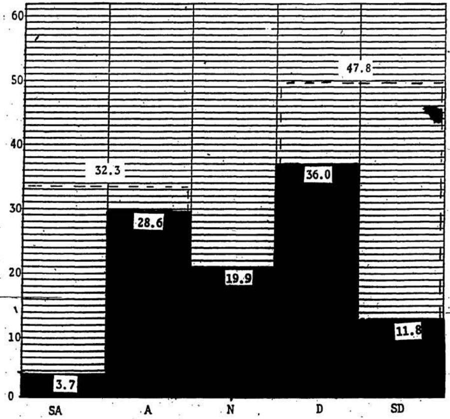


Figure 3M

Demonstration of activities is the method I use most frequently in the teaching of this course



(3N) Evaluation techniques constitute a major problem in the teaching of this course.

The teacher guidebook states that "An activity-oriented, student-centred program such as this offers an admirable opportunity for continuous evaluation. It is suggested that a high proportion of marks be allocated to the activity reports handed in regularly by each student."

Figure 3N shows that 16.9% of the teachers perceive evaluation techniques as constituting a major problem in the teaching of the course. Some of the following comments will surely indicate why:

(a) The emphasis of the course is on active student participation to enhance learning. The majority on evaluation however, is on test results, as grading students for activities done in groups is unfair.

(b) A lot of group work. In few cases the grades are invalid (Students have excellent write-ups, but don't understand the work fully). Tests usually rank students eventually.

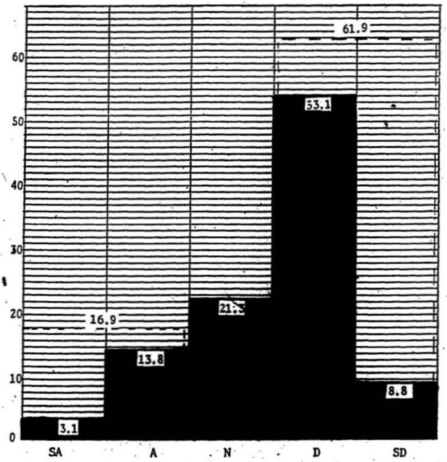
(c) There doesn't seem to be any uniformity within my school board as to evaluation procedures and techniques.

(d) Many opportunities for evaluation exist. The drawback is that they tax available teaching time to some degree.

(e) My evaluation must be based on content. Content is lacking.

Figure 3N

Evaluation techniques constitute a major problem in the testing of this course

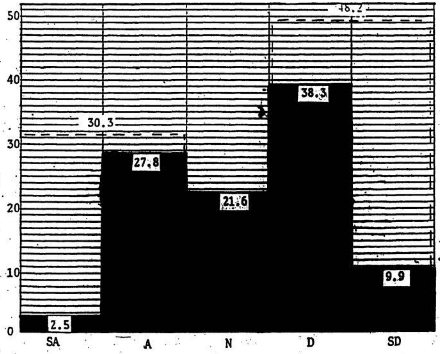


(30) Long answer type questions constitute the major percentage of my tests.

Figure 30 shows that 30.3% of the teachers have long answer type questions constituting the major percentage of their tests.

Figure 30

Long answer type questions constitute the major percentage of my tests



SUMMARY

The teachers were divided fairly evenly with regard to audio-visual resources. 37.1% disagreed, whereas 34.6% agreed that audio-visual resources were often used in the teaching of this course.

Thirty-eight point two percent agreed, whereas 45.7% disagreed that lecture-discussion was the method that they used most frequently in the teaching of this course. Thirty-two point three percent agreed, whereas 47.8% disagreed that demonstration of activities was the method used most frequently in the teaching of this course.

The majority of teachers (67.1%) insist on formal activity reports from their students for this course, as outlined in the teacher guidebook.

The large majority of the teachers (78.2%) perceived that the teacher guidebook provided sufficient help regarding methodology and techniques.

Contrary to the teacher guidebook, which suggests that a high proportion of marks be allocated to the activity reports, 73.8% of the teachers allocate less that 26% to these reports.

The majority of teachers (55%) perceived that the teacher guidebook provided sufficient help in the content areas.

Thirty-eight percent of the teachers perceived that the appropriate ratio of content to activities should be 1:1, 33.8% agreed to a higher rating of content, whereas 28.2% preferred a higher rating of activities.

The majority of teachers (61.9%) did not perceive evaluation techniques as constituting a major problem in the teaching of this course.

The study also revealed that the large majority of teachers used a wide variety of evaluation schemes. However, there were very wide discrepancies between the percentages allocated to each method of assessment.

Teachers' Perceptions of Facilities

Statements 4A to 4C were designed to elicit information related to basic question number 4: Do teachers perceive the facilities available for teaching science in the junior high schools as adequate?

(4A) Our school has adequate laboratory facilities for the teaching of this course.

Figure 4A shows that 44.5% of the teachers perceive that their schools do not have adequate laboratory facilities for the teaching of this course.

Teachers' comments regarding this statement were:

(a) There are insufficient funds to adequately stock the lab.

(b) No facilities at all.

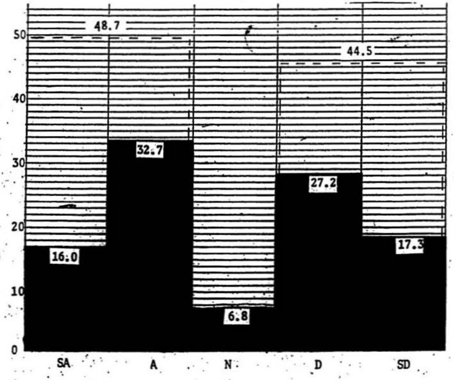
(c) We have the equipment - all we need. However, our lab is a pitiful excuse for a proper scientific environment.

(d) Facilities are lacking, because there isn't even any electricity.

(e) Consumable materials are difficult to replace, due to budget restraints.

Figure 4A

Our school has adequate laboratory facilities for the teaching of this course



(4B) I am teaching this course in a __________.

Figure 4B shows that 37% of the teachers are teaching the Searching For Structure program "solely" in a classroom.

The following are comments from some of the teachers who find themselves in a disadvantaged situation:

(a) I use a portable lab.

(b) I have gas and cold running water on a demonstration table.

(c) We are gradually getting the equipment needed, but it is hard to use them in a classroom.

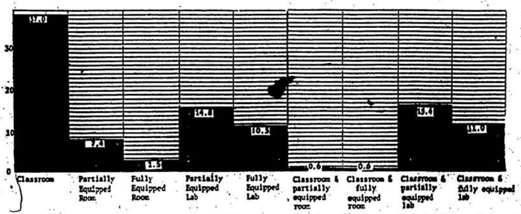
(d) No lab in school. Experiments are done in the library, in groups at individual tables.

(e) Presently bringing materials from class to class on a cart.

(f) In a classroom, without even a sink.

Figure 4B

I am teaching this course in a _________.



(4C) The location of our school poses serious problems for the efficient teaching of outdoor activities in this course.

Figure 4C shows that 56.2% of the teachers disagree, whereas 27.8% agree that the location of their school posed serious problems for the efficient teaching of outdoor activities in this course.

Some of their comments were:

(a) Good for study of plants and small animals (insects, etc.)

(b) We simply use buses to travel outside our immediate area when necessary.

(c) The school has nearby (1-3 miles) heath, forest, peatland, forest, marsh and river ecosystems.

(d) We are a rural school. Bus costs a fortune.

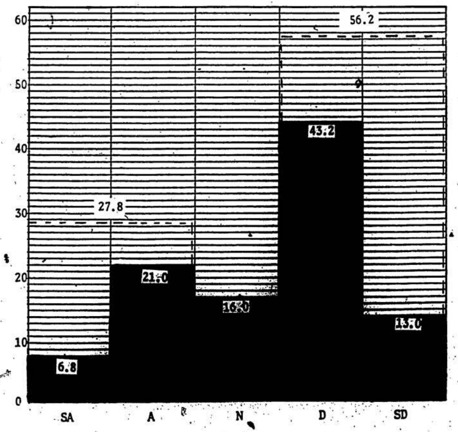
SUMMARY

The teachers were fairly evenly divided with regard to their perception of laboratory facilities. 48.7% agreed, whereas 44.5% disagreed that their school had adequate laboratory facilities for the teaching of this course.

One of the most astounding revelations of this study, and the one that should cause the most alarm is that 37% of the teachers are teaching this activity-oriented, "hands-on" science course <u>solely</u> in a classroom. This is most certainly an unacceptable situation.

Figure 4C

The location of our school poses serious problems for the efficient teaching of outdoor activities in this course



The majority of teachers (56.2%) did not perceive the location of their school as posing serious problems for their efficient teaching of outdoor activities in the course.

Teachers' Perceptions of Equipment and Supplies

Statements 5A and 5B were designed to elicit information related to basic question number 5: Do teachers perceive the equipment and supplies available for teaching science in the junior high schools as adequate for the development of the activities prescribed in the curriculum?

(5A) There is a "reasonable" amount of science equipment available in our school.

Figure 5A shows that 75.4% of the teachers perceive that there is a "reasonable" amount of science equipment available in their schools. 17.9% disagree with this statement and some of their comments were:

(a) If it can be shared so that activities are done in groups.

(b) We cannot do a quarter of the experiments.

(c) Enough for demonstration purposes only.

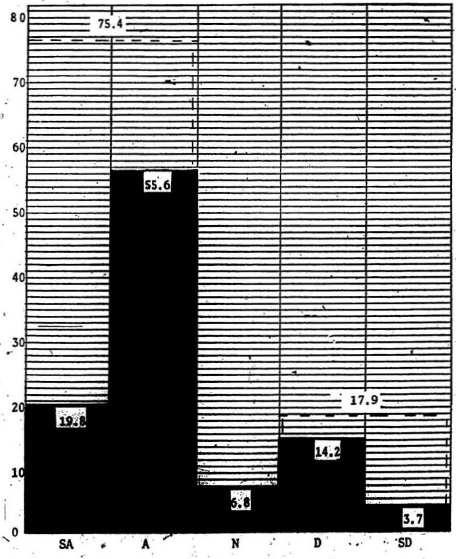
(d) No place for storage of chemicals, etc.

(5B) The lack of a "reasonable" amount of science equipment is creating serious problems in my teaching of this course.

Figure 5B shows that 12.7% of the teachers perceived that the lack of a "reasonable" amount of science equipment

Figure 5A

There is a "reasonable" amount of science equipment available in our school



was creating serious problems in their teaching of the course.

Comments from some of those teachers were:

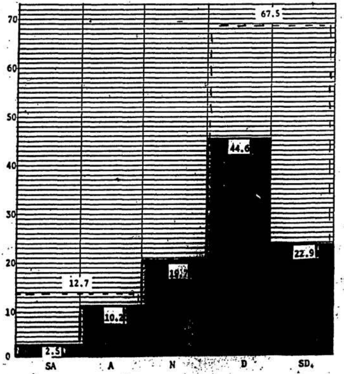
(a) Causing some problems. Equipment does not make a program, but it could improve it.

(b) We have to do much group work - often the groups are too large to be very effective.

(c) Need a lab! -Essential.

Figure 5B

The lack of a "reasonable" amount of science equipment is creating serious problems in my teaching of this course



SUMMARY

The large majority of teachers (75.4%) perceived that there was a "reasonable" amount of science equipment available in their school.

Only 12.7% perceived that the lack of a "reasonable" amount of science equipment created serious problems in their teaching of the course. However, even this 12.7% is a deplorable situation. No science class in this province should receive an inferior science education because of a lack of a "reasonable" amount of science equipment.

Teachers' Perceptions of the Need for Revision

Statement 6A was designed to elicit information related to basic question number 6: Do teachers perceive the need for a revision of the junior high school science curriculum? (6A) A search should begin for a more appropriate course for grade seven.

Figure 6A shows that 34.0% of the teachers agree whereas 40.1% disagree that a search should begin for a more appropriate science course for grade seven. The vast array of comments surely voice many various points of view and areas of concern:

(a) Some revisions/changes would be beneficial, especially on elaboration of key concepts.

(b) Give them a book that has something in it for them to read. Not all reading, but not all activity either.

(c) Excellent course for doing activities and developing interest, the skills, and processes of science in students.

(d) Perhaps a continual "updating" of the present text would be more suitable.

(e) If not, the grade six program should be more activity oriented, so that the student is not totally lost with this course. I personally feel that this course was designed with a small, high achieving student body in mind.

(f) This is the third text I have taught, and is by far the best.

(g) We need one for a multigrade classroom.

(h) I disagree, but considering the Department of Education I would not be surprised that "something good" should be eliminated.

(i) I think this is a good course, but that should not blind me. We should always search for bigger and better things.

(j) Supplementary material can be added to the sections that lack sufficient information.

(k) For larger schools the program is fine. However, my situation is quite removed from the ideal; a multigrade classroom with grades 7-9 can hardly, strongly recommend this type of program.

(l) Many teachers have problems with the course because of (1) no science background, (2) lack of facilities, and (3) lack of equipment. However, with greater effort in future planning, facilities and equipment can be obtained. It took me six years of frustration but now we have the facilities and equipment to teach the course. (7, 8 and 9).

(m) Even teachers with no science background are enjoying the course. It is an excellent course with emphasis on the methods of science.

(n) Not necessarily a better course, but better activities in Life Science and Earth Science.

(o) This is definitely the finest course ever introduced at this level.

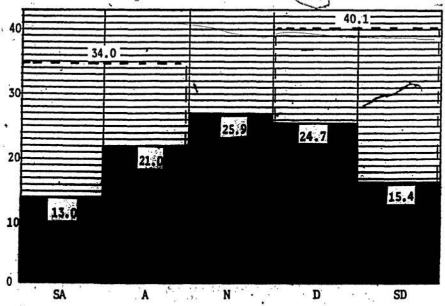
(p) I don't have any problem with the course. I need reasonable size groups (15-20), and more time to plan and set up lab activities so that they can run smoothly. In a "hands-on" environment, students, especially average, and below average, need as much structure as possible.

(q) It is time for a change, and an upgrading of the content and activities.

(4) I feel that the course should be revised. There are some valuable principles being introduced, but have no content for students to fall back on for further explanations. I continually have to supply extra readings, etc.

Figure 6A

A search should begin for a more appropriate Science course for grade seven



SUMMARY

The teachers were fairly evenly divided with regard to a course revision. The large percentage of the teachers

(40.1%) disagreed, whereas 34% agreed that a search should begin for a more appropriate science course for grade seven. The teachers were quite varied as to the reasons for their choice. Generally however, the strong thread that promoted the decision was: Those teachers who were able to teach the curriculum as the "prescribed curriculum" was designed disagreed, whereas those teachers who were handicapped in their teaching of the "prescribed curriculum" agreed that a search should begin for a more appropriate science course for grade seven.

Additional Perceived Variables

Statements 7A to 7P were designed to elicit additional information concerning the grade seven Search For Structure program.

(7A) Age

As shown by Figure 7A, the teachers range in age from a high of 38.5% being over 35 years to a low of 11.8% between 21 and 25 years of age.

(7B) Sex

There is a great discrepancy between the number of males and the number of females teaching the grade seven Search For Structure program. Figure 7B shows that 82.5% of the teachers are male, whereas only 17.5% are female.

Figure 7A

Age

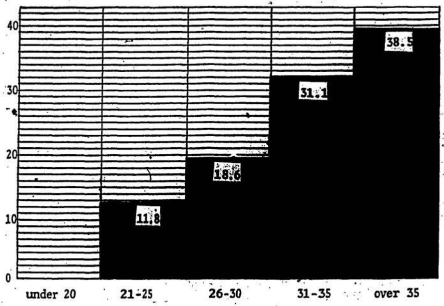


Figure 7C shows that 53.7% of the teachers have more than 10 years experience, 11.7% have 8-10, 16% have 4-7, 14.2% have 1-3, and 4.3% have less than 1 year.

(7D) Junior science grades presently teaching.

Figure 7D shows that 40.1% of the teachers are only teaching grade 7, 23.5% are teaching grades 7 and 8, 30.3% are teaching grades 7, 8, and 9, and 6.1% are teaching grades 7 and 9.

Figure 7B

Sex

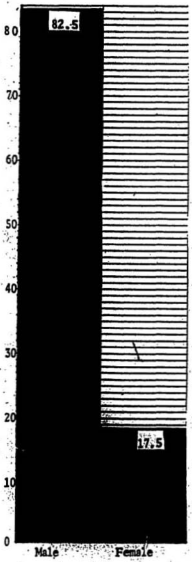
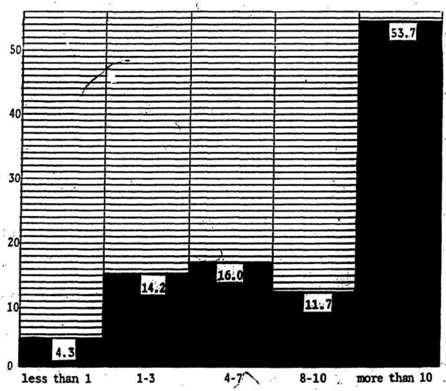


Figure 7C

Years of teaching experience



(7E). Enrollment size of school.

Figure 7E reveals that 16% of the grade seven junior high science teachers are teaching in schools with an enrollment size less than 100, 27.2% with enrollment size between 101 and 200, 19.8% with enrollment size between 201 and 300, 14.8% with enrollment size between 301 and 400, and 22.2% with enrollment size greater than 400.

Figure 7D

Junior Science Grades presently teaching

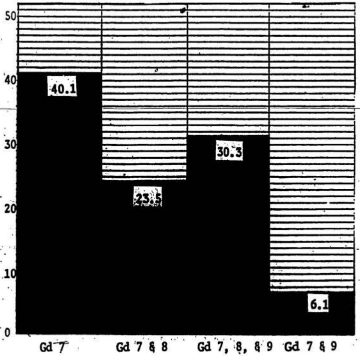
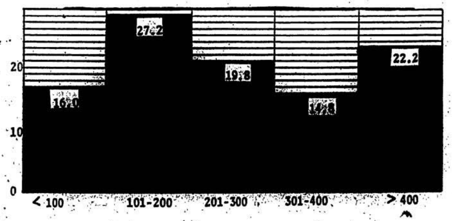


Figure 7E

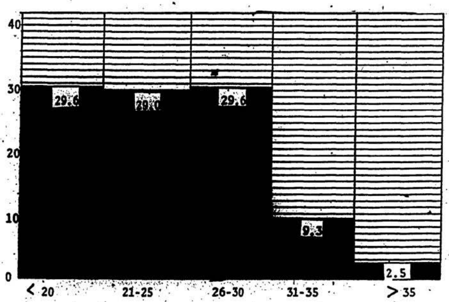
Enrollment size of school



(7F) Average junior science class size.

The theoretical student/teacher ratio in Newfoundland and Labrador classes is 23:1. Figure 7F shows that 41.4% of the grade seven junior high science teachers have student/teacher ratios greater than this. 9.3% of these teachers have average class sizes between 31 and 35, whereas 2.5% have an average junior science class size greater than 35.

Figure 7F
Average junior science class size

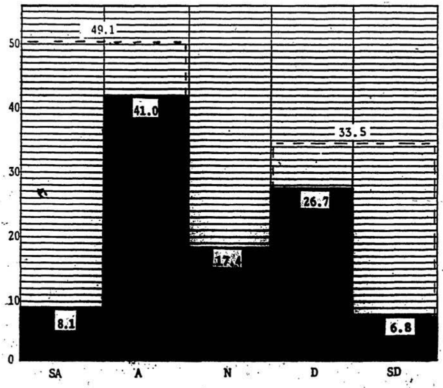


(7G) I am highly satisfied with this science course.

Figure 7G shows that 49.1% of the teachers agreed that they were highly satisfied with this science course.

Figure 7G

I am highly satisfied with this science course



(7H) My workload is higher for this course than for most courses I have taught previously.

Figure 7H shows that 46.9% of the teachers perceived that their workload for this course was higher than for most courses they had taught previously.

Teacher comments regarding this statement were:

(a) During the first year the program required more time and preparation.

(b) Once you have done the course and gathered materials, the students, under guidance do practically everything. Grading labs does take some time however.

(c) Correction of lab write-ups is very time consuming, as well as setting up some of the labs before class, especially when you have large classes.

(d) Any spare time that I may have had previously seems to be totally spent preparing lab work and other science activities.

(e) I have a heavy workload which allows very little time for preparing of experiments.

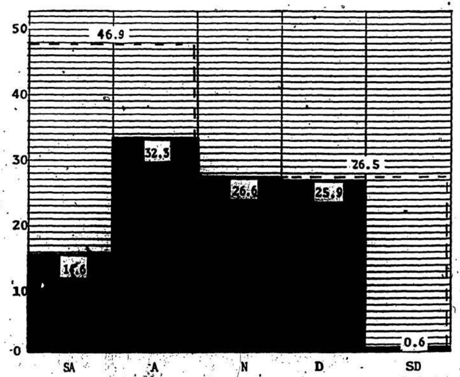
(f) Mostly because I have to borrow many items from another school.

(71) The majority of my students seemed to enjoy the course.

Figure 71 shows that 70.4% of the teachers perceived that the majority of their students seemed to enjoy the course.

Figure 7H

My workload is higher for this course than for most courses I have taught previously

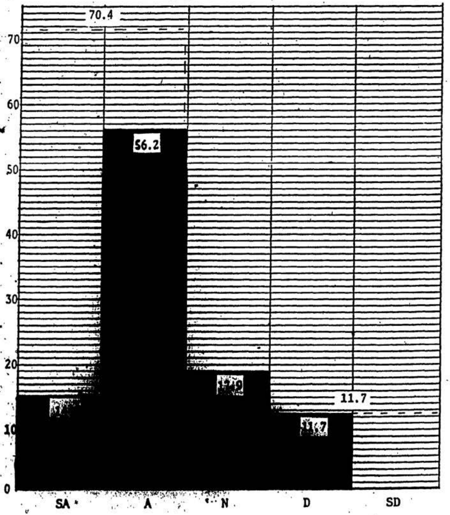


(7J) On a scale of 1-10 I would rate the danger level of the activities in this course as:

Figure 7J shows that 78.6% of the teachers rated the danger level of the activities in this course as less than 5. However, the comments elaborated on some of the issues regarding lab safety of which teachers were concerned:

Figure 71

The majority of my students seemed
to enjoy the course



(a) Some activities can be hazardous, e.g. using ammonia, hydrochloric acid, and iodine crystals.

Care must be exercised at all times. Lab safety must be emphasized.

(b) The danger level is high due to the fact that when I use a heat source or chemicals, I don't have a separate lab.

(c) Chemistry activities involving combustion can be dangerous.

(d) Monitoring 30 students doing ZnS reactions or burner activities can be hazardous.

(e) Some activities are harmless, others don't belong in a grade seven program, especially handling ether.

(f) Chloroform is no longer used in the labs at Memorial University, but is required for Activity 5, p. 105.

(g) Certain activities don't have enough cautions, e.g. sublimination of iodine crystals; the gas is lethal.

(h) Activity #9, p. 112; Iodine gas is a harmful irritant - Lab should be skipped regardless of how "good" the ventilation is.

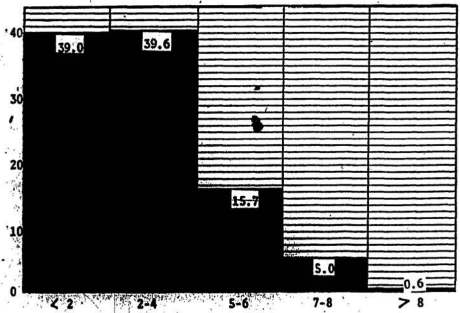
(i) Activity #5, p. 128; Any "tasting" should be skipped, since it is an unsafe lab procedure, regardless of the liquid being used (beaker may be contaminated).

(j) Activity #6, p. 157; Nothing should be put in the exhaust of a car since it is hot enough to burn, as well as potentially explosive in this case.

(k) Some activities require the use of chemicals, of which the labels do not give any special warnings. I am unfamiliar with them, and therefore try to avoid the use of them.

Figure 7J

On a scale of 1-10 I would rate the danger level of the activities in this course as:



(7K) I would rate the percentage of impractical activities in this course as:

Figure 7K shows how teachers rated the percentage of impractical activities in this course. Some of the reasons for the various ratings were:

(a) For time considerations - because of lack of equipment for 30 students - because of inefficiency.

(b) Some activities are impractical at school but can be done at home, i.e. experiencing a sunrise.

(c) I found the outdoor activities somewhat impractical because of time needed for each as well as relative unsuitability of local sites. I have improvised.

(d) Impractical only because of lack of lab space and supplies.

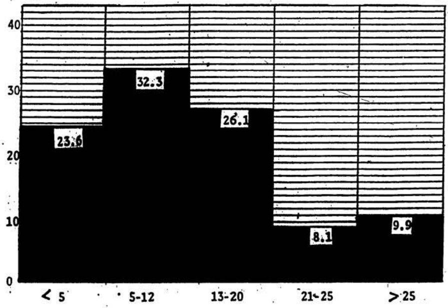
(e) Most of the Life Science and some of the Earth Science.

(f) Most activities in sections 1 and 2 were done. However, to do many of the activities in section 3 required materials that would be too expensive and as a result this section was not dealt with as much as the first two.

(g) The Ecology section in grade seven is about the worst section I have found in activities.

Figure 7K

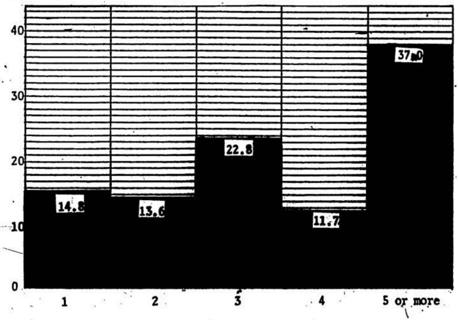
I would rate the percentage of impractical activities in this course as:



(7L) How many years (including the present) have you taught this course?

Figure 7L shows that 37% of the teachers have taught the course for 5 or more years, and that only 14.8% taught the course presently for the first time.

Figure 7L
How many years (including the present) have you taught this course?



(7M) I gain a high degree of satisfaction from teaching this course.

Figure 7M shows that 62.1% of the teachers gain a high degree of satisfaction from teaching this course.

Comments from the various teachers were:

(a) From the desire and interest of the students, more so than from the text itself.

(b) This is impossible for me, as I feel so ill-prepared for the physical science/earth science aspects of the course.

(c) I enjoy the physical science and earth science sections. The life science section is very hazy and poorly developed.

(d) Very satisfying to help, and then watch students gain a feeling of independence and satisfaction.

(e) This is true for the physical science section. However, the other sections can become frustrating to work with.

(f) I enjoy this text much more than the <u>Exploring Science</u>. I think the students do too.

(g) I dread the earth science section.

(h) When students enjoy a course as much as this one, it provides me with a high degree of satisfaction.

(7N) On a scale of 1-10 I would rate my satisfaction with the usual outdoor activity as __________.

The teacher guidebook states that "One of the important inclusions in this program is the provision for a wide variety of out-of-classroom learning experiences. Some activities take students out into the schoolyard and the street, others to fields, ravines, streams, ponds, and still others to factories, museums, utilities, and institutions.

This practice recognizes that not all science can or should be performed in the classroom or laboratory."

Figure 7M

I gain a high degree of satisfaction from teaching this course

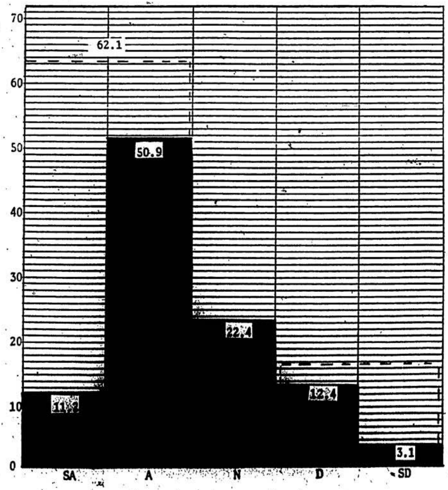


Figure 7N shows that the major percentage of the teachers (39.1%) rated their satisfaction with the usual outdoor activity between 4 and 7, with only 23.1% rating it higher on the scale.

Comments from some of the teachers were:

(a) The transportation and discipline problems override the success of the activity for the class as a whole (20-30% of the students are successful).

(b) Need a better identification guide for Newfoundland plants. Some activities are impractical, such as animal footprints which are not found near the school.

(c) If the proper preparation and planning is done, the outdoor activities as presented in this course are quite satisfactory.

(d) Difficult to plan outdoor activities on a daily or seasonal basis.

(e) Kids enjoy the collections of samples of living things.

(f) I modify outdoor activities to an extent to increase my level of satisfaction.

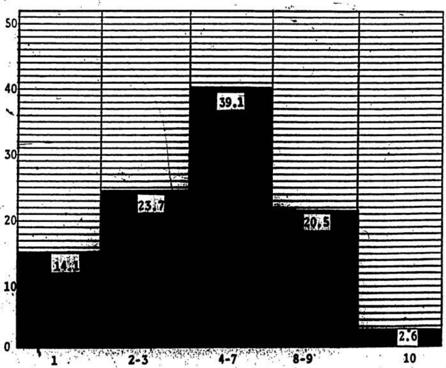
(g) It varies from year to year. The smaller my class, the more successful. This year I have a huge class and outdoor work is becoming a problem.

(h) Junior high students need tremendous discipline when working on their own in any environment, lab or outdoors. Even 20 students can be hard to handle in this setting.

(i) Weather is a major factor here in Labrador. Snow comes early and leaves quite late.

Figure 7N

On a scale of 1-10 I would rate my satisfaction with the usual outdoor activity as:



(70) My attitude towards this course has become more positive.

Figure 70 shows that only 14.4% of the teachers indicated that their attitude towards the course had not become more positive, whereas the majority of the teachers (58.8%) had developed a more positive attitude.

Some of the teachers' comments were:

(a) This being my first time teaching the program, I enjoy it very much and look forward to science class each day.

(b) The more I do with the course the better I feel about it.

(c) I still believe there is much room for improvement in the life science section (I have a degree in Biology with an emphasis on Ecology).

(d) I have had to learn this course with my students. I find every year I learn more; finding the course more challenging and interesting.

(e) As I have gained more background information.

(f) I was a little apprehensive at first, but now I enjoy it fully.

(g) As I find more efficient ways to do the labs.

(h) As I build up my materials file.

(7P) I really enjoyed teaching this course.

Figure 7P shows that 64.8% of the teachers really enjoyed teaching this course.

Figure 70

My attitude towards this course has become more positive

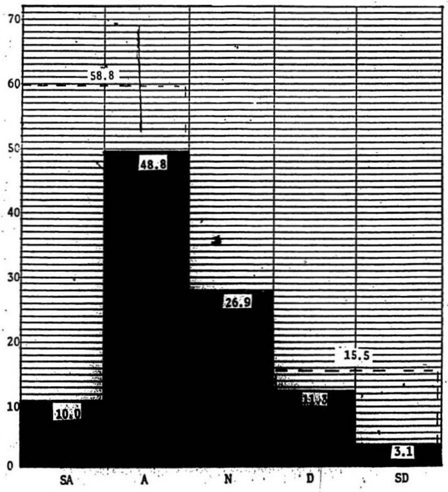
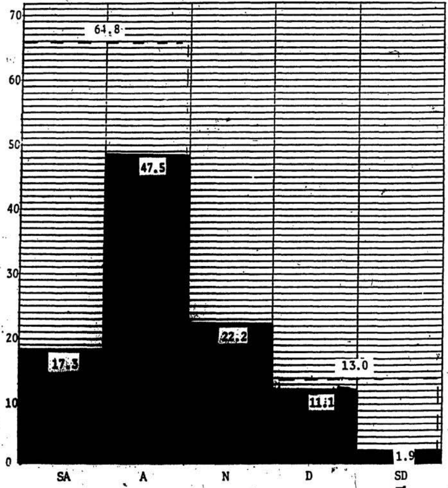


Figure 7P

I really enjoyed teaching this course



SUMMARY

The study revealed that 69.6% of the grade seven science teachers are over 30 years of age, and that the large percentage of them (82.5%) are male.

The majority of the teachers (53.7%) have been teaching for more than 10 years.

16% of the teachers are teaching in schools with an enrolment size less than 100, 27.2% between 101 and 200, 19.8% between 201 and 300, 14.8% between 301 and 400, and 22.2% with an enrolment size greater than 400.

The study revealed that 11.8% of the teachers have an average junior science class size greater than 30 students. This is surely an unacceptably high number of students for a highly activity oriented, "hands-on" science program.

The large majority of teachers (70.4%) perceived that the majority of their students seemed to enjoy the course.

The majority of teachers (62.1%) agreed that they gained a high degree of satisfaction from teaching this course.

The majority of teachers (58.8%) agreed that their attitude towards this course has become more positive, and 64.8% agreed that they really enjoyed teaching this course.

SECTION II

A Pearson Product Moment Correlation was run on the VAX computer system. The Likert type responses were reduced from a five point system to a three point system. The strongly agree and agree were grouped together, and also the disagree and strongly disagree.

Appropriate correlation statements were selected by the researcher to be correlated with all possible statements and items on the questionnaire. Table 2 reveals the complete list of correlations.

The eight statements that revealed the greatest number of significant correlations were:

C1. I feel confident that I know the goals of science education in the <u>Searching For Structure</u> program.

C2. There is a strong need to improve my professional standing for the teaching of this course.

C3. I attended the Memorial University Junior High Science Institute.

C4. Our school has adequate laboratory facilities for the teaching of this course.

C5. The majority of my students seemed to enjoy the course.

C6. I really enjoyed teaching this course.

C7. I am highly satisfied with this science course.

C8. A search should begin for a more appropriate science course for grade seven.

The Pearson product moment correlation coefficient, r, is the standard measure of the linear relationship between two variables. A positive sign indicates a tendency for high values of one variable to occur with high values of the other, and low to occur with low. A negative sign indicates

Table 2

	Cert Teaching Certificate	Exper. years of teaching experience	Courses number of university science courses taken	Bio university Biology courses taken	Chem university Chemistry courses taken	Geo university Geology courses taken	Phs university Physics courses taken	Ots other branches of university science courses taken	Methods Number of university science methods courses taken	Enroll Enrollment - size of the school	Percep 5 I am highly satisfied with this science course	Percep 7 I feel confident that I know the goals of science education in the Searching For Structure Program
Cert	----	.145	.005**	.022	.005**	.093	.157	-.019*	.001***	.020*	-.438	-.030*
Exper	.145	----	-.000***	-.000***	-.033*	.032*	-.003**	-.482	-.243	.359	-.001***	-.247
Courses	.005**	-.000***	----	.000***	.000***	.005**	.000***	.005**	.000***	.004**	.047*	-.164
Bio	.022*	-.000***	.000***	----	.000***	.422	.085	-.003**	.014*	.036*	-.449	-.193
Chem	.005**	-.033*	.000***	.000***	----	-.256	.000***	-.045*	.000***	.011*	.398	-.009**
Geo	.093	.032*	.005**	.422	-.256	----	.293	-.230	.207	.132	.466	-.350
Phs	.157	-.003**	.000***	.085	.000***	.293	----	.467	.000***	.003**	.199	-.035*
Ots	-.019*	-.482	.005**	-.003**	-.045*	-.230	.467	----	.340	-.463	.260	.288
Methods	.001***	-.243	.000***	.014*	.000***	.207	.000***	.340	----	.011*	.342	-.005**
Enroll	.020*	.359	.004**	.036*	.011*	.132	.003**	-.463	.011*	----	.277	.334
Percep 5	-.438	-.001***	.047*	-.449	.398	.466	.199	.260	.342	.277	----	.037*
Percep 7	-.030*	-.247	-.164	-.193	-.009**	-.350	-.035*	.288	-.005**	.334	.037*	----
Percep 9	-.200	-.462	-.108	-.063	-.007**	-.206	-.014*	-.360	-.019*	-.001***	.002**	.001***
Percep 13	-.078	-.000***	.032*	-.205	.356	-.305	.083	.484	.469	-.255	.000***	.014*
Percep 18	-.222	-.132	.432	-.438	-.307	-.099	-.115	-.142	-.249	.357	.000***	.028*
Percep 21	.025*	-.145	.000***	.006**	.000***	.033*	.000***	-.389	.000***	.082	.201	-.000***
Percep 22	-.205	-.000***	.262	.199	.197	-.226	.201	.239	-.298	.403	.000***	.012*
Percep 24	.447	-.028*	.499	-.482	-.194	-.062	-.085	-.477	.436	-.360	.061	.104
Percep 36	-.035*	-.063	.072	-.290	.470	.457	.277	.228	.486	-.464	.000***	.000***
Percep 41	-.007**	-.111	.101	-.052	-.429	.361	.129	.012*	-.231	-.384	.000***	.002**
Percep 50	.092	.002**	-.006**	.491	-.129	.267	-.089	-.020*	-.356	-.084	-.000***	-.004**

	Percep 9 Our school has adequate laboratory facilities for the teaching of this course	Percep 13 The majority of my students seemed to enjoy the course	Percep 18 The majority of activities in this course were completed as "hands-on" by the students	Percep 21 There is a strong need to improve my professional standing for the teaching of this course	Percep 22 I have received an inservice or workshop session for the teaching of this course	Percep 24 I attended the Memorial University Junior High Science Institute	Percep 36 I gain a high degree of satisfaction from teaching this course	Percep 41 I really enjoyed teaching this course	Percep 50 A search should begin for a more appropriate science course for grade seven
Cert	-.200	-.354	-.222	.025*	-.205	.447	-.035*	-.007**	.092
Exper	-.462	-.000***	-.132	-.145	-.000***	-.028*	-.063	-.111	.002**
Courses	-.108	.032*	.432	.000***	.262	.499	.072	.101	-.006**
Bio	-.063	-.205	-.438	.006**	.199	-.482	-.290	-.052	.491
Chem	-.007**	.356	-.307	.000***	.197	-.194	.470	-.429	-.129
Geo	-.206	-.305	-.099	.033*	-.226	-.062	.457	.361	.267
Phs	-.014*	.083	-.115	.000***	.201	-.085	.277	.129	-.089
Ots	-.360	.484	-.142	-.389	.239	-.477	.228	.012*	-.020*
Methods	-.019*	.469	-.249	.000***	-.298	.436	.486	-.231	-.356
Enroll	-.001***	-.255	.357	.082	.403	-.360	-.464	-.384	-.084
Percep 5	.002**	.000***	.000***	.201	.000***	.061	.000***	.000***	-.000***
Percep 7	.001***	.014*	.028*	-.000***	.012*	.104	.000***	.002**	-.004**
Percep 9	----	.000***	.000***	-.004**	-.395	-.324	.001***	.001***	-.001***
Percep 13	.000***	----	.000***	-.372	.004**	.046	.000***	.000***	-.000***
Percep 18	.000***	.000***	----	-.061	.003**	.403	.000***	.001***	-.000***
Percep 21	-.004**	-.372	-.061	----	.380	-.390	-.182	-.392	-.465
Percep 22	-.395	.004**	.003**	.380	----	.000***	.004**	.064	-.000***
Percep 24	-.324	.046*	.409	-.390	.003***	----	.031*	.142	-.005**
Percep 36	.000***	.000***	.000***	-.182	.004**	.031	----	.000***	-.000***
Percep 41	.001***	.000***	.001***	-.388	.064	.142	.000***	----	-.000***
Percep 50	-.001***	-.000***	-.000***	-.465	-.000***	-.003**	-.000***	-.000***	----

a tendency for high values of one variable to be associated with low values of the other.

A table is drawn for each of the eight correlated statements, showing the level of significance with each of the correlated items. The probability code for the diagrams are:

$\overline{<}$ .001 ***

$\overline{<}$ .01 **

$\overline{<}$ .05 *

If the correlation is negative, a negative sign (-) is placed beneath the level of significance code. If no negative sign appears the correlation is positive.

Table C1 shows that confidence in knowing the goals of science education in the Searching For Structure program correlates with (1) teachers who had the majority of activities in their course completed as "hands-on" by the students, (2) teachers who taught in schools that had adequate laboratory facilities for the teaching of the course, (3) teachers who really enjoyed teaching the course, (4) teachers who disagreed that a search should begin for a more appropriate science course for grade seven, (5) teachers who had a high number of science methods courses, (6) teachers who had university chemistry courses, (7) teachers who had received an inservice or workshop session for the teaching of the course, (8) teachers of classes where the majority of students seemed to enjoy the course, (9) teachers who had the majority of activities in their course completed as "hands-on" by the students, (10) teachers who had high levels of certification, (11) teachers with university physics courses, and (12) teachers feeling highly satisfied with this science course.

Table C1

I feel confident that I know the goals of science education in the Searching For Structure program.

	1	2	3	4	5	6
p=	.000	.001	.002	.004	.005	.006
sign.	***	***	**	**	**	**
	–			–	–	–

	7	8	9	10	11	12
p=	.012	.014	.028	.030	.035	.012
	*	*	*	*	*	*
				–	–	

Table C2 shows that perceiving a strong need to improve professional standing for the teaching of this course correlates with (1) the low number of university science courses taken, (2) low numbers of university science methods courses taken, (3) low teaching certificate, and (4) lack of Chemistry, Physics, Biology, and Geology courses.

Table C2

There is a strong need to improve my professional standing for the teaching of this course

	1	2	3	Chem	Phys	Biol	Geol
p=	.000	.000	.025	.000	.000	.006	.033
sign	***	***	*	***	***	**	*

Table C3 shows that attending Memorial University's Junior High Science Institute correlated with (1) disagreement with beginning a search for a more appropriate science course for grade 7, (2) the more experienced teachers, and (3) a high degree of satisfaction from teaching the course.

Table C3

I attended the Memorial University Junior High Science Institute

	1	2	3
p=	.055	.028	.031
sign	**	*	*

Table C4 shows a high degree of correlation between not having adequate laboratory facilities for the teaching of the course and (1) not feeling confident in knowing the goals of science education in the <u>Searching For Structure</u> program, (2) the majority of students not seeming to enjoy the course, (3) the majority of activities not being completed as "hands-on" by the students, (4) low enrolment size of the schools, (5) the teacher not gaining a high degree of satisfaction from teaching the course, (6) the teacher agreeing that a search should begin for a more appropriate science course for grade seven, (7) a strong need to improve ones professional standing for the teaching of the course, (8) a lack of university chemistry courses, (9) a lack of university physics courses, and (10) low number of science methods courses.

Table C4
Our school has adequate laboratory facilities for the teaching of this course

	1	2	3	4	5
p=	.000	.000	.000	.001	.001
sign	***	***	***	***	***
				-	

	6	7	8	9	10
p=	.001	.004	.007	.014	.019
sign	***	**	**	*	*
	-	-	-	-	-

Table C5 shows the strong correlation between the majority of students seeming to enjoy the course and (1) a high degree of satisfaction with this science course by the teacher, (2) the school having adequate laboratory facilities for the teaching of this course, and (3) a high degree of confidence by the teacher in knowing the goals of science education in the <u>Searching For Structure</u> program.

Table C5

The majority of my students seemed to enjoy the course

	1	2	3
p=	.000	.000	.014
sign	***	***	*

Table C6 shows the degree of correlation between the teacher really enjoying teaching this course and (1) the majority of their students seeming to enjoy the course, (2) disagreeing that a search should begin for a more appropriate science course for grade seven, (3) the school having adequate laboratory facilities for the teaching of this course, (4) the majority of activities in the course being completed as "hands-on" by the students, (5) confidence in knowing the goals of science education in the Searching For Structure program, (6) higher teaching certificate, and (7) university science courses other than Biology, Chemistry, Physics and Geology.

Table C6

I really enjoyed teaching this course

	1	2	3	4	5	6	7
p=	.000	.000	.001	.001	.002	.007	.012
sign	***	***	***	***	**	**	*

Table C7 shows the correlation between the high degree of satisfaction with this science course and (1) teachers who had received an inservice or workshop session for the teaching of the course, (2) teachers, whose student majority seemed to enjoy the course, (3) teachers who disagreed that a search should begin for a more appropriate science course for grade seven, (4) teachers of classes where the majority of activities were completed as "hands-on" by the students, (5) teachers with many years of experience, (6) teachers at schools which had adequate laboratory facilities for the teaching of this course, (7) teachers who felt confident that they knew the goals of science education in the Searching For Structure program, and (8) teachers with a low number of university science courses.

Table C7

I am highly satisfied with this science course

	1	2	3	4	5	6	7	8
p=	.000	.000	.000	.000	.001	.002	.037	.047
sign	***	***	***	***	***	**	*	*

Table C8 shows that in the study, agreeing that a search should begin for a more appropriate science course for grade seven correlates with (1) the majority of students not seeming to enjoy the course, (2) the majority of activities in the course not being completed as "hands-on" by the students, (3) not having received an inservice or workshop session for the teaching of this course, (4) a low degree of satisfaction from teaching the course, (5) did not enjoy teaching the course, (6) the school not having adequate laboratory facilities for the teaching of this course, (7) low number of years teaching experience, (8) a lack of confidence in knowing the goals of science education in the Searching For Structure program, (9) not attending the Memorial University Junior High Science Institute, (10) low number of university science courses, and (11) branches of university courses other than Biology, Chemistry, Physics, and Geology.

Table C8

A search should begin for a more appropriate science course for grade seven

	1	2	3	4	5	6	7
p=	.000	.000	.000	.000	.000	.001	.002
sign	***	***	***	***	***	***	**
	-	-	-	-	-	-	

	8	9	10	11
p=	.004	.005	.006	.020
sign	**	**	**	*
	-	-		-

SUMMARY

The section on correlations can probably best be summed up with reference to how the teachers responded to the question regarding course revision. Generally, those teachers who taught the "prescribed curriculum" disagreed, whereas those who were unable to teach the "prescribed curriculum" agreed that a search should begin for a more appropriate course. Since the larger percentage (40.1%) disagreed with a course revision, the correlated reasons promoting this decision will be highlighted:

(1) The majority of students seemed to enjoy the course.

(2) The majority of activities in the course were completed as "hands-on" by the students.

(3) Having received an inservice or workshop session for the teaching of the course.

(4) A high degree of satisfaction from teaching the course.

(5) Enjoyed teaching the course.

(6) The school had adequate laboratory facilities for the teaching of this course.

(7) High number of years teaching experience.

(8) Confidence in knowing the goals of science education in the <u>Searching For Structure</u> program.

(9) Having attended the Memorial University Junior High Science Institute.

(10) High number of university science courses.

(11) Branches of university science courses taken were Biology, Chemistry, Physics, and Geology.

None of these correlations would be considered unexpected. Indeed the factors outlined above would probably correlate significantly with the positive responses for any prescribed science curricula. However, the significant factor is that this study goes further than offering a hypothesis; it provides evidence that these eleven factors correlated significantly with the grade seven science teachers in Newfoundland and Labrador who wished to retain the present Searching For Structure program in their schools.

CHAPTER V

SUMMARY AND RECOMMENDATIONS

The purpose of this research was to determine the degree of harmony between what has been officially prescribed as the junior high science curriculum for the Newfoundland and Labrador schools and the perceptions of Newfoundland and Labrador junior high school science teachers. The researcher was interested in exploring how the respondents viewed six aspects of the curriculum, as defined in this study. These aspects were: (1) teacher preparation, (2) goals and objectives, (3) teaching techniques, (4) adequacy of teaching facilities, (5) adequacy of equipment and supplies, and (6) revision of the curriculum.

The researcher sought to answer the following questions:

1. Is the ideal professional preparation perceived by junior high school science teachers in agreement with the requirements of the Newfoundland Department of Education?
2. Are the goals and objectives perceived by the junior high school science teachers in agreement with those stated in the science curriculum?
3. Do teachers perceive the techniques recommended in the science curriculum as appropriate for the

achievement of the prescribed goals and objectives?

4. Do teachers perceive the facilities available for teaching science in the junior high school as adequate?

5. Do teachers perceive the equipment available for teaching science in the junior high schools as adequate for the development of the activities prescribed in the curriculum?

6. Do teachers perceive a need for a revision of the junior high school science curriculum?

Each of the six basic questions will be answered individually. The answers will be discussed and recommendations advocated.

Perception of Teacher Preparation

1. Is the ideal professional preparation perceived by junior high school science teachers in agreement with the requirements of the Newfoundland Department of Education?

Teachers are well trained generally, but are weaker than they should be in science and science education. 80% of the teachers have a grade V teaching certificate or higher, but 38.8% have less than four university science courses, and 34.2% have not taken a single university science methods course.

Since Searching For Structure is a general program, and requires knowledge in four science fields; Biology, Chemistry, Physics, and Geology, even teachers who felt extremely well qualified in one or several fields felt professionally underqualified in others. This would surely indicate a need to broaden the science base for teachers training to be junior high school science teachers.

The study reveals that perceiving a strong need to improve professional standing for the teaching of this course correlates with (1) the low number of university science courses taken, (2) low numbers of university science methods courses taken, (3) low teaching certificate, and (4) lack of Chemistry, Physics, Biology, and Geology courses.

Recommendations:

(1) Presently, it is possible to graduate from Memorial University with a conjoint degree of Bachelor of Science, and Bachelor of Education, and only have taken one science methods course. These regulations should be changed to encourage science teachers to not only broaden their science base, but to take multiple science methods courses.

(2) Pressure should be exerted from the Department of Education and from school boards to those teachers who are professionally underqualified for the teaching of this course. The low attendance by the grade seven science teachers at the Memorial University Junior High Science

Institute (8.1%) surely indicates that this pressure, or high level of encouragement, is necessary.

(3) The Department of Education and school boards should be constantly and consistently encouraging the professional development of science teachers through inservices and workshops; and working in conjunction with Memorial University to assure availability of appropriate science and science methods courses during the summer sessions.

(4) To achieve a "reasonable" level of teacher preparation, we must strive for the "ideal".

<u>Perception of Goals and Objectives</u>

2. Are the goals and objectives perceived by the junior high school science teachers in agreement with those stated in the science curriculum?

The majority of teachers agreed that the present <u>Searching For Structure</u> science program for grade seven; the "perceived curriculum" possessed the following merits in accomplishing junior high science curricular goals and objectives; the "prescribed curriculum":

(a) The course was extensive and flexible enough to satisfy a variety of individual student interests and abilities.

(b) The course permitted students to acquire an increasing independence of the teacher.

(c) The language level of the course was appropriate for their grade seven students.

(d) The majority of concepts in this course were suitable for the average grade seven student.

(e) The illustrations and diagrams in the text were appropriate.

(f) Outdoor activities were very important to the teaching of this course.

(g) The majority of activities in the course were completed as "hands-on" by the students.

(h) The questions at the end of the chapters were quite relevant to the material covered in the chapters.

(i) The course provided a balanced content selection.

(j) This course encourages students to function at the highest cognitive levels appropriate for their stage of development.

The two items that the majority of teachers did not agree with were:

(a) The ratio of content to activities was appropriate.

(b) The activities in the course were very practical for Newfoundland students.

Teachers' comments regarding these issues were:

(a1) Although I agree with the activity approach to science, I feel that much more content is necessary so that students can have more background information.

(a2) More content would be appropriate in the sections on ecology and earth science. I think the section on ecology should be supplemented with a handbook on flowers and plants of Newfoundland which all students should have.

(b1) Some of the activities need to be modified for local areas.

(b2) More activities need to be directed towards some of our concerns with the environment, i.e. acid rain and endangered species.

(b3) The science outdoor activities are totally inappropriate for Western Labrador.

Recommendations:

The majority of teachers perceive this junior high science "perceived curriculum" as adequately satisfying the goals and objectives of the "prescribed curriculum". The curriculum could be improved by addressing the two areas of concern expressed by the teachers.

1. The ratio of content to activities issue could be resolved by adding a content supplement to the course.

2. The practicality of activities issue could be resolved by adding a handbook which consists of activities pertaining to our unique geographic, environmental, and climatic setting. This handbook could also contain information on local flora, fauna, rocks and minerals.

Perception of Techniques Recommended

3. Do teachers perceive the techniques recommended in the science curriculum as appropriate for the achievement of the prescribed goals and objectives?

With reference to techniques recommended, the majority of teachers agreed with the following:

(a) The teacher guidebook provides sufficient help regarding methodology and techniques.

(b) The teacher guidebook provides sufficient help in the content areas.

(c) Evaluation techniques do not constitute a major problem in the teaching of this course.

(d) They used a variety of methods for assessing student progress, which included homework, projects, tests/quizzes, lab writeups and observation.

(e) They insisted on formal activity reports from their students for this course.

(1) Teaching methods, (2) evaluation allocations, and (3) the appropriate ratio of content to activities were more controversial issues.

(1) Lecture-discussion was the most frequent teaching method used by 38.2% of the teachers, and demonstration of activities was the method used most frequently by 32.3%. With such an activity oriented, "hands-on" program, demonstration of activities could be considered a "reasonable" alternative, but surely not lecture-discussion.

(2) The majority of teachers did not perceive that the teacher guidebook offered sufficient information regarding the evaluation procedures for the course. The percentages allocated to each method of assessment ranged from 0-40% for homework, 0-40% for projects, 10-80% for tests and quizzes, 0-60% for lab writeups, and 0-40% for observation.

There is a serious lack of consistency on evaluation allocations within individual school boards, and certainly throughout the province.

(3) The larger percentage of teachers (38%) perceived that the appropriate ratio of content to activities should be 1:1, 33.8% preferred a higher rating of content, whereas 28.2% agreed to a higher rating of activities. Clearly, the majority of teachers prefer a higher rating of content than is available in the present text.

Recommendations:

1. The science coordinators must take a more active role in monitoring the teaching methods of the teachers. Appropriate teaching methodologies and strategies could be demonstrated and encouraged at inservice and workshop sessions.
2. The Department of Education needs to promote consistency of evaluation allocations. This can be accomplished by developing systematic guidelines to be monitored by the science coordinators.
3. The higher rating of content can easily be accomplished by adding a content supplement to be used in conjunction with the textbook.

Perception of Facilities

4. Do teachers perceive the facilities available for teaching science in the junior high school as adequate?

The study revealed that 44.5% of the teachers perceived that their schools did not have adequate laboratory facilities for the teaching of this course, and that 37% of them were teaching the course "solely" in a classroom.

Many teachers in this province are prevented from teaching this course properly because of overcrowded classrooms and laboratories, a lack of sufficient facilities, or because the facilities are non existent.

The responsibility for science facilities rests chiefly with the Denominational Education Councils.

They are provided with the funds by the Government of this province, and on recommendation from the various school boards they decide how, and where the money will be spent.

Recommendation:

The Denominational Education Councils need to give the quality and availability of absolutely necessary facilities the high priority that they deserve. The pathway of denominational isolation must be altered, and the pathway of denominational cooperation must be fostered, so that sufficient funds are available for the upgrading and building of appropriate and badly needed laboratory facilities.

<u>Perception of Equipment</u>

5. Do teachers perceive the equipment available for teaching science in the junior high schools as adequate for the development of the activities prescribed in the curriculum?

The majority of the teachers (75.4%) perceived that there was a "reasonable" amount of science equipment available in their schools.

The majority of the teachers (67.5%) did not perceive that the lack of a "reasonable" amount of science equipment was creating serious problems in their teaching of the course.

The responsibility for science equipment rests chiefly with the Denominational Education Councils. They allocate the provincial funds to their respective school boards. When a lack of absolutely essential science equipment prevents the proper teaching of any "prescribed curriculum" in any school, surely concern must be generated.

Recommendation:

Priority must be placed on making available sufficient funds for necessary basic equipment and supplies, rather than on duplication of facilities and advocation of isolation by denomination.

Perception of the Need for Revision

6. Do teachers perceive a need for a revision of the junior high school science curriculum?

The larger percentage of the teachers (40.1%) did not agree that a search should begin for a more appropriate science course for grade seven, 34% agreed, and 25.9% remained neutral.

It is very interesting to note in the study, that agreeing that a search should begin for a more appropriate science course for grade seven correlates with (1) a lack of confidence in knowing the goals of science education in the Searching For Structure program, (2) the school not having adequate laboratory facilities for the teaching of this course, (3) the majority of students not seeming to enjoy the course, (4) the majority of activities in the course not being completed as "hands-on" by the students, (5) not having received an in-service or workshop session for the teaching of the course, (6) not attending the Memorial University Junior High Science Institute, (7) a low degree of satisfaction from teaching the course, (8) did not enjoy teaching the course, (9) low number of years teaching experience, (10) low number of university science courses, and (11) branches of university science courses other than Biology, Chemistry, Physics, and Geology.

The above correlations would surely indicate the interrelationship between teacher professional preparation, availability of facilities and equipment, and the proper teaching of the "prescribed curriculum".

Junior high science education in Newfoundland and Labrador is falling short of the acceptable standards, and is guilty of repetitious shortcomings as exemplified by the following concern when the Exploring Science program was phased out and the innovative Searching For Structure program was phased in, six years ago.

When the Searching For Structure and the Exploring Science, 2nd Edition programs were piloted, the majority of teachers echoed the following warning:

"The junior high science program suffered to the extent that laboratory facilities and equipment were in short supply or non existent". The teachers of both programs stated emphatically that "the new program would not be much of an improvement over the old program if facilities and equipment were not upgraded".

CONCLUDING REMARKS

The future of this junior high science curriculum, and any other junior high science curricula rests with the provincial Department of Education. If the present direction of the educational system in this province continues, then the "prescribed curriculum" will never become the "ideal curriculum". The responsibility rests with the Department of Education to chart the advancement of educational progress away from denominational isolation towards a fostering of denominational cooperation. Is the present Provincial Government willing to, and capable of, standing up to this challenge? The potential future of all Newfoundland and Labrador students rests with that decision. Indeed, the future of this province!!

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APPENDIX A

QUESTIONNAIRE FOR TEACHERS

I am a teacher who is presently in the process of completing a master's program in Curriculum and Instruction at Memorial University. In my eight year career as a teacher, I taught French and special education in an elementary school; science, geography, history, and religion in a multigrade school; and junior high science in a secondary school. I watched with keen interest the phasing out of the Exploring Science Program and the phasing in of the Searching For Structure Program.

This innovative grade seven program has now been taught for six consecutive years. Within this period of time the program has matured and can be expected to defend its own merits. I consider that NO ONE is more aware of the REALITY of this existing program in our Newfoundland and Labrador schools than the TEACHERS who are daily in contact with the students.

The title of my thesis is: "The Perceptions of Newfoundland and Labrador Junior High Science Teachers Concerning the Grade Seven Searching For Structure Program".

All too often teachers' views on the educational process have been neglected. The teachers' point of view is indeed important, and this study is an attempt to give teachers an opportunity to express their views. The main thing is that you answer as honestly as possible. Thank you kindly for your co-operation.

George Sutton

PERSONAL INFORMATION

Please answer the following questions by placing a check mark in the appropriate blocks:

P1. Age

- ☐ A under 20
- ☐ B 21 - 25
- ☐ C 26 - 30
- ☐ D 31 - 35
- ☐ E over 35

P2. Sex

- ☐ A male
- ☐ B female

P3. Teaching certificate

- ☐ A less than Grade IV
- ☐ B IV
- ☐ C V
- ☐ D VI
- ☐ E VII or higher

3

P4.	Years of teaching experience	☐ A less than 1 ☐ B 1 - 3 ☐ C 4 - 7 ☐ D 8 - 10 ☐ E more than 10
P5.	Junior Science Grades presently being taught by me	☐ A Grade 7 ☐ B Grade 8 ☐ C Grade 9
P6.	Number of university science courses taken	☐ A 0 ☐ B 1 ☐ C 2 - 3 ☐ D 4 - 6 ☐ E more than 6
P7.	Branch of university science courses taken (check more than one if applicable)	☐ A Biology ☐ B Chemistry ☐ C Geology ☐ D Physics ☐ E Others

P8. Number of university science methods courses taken (do not include science institute courses)

- ☐ A 0
- ☐ B 1
- ☐ C 2 - 3
- ☐ D 4 - 5
- ☐ E more than 5

P9. Enrollment size of school

- ☐ A less than 100
- ☐ B 101 - 200
- ☐ C 201 - 300
- ☐ D 301 - 400
- ☐ E greater than 400

P10. Average Junior Science class size

- ☐ A less than 20
- ☐ B 21 - 25
- ☐ C 26 - 30
- ☐ D 31 - 35
- ☐ E greater than 35

INSTRUCTIONS

The statements below are designed to assess your perception of certain aspects of the grade seven Searching For Structure Program. Please indicate the extent to which you agree with each statement by placing a check mark in the appropriate column. Comment space is provided beneath each statement, and all comments would be considered extremely beneficial.

Abbreviations

SA Strongly agree

A Agree

N Neutral

D Disagree

SD Strongly disagree

	SA	A	N	D	SD
1. This course is extensive and flexible enough to satisfy a variety of individual student interests and abilities.	☐	☐	☐	☐	☐

Comment:

2. This course permits students to acquire an increasing independence of the teacher.

   SA A N D SD
   ☐ ☐ ☐ ☐ ☐

   Comment:

3. The language level of this course is appropriate for my grade seven students.

   SA A N D SD
   ☐ ☐ ☐ ☐ ☐

   Comment:

4. The ratio of content to activities is appropriate.

   SA A N D SD
   ☐ ☐ ☐ ☐ ☐

   Comment:

5. I am highly satisfied with this science course.

   SA A N D SD
   ☐ ☐ ☐ ☐ ☐

   Comment:

		SA	A	N	D	SD
6.	The degree of difficulty of the majority of concepts in this course is suitable for the average grade seven student.	☐	☐	☐	☐	☐

Comment:

		SA	A	N	D	SD
7.	I feel confident that I know the goals of science education in the Searching For Structure Program.	☐	☐	☐	☐	☐

Comment:

		SA	A	N	D	SD
8.	My workload is higher for this course than for most courses I have taught previously.	☐	☐	☐	☐	☐

Comment:

		SA	A	N	D	SD
9.	Our school has adequate laboratory facilities for the teaching of this course.	☐	☐	☐	☐	☐

Comment:

10. Audio-visual resources are often used in the teaching of this course.

SA A N D SD

☐ ☐ ☐ ☐ ☐

Comment:

11. I am teaching this course in a:

☐ classroom
☐ partially equipped room
☐ fully equipped room
☐ partially equipped lab
☐ fully equipped lab

Comment:

12. The illustrations and the diagrams in the text are appropriate.

SA A N D SD

☐ ☐ ☐ ☐ ☐

Comment:

13. The majority of my students seemed to enjoy the course.

SA A N D SD

☐ ☐ ☐ ☐ ☐

Comment:

✓

14. Lecture-discussion is the method I use most frequently in the teaching of this course.

    SA A N D SD
    ☐ ☐ ☐ ☐ ☐

    Comment:

15. I consider outdoor activities very important to the teaching of this course.

    SA A N D SD
    ☐ ☐ ☐ ☐ ☐

    Comment:

16. I insist on formal activity reports from my students for this course.

    SA A N D SD
    ☐ ☐ ☐ ☐ ☐

    Comment:

17. On a scale of 1 - 10 I would rate the danger level of the activities in this course as:

    ☐ <2
    ☐ 2 - 4
    ☐ 5 - 6
    ☐ 7 - 8
    ☐ >8

    Comment:

18. The majority of activities in this course wêre completed as "hands-on" by the students. SA A N D SD ☐ ☐ ☐ ☐ ☐

Comment:

19. I would rate the percentage of impractical activities in this course as:

☐ <5
☐ 5 - 12
☐ 13 - 20
☐ 21 - 25
☐ >25

Comment:

20. The teacher guidebook provides help regarding methodology and techniques. SA A N D SD ☐ ☐ ☐ ☐ ☐

Comment:

21. There is a strong need to improve my professional standing for the teaching of this course. SA A N D SD ☐ ☐ ☐ ☐ ☐

Comment:

22. I have received an in-service or workshop session for the teaching of this course.

SA A N D SD

☐ ☐ ☐ ☐ ☐

Comment:

23. How many years (including the present) have you taught this course?

☐ 1
☐ 2
☐ 3
☐ 4
☐ 5 or more

Comment:

24. I attended the Memorial University Junior High Science Institute.

SA A N D SD

☐ ☐ ☐ ☐ ☐

Comment:

25. My subject coordinator has been helpful regarding the teaching of this course.

SA A N D SD
☐ ☐ ☐ ☐ ☐

Comment:

26. The guidebook offers sufficient information regarding the evaluation procedures for the course.

SA A N D SD
☐ ☐ ☐ ☐ ☐

Comment:

27. The questions at the end of the chapters are quite relevant to the material covered in the chapters.

SA A N D SD
☐ ☐ ☐ ☐ ☐

Comment:

28. The percentage of evaluation for this course that I allocate to the activity reports is:

☐ <5
☐ 5 - 10
☐ 11 - 25
☐ 26 - 50
☐ >50

Comment:

29. I often use the test at the end of a chapter as the main guide for my chapter test.

SA ☐ A ☐ N ☐ D ☐ SD ☐

Comment:

30. I use laboratory tests to evaluate the process abilities of the students.

SA ☐ A ☐ N ☐ D ☐ SD ☐

Comment:

31. The teacher guidebook provides sufficient help in the content areas.

SA ☐ A ☐ N ☐ D ☐ SD ☐

Comment:

32. This course provides a balanced content selection.

SA A N D SD
☐ ☐ ☐ ☐ ☐

Comment:

33. The activities in the course are very practical for Nfld. students.

SA A N D SD
☐ ☐ ☐ ☐ ☐

Comment:

34. This course encourages students to function at the highest cognitive levels appropriate for their stage of development.

SA A N D SD
☐ ☐ ☐ ☐ ☐

Comment:

35. The appropriate ratio of content to activities should be:

☐ 1:3
☐ 1:2
☐ 1:1
☐ 2:1
☐ 3:1

Comment:

36. I gain a high degree of satisfaction from teaching this course.

SA A N D SD

☐ ☐ ☐ ☐ ☐

Comment:

37. My method/methods for assessing student progress in this course involves:

Comment:

☐ homework

☐ projects

☐ tests/quizzes

☐ lab write-ups

☐ observation

38. Percentage allocated to each method of assessment

	0	10	20	30	40	50	60	70	80	90	100
Homework											
Projects											
Tests/quizzes											
Lab write-ups											
Observation											

Comment:

39. There is a "reasonable" amount of science equipment available in our school.

SA A N D SD

☐ ☐ ☐ ☐ ☐

Comment:

40. The lack of a "reasonable" amount of science equipment is creating serious problems in my teaching of this course.

SA A N D SD

☐ ☐ ☐ ☐ ☐

Comment:

41. I really enjoyed teaching this course.

SA A N D SD

☐ ☐ ☐ ☐ ☐

Comment:

42. On a scale of 1 - 10 I would rate my satisfaction with the usual outdoor activity as:

☐ 1
☐ 2 - 3
☐ 4 - 7
☐ 8 - 9
☐ 10

Comment:

43. Demonstration of activities is the method I use most frequently in the teaching of this course.

SA A N D SD
☐ ☐ ☐ ☐ ☐

Comment:

44. I rate myself as a qualified professional science teacher of this course.

SA A N D SD
☐ ☐ ☐ ☐ ☐

Comment:

45. The Memorial University Junior High Science Institute was helpful for the teaching of this course.

SA A N D SD
☐ ☐ ☐ ☐ ☐

Comment:

46. My attitude towards this course has become more positive.

SA A N D SD
☐ ☐ ☐ ☐ ☐

Comment:

47. Evaluation techniques constitute a major problem in the teaching of this course. SA A N D SD ☐ ☐ ☐ ☐ ☐

Comment:

48. Long answer type questions constitute the major percentage of my tests. SA A N D SD ☐ ☐ ☐ ☐ ☐

Comment:

49. The location of our school poses serious problems for the efficient teaching of outdoor activities in this course. SA A N D SD ☐ ☐ ☐ ☐ ☐

Comment:

50. A search should begin for a more appropriate science course for grade seven. SA A N D SD ☐ ☐ ☐ ☐ ☐

Comment:

APPENDIX B

On the questionnaires that were distributed to all of the grade seven science teachers there were statements that were designed to assess their perceptions of certain aspects of the grade seven Searching for Structure Program. Apart from indicating the extent to which they agreed with each statement many teachers commented on the various aspects of the program as it related to their particular teaching situation. I consider these comments the "heart and soul" of this particular study. I tabulated all of the comments that were expressed and the following is a listing of these particular expressions and concerns. Deletions were only made where repetitions were uncovered.

Qualities of Course

Statement # 1. This course is extensive and flexible enough to satisfy a variety of individual student interests and abilities.

Comments:

(a) Depends upon teachers ability to supplement text material.

(b) I would like for there to be more activities of varied difficulty.

(c) It would if the whole class were high achievers.

(d) In many respects, the course is not challenging enough for the more capable students in the class.

(e) If class size were smaller.

(f) In theory perhaps - depends on materials, space, and time available for remedial or enrichment.

(g) With small class size and a properly equipped lab.

(h) Slower students (and special education) have great difficulty with the reading level and the concepts.

(i) Agree, but with large numbers it is not always possible to deal with the differences in student ability to master some activities.

Statement # 2. This course permits students to acquire an increasing independence of the teacher.

Comments:

(a) Much more explanatory and descriptive material required for maximum student independence.

(b) This can be done by having fairly small groups do certain activities with a short write-up to follow.

(c) This depends on many factors such as laboratory scheduling, materials and facilities.

(d) In multigrade they have to learn to be independent workers in most subject areas.

(e) The format in all three grades is similar. Once established in grade seven, the level of dependence decreases in the remaining grades.

(f) I find more guidance is necessary.

(g) Often in many elementary schools in this province, science is not considered a subject to stress as important until grade 7. These students then become dependent on the teacher just to operate in a scientific environment. I would agree if more stress was given to science in grades 4-6. The potential is there.

(h) Through labs and activities students get the opportunity to work more in groups and on their own, requiring only teacher supervision.

(i) I function mainly as a resource person during many activities.

Statement # 3. The language level of this course is appropriate for my grade seven students.

Comments:

(a) For about half the students it is satisfactory.

(b) For the most it is appropriate but some students need explanation and coaching.

(c) Some is difficult for below average students.

(d) This is very evident for lower students. For example most of my grade 7 students don't know the meaning of words like predict, evaluate, circumstantial.

(e) Teacher has to water down materials for slower students.

(f) Many students in my class are below average intelligence.

(g) There are some activities that are not explained well enough and students need a lot of introduction before they can actually do these activities.

(h) I have a mixed grade of students; about half of which are considered low achievers. They frequently have trouble with the terminology.

Statement # 4. The ratio of content to activities is appropriate.

Comments:

(a) Although I agree with the activity oriented approach to science, I feel that much more content is necessary so that the students can have more background information.

(b) More content would be appropriate in the sections on ecology and earth science. I think the section on ecology should be supplemented with a handbook on flowers and plants of Newfoundland which all students should have.

(c) Many points rely on activities only with little or no mention elsewhere in the unit. If the activity is not done, the concept is missed.

(d) Content is sacrificed to activities, even when the activities presented are trivial.

(e) Any extra content can be supplied by the teacher from the excellent guidebook.

(f) I find there are too many activities and not enough content to meet the needs of the weaker students.

(g) More content required to give a better background to relate the activities to.

<u>Statement # 5.</u> The degree of difficulty of the majority of concepts in this course is suitable for the average grade seven student.

Comments:

(a) The concepts can be adjusted in terms of exploration and explanation to suit most students that enter grade seven.

(b) For an average grade seven class, yes. But not for a class where many are under-achievers.

(c) The concepts would prove difficult if it were not for the activities. The labs "drive the nail home," so to speak.

<u>Statement # 6.</u> My workload is higher for this course than for most courses I have taught previously.

Comments:

(a) During the first year the program required more time and preparation.

(b) Once you have done the course and gathered materials, the students, under guidance do practically everything. Grading labs does take some time however.

(c) Correction of lab write-ups is very time consuming as well as setting up some of the labs before class, especially when you have large classes.

(d) Any spare time that I may have had previously seems to be totally spent preparing lab work and other science activities.

(e) At first it involved much preparation, but now things have fallen into place and I find the course offers no more workload at this moment than my other courses.

(f) There is much more lab preparation in this course.

(g) I have a heavy workload which allows very little time for preparation of experiments.

(h) Mostly because I have to borrow many items from another school.

Statement # 7. The illustrations and diagrams in the text are appropriate.

Comments:

(a) Illustrations and diagrams should be more colorful and up to date. They could be more precise and better labelled.

(b) I feel there could be more, however.

(c) Many are too complicated for the grade seven students.

(d) Schematic diagrams would be more appropriate in a lot of cases.

(e) There should be more explicit diagrams especially in the Life Science sections.

Statement # 8. The majority of my students seemed to enjoy the course.

Comments:

(a) The activities are enjoyed. They are interested in class lecture and discussion, but the lack of readable material makes certain concepts frustrating for some.

(b) The students in my particular school really enjoy this course, especially when they have to present their activity to the whole class.

(c) Where so many have difficulty, the course becomes a "turn-off".

(d) Most dislike vehemently the Life Science section.

(e) Students like "to do" instead of being told.

(f) Students get upset when they are told that a class will be held in the classroom.

(g) Even when they find questions and articles difficult they go "gung ho" over the labs.

(h) Especially the first unit.

(i) Some do, some don't. It fits the highly motivated student best.

(j) The kids seem to enjoy the hands on and group approach to science. Their comments seem to indicate that they enjoy it much more than the regular classroom routine of other subjects.

(k) Students enjoy activities whether anything is learned or not.

(l) Continually complain because it is all lab work.

(m) I find that the average and above average students like the course. However, the weaker students become frustrated with it.

(n) They love the lab.

(o) All are enthusiastic and love the atmosphere created in the lab.

(p) They especially look forward to all activities.

<u>Statement # 9.</u> I consider outdoor activities very important to the teaching of this course.

Comments:

(a) Our community provides an adequate natural set-up for many activities in the course.

(b) This is extremely important in the beginning of the course. I usually take them (mid-October) on a one day field trip where we do the transit survey and study the pond ecosystem. Student feedback is very positive about this activity.

(c) Especially for Life Science section. Important, but in most cases not practical. A 40 minute class doesn't allow much time.

(d) I try to get out as often as I can. It's one resource we do have.

(e) Outdoor activities are almost impossible to carry out, and are generally unnecessary at the grade seven level.

(f) Especially in Ecology and Earth Science sections.

(g) Many outdoor activities I tried didn't work.

(h) Some activities I find I can do in the area close to school. However, those that require the children to move farther from school, are almost impossible because of school time tabling and buses.

(i) I like to get outside, however, I find it difficult if I have 30-38 students. Small groups are great.

(j) Kids tend to lose track of what they are trying to accomplish outdoors when they have only a 45 minute period to get out, get work done and get back.

(k) Labrador doesn't off much outdoor time due to weather.

(l) Agree, but in Labrador West this is next to impossible. Our winter begins in September and ends in May.

(m) I try to get a few outdoor activities done in the spring when students are "trained" properly.

(n) With classes of 35 students, outdoor activities are impossible.

(o) My class belongs to a rural area where the outdoors plays a large part in their lives. They are comfortable working in a familiar environment. It makes the course relevant.

Statement # 10. On a scale of 1-10 I would rate the danger level of the activities in this course as:

Comments:

(a) Some activities can be hazardous, e.g. using ammonia, hydrochloric acid, and iodine crystals. Care must be exercised at all times. Lab safety must be emphasized.

(b) No danger under supervision.

(c) The danger level is high due to the fact that when I use a heat source or chemicals, I don't have a separate lab.

(d) Only a couple of activities are especially dangerous.

(e) Chemistry activities involving combustion can be dangerous.

(f) What could usually present extreme danger I do in the lab as a teacher demonstration.

(g) Monitoring 30 students doing ZnS reactions or burner activities can be hazardous.

(h) Some activities are harmless, others don't belong in a grade seven program, especially handling ether.

(i) Before the course begins a two class session on lab safety and orientation of facilities promotes safety. Most students are quite familiar with behaviour in the lab before activities are attempted in grade seven.

(j) Instill good safety habits and enforce them.

(k) Danger is kept to a minimum by close supervision. Also, some dangerous activities are omitted.

(l) Chloroform is no longer used in the labs at Memorial University but is required for Activity 5, pg. 105.

(m) Certain activities don't have enough cautions e.g. sublimation of iodine crystals; the gas is lethal.

(n) Activity # 9, pg. 112; Iodine gas is a harmful irritant- lab should be skipped regardless of how "good" the ventilation is.

Activity # 5, pg. 128; Any "tasting" should be skipped since it is an unsafe lab procedure regardless of the liquid being used (beaker may be contaminated).

Activity # 6, pg. 157; Nothing should be put in the exhaust of a car since it is hot enough to burn as well as potentially explosive in this case.

(o) Some activities require the use of chemicals of which the labels do not give any special warnings. I am unfamiliar with them, and therefor try to avoid the use of them.

Statement # 11. I would rate the percentage of impractical activities in this course as:

Comments:

(a) For time considerations - because of lack of equipment for 30 students - because of inefficiency.

(b) Some activities are impractical at school but can be done at home i.e. experiencing a sunrise.

(c) I found the outdoor activities somewhat impractical because of time needed for each as well as relative unsuitability of local sites. I have improvised.

(d) Impractical only because of lack of lab space and supplies.

(e) Most of the Life Science and some of the Earth Science.

(f) Most activities in sections 1 and 2 were done. However, to do many of the activities in section 3 required materials that would be too expensive and as a result this section was not dealt with as much as the first two.

(g) The ecology section in grade seven is about the worst section I have found in activities.

Statement # 12. The teacher guidebook provides sufficient help regarding methodology and techniques.

Comments:

(a) More detailed instructions should be available for experiments and use of alternate materials. Care and handling of potentially hazardous materials is not sufficiently approached.

(b) Rarely used, but usually provides information when needed.

(c) Very useful for not only understanding the program, but especially good for novice teachers with little background.

(d) The section on Earth Science does not provide sufficient information.

(e) The guidebook is by far the best of its type I have ever seen or used, because it was designed by teachers for teachers.

(f) Very well put together book.

(g) All questions are answered and additional information is provided.

(h) Never use it, but I guess it could be helpful.

Statement # 13. The guidebook offers sufficient information regarding the evaluation procedures for the course.

Comments:

(a) I think this is the main weakness of the course.

(b) Evaluation procedures need to be geared to the level of ability of the students.

(c) I have a system which arose from discussion with my program coordinator, the guidebook, and finally my own appreciation of evaluation.

(d) It offers some information regarding content, but does very little in offering unit evaluation.

(e) The guidebook is good, but at the science institute we evaluated each chapter and drew up a series of tests which we distributed to many science teachers.

Statement # 14. The questions at the end of the chapters are quite relevant to the material covered in the chapters.

Comments:

(a) Assigning these questions as homework allows students to try to "iron out" things for themselves. Discussion of student answers is most helpful.

(b) Questions are relevant but I feel that there are not enough of them to cover the chapter materials.

(c) They don't always cover all angles - particularly questions dealing with labs.

(d) Could use more application-type questions.

Statement # 15. The teacher guidebook provides sufficient help in he content areas.

Comments:

(a) When I feel a need to "brush up" the guidebook is adequate.

(b) The background information on the Earth Science section is very difficult to understand if you have no background in this area. The activities are not thoroughly covered, and it does not provide answers to chapter tests for this section.

(c) Some help but not enough.

(d) As a science major, I don't have much problem with content, but I know those who don't have a good background in science that do.

Statement # 16. This course provides a balanced content selection.

Comments:

(a) Content topics are balanced, but text content on these topics is poor.

(b) Sufficient content in the various sciences that help a student make a choice in high school.

(c) The content in some cases is only sufficient to cause confusion.

(d) Maybe balanced in appearance, but I find that the Life Science section is very time consuming, very difficult to do and the section which I feel the most uncomfortable with.

Statement # 17. The activities in the course are very practical for Newfoundland students.

Comments:

(a) Most are practical, but some could be modified for local areas.

(b) I would like to see more activities directed towards some of our concerns with the environment, i.e. acid rain. I also think time should allotted for science fairs.

(c) The Life Science unit requires much revision to make it practical here, i.e. acid rain and endangered species.

(d) Ecological activities are not practical.

(e) Life Science activities, especially outdoors, are totally inappropriate for Western Labrador.

(f) The section on ecology is particularly relevant as field trips are easy to arrange. Also, the supplement by Anna Nolan is extremely helpful.

Statement # 18. This course encourages students to function at the highest cognitive levels appropriate for their stage of development.

Comments:

(a) Under ideal conditions.

(b) Students can reach beyond the core concepts to depths that encourage full development.

(c) Only at a very low teacher-student ratio.

(d) With the help, of course, of appropriate teacher methodology.

(e) I have observed that many students are not ready for the reasoning required to draw conclusions from some activities.

Teacher Variable

Statement # 1. I am highly satisfied with this science course.

Comments:

(a) Some students could be every activity in the book and still leave knowing very little. The text I believe is the problem. Many like and are capable of going ahead, but others need extra, at home reading.

(b) Lower ability students have great difficulty with it.

(c) Not appropriate for multigrade classroom.

(d) I preferred the program "Spaceship Earth" that I piloted and taught for several years.

(e) My comments tend clearly to be positive.

(f) I like the program, as it provides hands on activities, but the section on Earth Science does not provide enough content for teachers or students.

(g) Needs content.

(h) A lot of activities take too much time, just to find out some simple concept; which could be easily explained.

(i) The course, especially the ecology component is designed with ideal environment, class size and course load in mind.

(j) I find there is not enough background information given to the students; especially the weaker students.

(k) Strongly agree, due to the fact that I enjoy teaching it, and feel I am doing an adequate job, even though I am completely lacking in science courses.

(l) Teaching in a small school presents problems supplying materials for so many experiments.

Statement # 2. I feel confident that I know the goals of science education in the Searching for Structure program.

Comments:

(a) The behavioral objectives are well laid out. I find that integration of the three main sections requires some work.

(b) Goals are cl[illegible] implementation extremely difficult.

(c) One of the stronger goals is to make science a "hands on" subject. The labs, more than effectively achieve this.

Statement # 3. There is a strong need to improve my professional standing for the teaching of this course.

Comments:

(a) Workshops, courses, either credit or non-credit, that can be obtained locally and without a lot of expense to the teacher.

(b) Need some inservice in the Earth Science section.

(c) I would like to have a continual upgrading i.e. junior high school science trends.

(d) I would have said agree in my first year teaching the course, but experience is a fine teacher.

(e) While I have no formal training in biology, I have an interest in it, and have learned much on my own.

(f) If I had a stronger background in Chemistry and Physics, I'm sure it would help.

(g) I am presently upgrading and working on a sixth grade certificate, I plan on doing some science courses, if possible.

(h) I am an avid science fan, and I love the labs as much as the students. I feel now that I am teaching one of the better programs in my school.

(i) Only if I were to teach a higher grade level, which I feel I shall not be doing.

(j) The science institute was very beneficial.

(k) I simply do not have the facilities and equipment to teach this course effectively. I do have the knowledge.

(l) I wish I had done more science courses.

Statement # 4. I have received an inservice or workshop session for the teaching of this course.

Comments:

(a) Most of the content of the course was part of the teacher's professional or university training.

(b) Have received little correspondence from my program coordinator on the teaching of this course. This would be helpful for teachers that are teaching the course for the first time.

(c) The one workshop I did attend, I found the discussion oriented to larger schools with facilities to conduct the majority of the activities; therefore of no value to me.

(d) I received an inservice this year, after teaching the course for two years.

(e) I did attend one, and it was really beneficial. Other teachers have a wealth of knowledge to offer us new teachers.

(f) Yes, and those I find invaluable.

Statement # 5. I gain a high degree of satisfaction from teaching this course.

Comments:

(a) From the desire and interest of the students, more so than from the text itself.

(b) This impossible for me, as I feel so ill prepared for the Physical Science/Earth Science aspects of the course.

(c) I enjoy the Physical Science and Earth Science sections. The Life Science section is very hazy and poorly developed.

(d) Very satisfying to help, and then watch students gain a feeling of independence and satisfaction.

(e) This is true for the physical science section. However, the other sections can become frustrating to work with.

(f) I enjoy this text much more than the Exploring Science. I think the students do too.

(g) I dread the Earth Science section.

(h) When students enjoy a course as much as this one, it provides me with a high degree of satisfaction.

Statement # 6. I really enjoyed teaching this course.

Comments:

(a) Students have a strong desire to learn and they are highly motivated. This makes it much easier for me.

(b) For a small school, with only one grade seven class consisting of students of varying degrees of ability, this course has many drawbacks.

(c) I like science, but my enjoyment of teaching this course would be fuller with more background.

(d) Yes - for Physical and Earth Science. Not at all for Life Science.

(e) Depends on size of class - the more students in a room, the less satisfaction.

(f) Agree, in spite of the drawbacks (I also have two grades in the same room).

(g) For student science should be "doing and learning" and that's what takes place in this course.

(h) The students enjoy the course, therefore I enjoy teaching it.

(i) I am presently teaching 12 different courses from grades 7 - 12, and I find that this course involves more time than any other. Approximately 40% of my preparation time is spent of this course.

Statement # 7. On a scale of 1-10 I would rate my satisfaction with the usual outdoor activity as:

Comments:

(a) The transportation and discipline problems override the success of the activity for the class as a whole (20-30% of students are successful).

(b) Need a better identification guide for Newfoundland plants. Some activities are impractical, such as animal footprints which are not found near the school.

(c) If the proper preparation and planning is done, the outdoor activities as presented in this course are quite satisfactory.

(d) Difficult to plan outdoor activities on a daily or seasonal basis.

(e) Kids enjoy the collections of samples of living things.

(f) I modify outdoor activities to an extent to increase my level of satisfaction.

(g) It varies from year to year. The smaller my class the more successful. This year I have a huge class and outdoor work is becoming a problem.

(h) Junior high students need tremendous discipline when working on their own in any environment, lab or outdoors. Even 20 students can be hard to handle in this setting.

(i) Weather is a major factor here in Labrador. Snow comes early and leaves quite late.

Statement # 8. I rate myself as a qualified professional science teacher of this course.

Comments:

(a) In certain areas.

(b) My knowledge of geology is very limited.

(c) In teaching Life Science, I feel I'm qualified professionally.

(d) Experience!!! I've learned a lot from a co-worker who is a senior high science teacher as well.

Statement # 9. My attitude towards this course has become more positive.

Comments:

(a) This being my first time teaching the program, I enjoy it very much and look forward to science class each day.

(b) The more I do with the course the better I feel about it.

(c) I still believe there is much room for improvement in the Life Science section (I have a degree in Biology with an emphasis on Ecology).

(d) I have had to learn this course with my students. I find every year I learn more; finding the course more challenging and interesting.

(e) As I have gained more background information.

(f) I was a little apprehensive at first, but now I enjoy it fully.

(g) As I find more efficient ways to do the labs.

(h) As I build up my materials file.

Facilities and Equipment

Statement # 1. Our school has adequate laboratory facilities for the teaching of this course.

Comments:

(a) There are insufficient funds to adequately stock the lab.

(b) No facilities at all.

(c) We have the equipment - all we need. However, our lab is a pitiful excuse for a proper scientific environment.

(d) Facilities are lacking because there isn't even any electricity.

(e) Consumable materials are difficult to replace, due to budget restraints.

Statement # 2. I am teaching this course in:

Comments:

(a) Change from classroom to lab depending upon particular lesson plan and availability of lab.

(b) I use a portable lab.

(c) I have a gas and cold running water on a demonstration table.

(d) I frequently have to use the classroom due to the unavailability of the lab.

(e) Lecture from classroom, classroom discussion following the lab work, and activities done in groups in the lab.

(f) We are gradually getting the equipment needed, but it is hard to use them in a classroom.

(g) No lab in school. Experiments are done in the library, in groups at individual tables.

(h) Presently bringing materials from class to class on a cart.

(i) In a classroom, without even a sink.

Statement # 3. There is a "reasonable" amount of science equipment available in our school.

Comments:

(a) If it can be shared so that activities are done in groups.

(b) We cannot do a quarter of the experiments.

(c) Enough for demonstration purposes only.

(d) No place for storage of chemicals, etc.

Statement # 4. The lack of a "reasonable" amount of science equipment is creating serious problems in my teaching of this course.

Comments:

(a) Causing some problems. Equipment does not make a program, but it could improve it.

(b) We have to do much group work - often the groups are too large to be very effective.

(c) Need a lab! Essential.

Statement # 5. The location of our school poses serious problems for the efficient teaching of outdoor activities in this course.

Comments:

(a) Good for study of plants and small animals (insects, etc.).

(b) We simply use buses to travel outside out immediate area when necessary.

(c) The school has nearby (1-3 miles) heath, forest, peat land, forest, marsh and river ecosystems.

(d) We are a rural school. Bus costs a fortune.

Teaching Methods

Statement # 1. Lecture - discussion is the method I use most frequently in the teaching of this course.

Comments:

(a) I have to perform the experiment and base learning through actual observation.

(b) Discussion and student activity used most frequently. However, this can be a problem when class exceeds 25.

(c) Student activity centered when materials permit.

Statement # 2. The majority of activities in this course were completed as "hands on" by the students.

Comments:

(a) Many were used as demonstrations to save time and ensure student learning. Often, doing an activity does not guarantee learning.

(b) Because of a lack of materials and facilities many activities were done as demonstrations.

(c) Many labs that should have been "hands on" we lacked the materials for. Money is always a problem.

(d) Due to the situation I'm in, this was impossible.

(e) No sufficient equipment or lab time.

(f) This approach seems to be enjoyed by students, and it seems that they are better able to recall those things that they have actually done for themselves.

(g) We do all the activities, but the students might only get a chance to watch because of the classroom situation.

Statement # 3. Demonstration of activities is the method I use most frequently in the teaching of this course.

Comments:

(a) Yes, because of the size of the class.

(b) Usually, due to a lack of equipment.

(c) For any activities that are considered hazardous, or for which there is not enough equipment, I demonstrate.

(d) I demonstrate when there is a lack of equipment, where dangerous chemicals are used, or when the task is difficult.

(e) High school science courses take priority in the lab over junior high courses.

Course Evaluation

Statement # 1. I insist on formal activity reports from my students for this course.

Comments:

(a) Field trip requires actual report of observations made on natural setting - such as pond ecosystem, rock formations, etc.

(b) Periodically, to reinforce and maintain the formal method of reports for neatness, clarity, and skill.

(c) Usually all activities have to be formally recorded in a special exercise.

(d) I periodically collect notebooks to ensure that a scientific method is adhered to, according to my requests. Formal reports would be overburdening.

(e) Each group has its lab book; each student rotates in writing out the experiment, getting materials, doing the activities, drawing diagrams when necessary, etc.

(f) Sometimes this is the case, but I find that too much formal reporting can lead to a certain amount of disinterest.

(g) I use a version of the formal write-up. Kids at this age don't respond well to a tightly structured write-up.

(h) This ensures good work habits and organization.

Statement # 2. The percentage of evaluation for this course that I allocate to the activity report is:

Comments:

(a) A number of formal reports and all activity reports are written in the student lab book. Because many activities must be done in groups, the reports may often represent a single students work. (Interest, behaviour, adherence to rules [safety], and diligence are also considered here.)

(b) This includes evaluation on skill development, application, and observation, as well as manipulation of lab variables.

(c) I am seriously considering making it 50% of the course as of next year.

(d) These are important in letting me know if the major concept has been grasped (conclusion especially).

Statement # 3. I often use the test at the end of a chapter as the main guide for my chapter test.

Comments:

(a) In some cases, parts of the review were used, but other times were used because of content covered in introduction.

(b) I tend to use it as a study guide.

(c) Use the test mainly for review purposes.

(d) I refer to it but base my tests on the objectives at the beginning of each unit.

Statement # 4. I use laboratory tests to evaluate the process abilities of the students.

Comments:

(a) I did this on the Physical Science part of the course.

(b) I agree they should be used, but students work in groups, and sometimes the mark may be invalid (may copy).

(c) I should test this as well. I will in the future.

(d) I would like to evaluate these, but I have not done so as yet.

(e) Never considered them, but I will in the future.

Statement # 5. Evaluation techniques constitute a major problem in the teaching of this course.

Comments:

(a) The emphasis of the course is on active student participation to enhance learning. The majority on evaluation, however, is on test results, as grading students for activities done in groups is unfair.

(b) A lot of group work. In few cases the grades are invalid (students have excellent write-ups but don't understand the work fully). Tests usually rank students eventually.

(c) There doesn't seem to be any uniformity within my school board as to evaluation procedures and techniques.

(d) Many opportunities for evaluation exist. The drawback is that they tax available teaching time to some degree.

(e) My evaluation must be based on content. Content is lacking.

Statement # 6. Long answer-type questions constitute the major percentage of my tests.

Comments:

(a) Depends upon tests. Students at this level, I find, have a poor writing ability, and perform better on objective/short answer questions (depends on topics).

(b) You can attend to higher levels of processing with varied types of testing techniques.

(c) I try to organize my tests such that they include completion, multiple choice, and lab questions, as well as long answer questions.

Extraneous Factors

Statement # 1. My subject coordinator has been helpful regarding the teaching of this course.

Comments:

(a) Didn't ask for his help.

(b) Very helpful and encouraging.

(c) No subject coordinator.

(d) Have very limited communication with him.

(e) Lended an ear.

(f) Provided answers when called upon.

(g) My program coordinator has always been there to help, regardless of the questions, problems or comments I have for him. Consequently the course runs that much more smoothly.

(h) I'm sure he would be if I approached him.

(i) I haven't heard from him regarding teaching this course. In the same light, I haven't contacted him.

(j) I have not formally met with him.

(k) Tends to do own thing.

(l) There has been no need for his help.

(m) Most help from fellow science teachers of the junior high grades.

(n) Financial assistance, inservice, materials.

(o) I have not had much occasion to seek assistance regarding this course, but he is very helpful when approached.

Statement # 2. The Memorial University Junior High Science Institute was helpful for the teaching of this course.

Comments:

(a) I did not attend such an institute, but I feel it would be very valuable.

(b) I was lucky enough to have a good science background, before doing the institute, but I still found it useful.

(c) It was probably the best course I did at university as it relates to teaching. I would very highly recommend it to anyone teaching science in grades 7, 8 and 9.

(d) I would have had to rate myself as an unqualified, unprofessional, science teacher of this course, if not for this institute.

Ideal Curriculum

Statement # 1. The appropriate ratio of content to activities should be:

Comments:

(a) Need fewer activities and more content in a multigrade classroom.

(b) The course needs more content for students. There is often insufficient background for students.

Statement # 2. A search should begin for a more appropriate science course for grade seven.

Comments:

(a) Some revisions/changes would be beneficial, especially on elaboration of key concepts.

(b) Give them a book that has something in it for them to read. Not all reading, but not all activity either.

(c) Excellent course for doing activities and developing interest, the skills, and processes of science in students.

(d) Perhaps a continual "updating" of the present text would be more suitable.

(e) If not, the grade six program should be more activity oriented, so that the student is not totally lost with this course. I personally feel that this course was designed with a small, high achieving student body in mind.

(f) This is the third text I have taught, and is by far the best.

(g) We need one for a multigrade classroom.

(h) I disagree, but considering the Department of Education I would not be surprised that "something good" should be eliminated.

(i) I think this is a good course, but that should not blind me. We should always search for bigger and better things.

(j) Supplementary material can be added to the sections that lack sufficient information.

(k) For larger schools the program is fine. However, my situation is quite removed from the ideal; a multigrade classroom with grades 7-9 can hardly, strongly recommend this type of program.

(l) Many teachers have problems with the course because (1) no science background, (2) lack of facilities, and (3) lack of equipment. However, with greater effort in future planning, facilities and equipment can be obtained. It took me 6 years of frustration, but now we have the facilities and equipment to teach the course (7, 8 and 9).

(m) Even teachers with no science background are enjoying the course. It is an excellent course with emphasis on the methods of science.

(n) Not necessarily a better course, but better activities in Life Science and Earth Science.

(o) This is definitely the finest course ever introduced at this level.

(p) I don't have any problem with the course. I need reasonable size groups (15-20) and more time to plan and set up lab activities so that they can run smoothly. In a "hands on" environment, students, especially average and below average, need as much structure as possible. I need better lab facilities, and I suspect that many other schools do as well.

(q) It is time for a change, and an upgrading of the content and activities.

(r) I feel that the course should be revised. There are some valuable principles being introduced, but have no content for students to fall back on for further explanations. I continually have to supply extra reading, etc.

Appendix C

Pearson Correlation

Teaching certificate	Methods *** .001			Courses ** .005	Chem ** .005			Others * .019 -	Enroll * .020	Bio * .022
Years of teaching experience	Courses *** .000 -	Bio *** .000 -			Physics ** .003 -				Chem * .003 -	Geol * .032
Number of university science courses taken	Exper *** .000 -	Bio *** .000	Chem *** .000	Physics *** .000	Methods *** .000	Cert ** .005	Geol ** .005	Others ** .005	Enroll ** .004	
Branch of university science courses taken: - Biology	Chem *** .000				Others ** .003 -				Methods * .014	Enroll * .036
- Chemistry	Physics *** .000	Methods *** .000							Others * .045 -	Enroll * .011
- Physics	Methods *** .000				Enroll ** .003					
Number of university science methods courses taken										Enroll ** .003
Percep 5. I am highly satisfied with this science course	P. 22 *** .000	P. 36 *** .000	P. 41 *** .000	P. 50 *** .000 -	P. 13 *** .000	P. 18 *** .000	Exper *** .001 -	9 ** .002	Courses * .047	7 * .037

Perception 7 — I feel confident that I know the goals of science education in the Searching For Structure program.

Perception 9 — Our school has adequate laboratory facilities for the teaching of this course.

Perception 13 — The majority of my students seemed to enjoy the course.

Perception 18 — The majority of activities in this course were completed as "hands-on" by the students.

Perception 22 — I have received an inservice or workshop session for the teaching of this course.

Perception 36 — I gain a high degree of satisfaction from teaching this course.

Perception 41 — I really enjoyed teaching this course.

Perception 50 — A search should begin for a more appropriate science course for grade seven.

Percep 7. I feel confident that I know the goals of science education in the Searching For Structure program	P. 21 *** .000 -	P. 36 *** .000	P. 9 *** .001	Chem ** .009 -	Methods ** .005 -	P. 50 ** .004 -	P. 41 ** .002	Cert. .030 -	Physics .035 -	P. 13 .014	P. 22 .012	P. 18 .028
Percep 9. Our school has adequate laboratory facilities for the teaching of this course	P. 13 *** .000	P. 18 *** .000	Enrol *** .001 -	P. 36 *** .001	P. 41 *** .001	P. 50 *** .001 -			Chem *** .007 -	P. 21 ** .004 -	Physics * .014 -	Methods * .019 -
Percep 13. The majority of my students seemed to enjoy the course	P. 18 *** .000	P. 36 *** .000	P. 41 *** .000	P. 50 *** .000 -	Exper *** .000 -			P. 22 ** .004			Courses * .032	P. 24 * .046
Percep 18. The majority of activities in the course were completed as "hands-on" by the students	P. 36 ***	P. 50 *** -	P. 41 ***				P. 22 **					P. 7 *
Percep 21. There is a strong need to improve my professional standing for the teaching of this course	Courses *** .000	Chem *** .000	Physics *** .000	Methods *** .000			Biol ** .006				Cert * .025	Geol * .033

Perception 22 I have received an inservice or workshop session for the teaching of this course.

Perception 36 I gain a high degree of satisfaction from teaching this course.

Perception 41 I really enjoyed teaching this course.

Perception 50 A search should begin for a more appropriate science course for grade seven.

Percep 22. I have received an inservice or workshop session for the teaching of this course	P. 24 *** .000	P. 50 *** .000 —	Exper *** .000 —	P. 36 ** .004
Percep 24. I attended the Memorial University Junior High Science Institute	P. 50 ** .005 —		Exper * .028 —	P. 36 * .031
Percep 36. I gain a high degree of satisfaction from teaching this course	P. 41 *** .005	P. 50 *** .000 —		Cert * .035 —
Percep 41. I really enjoyed teaching this course	P. 50 *** .000 —		Cert ** .007 —	Others * .012
Percep 50. A search should begin for a more appropriate science course for grade seven	Exper ** .002	Courses ** .006 —		Others ** .020 —