

AN EVALUATION OF A GENERAL MODEL
FOR INDIVIDUALIZING INSTRUCTION

BY

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ABSTRACT

The purpose of this study was to develop, implement and assess the effectiveness of a general model for individualizing instruction in terms of its effects on:

- (i) students' academic achievement
- (ii) students' attitudes towards a subject
- (iii) teachers' attitudes towards students

The need to develop a general model for individualizing instruction was deduced from an analysis of current models and procedures of individualization. The model is aimed at understanding individualized teaching and at the same time catering to individualized learning. Its purpose is to provide teachers with the opportunity to exercise their particular strengths in teaching and a chance to compensate in some way for their individual weaknesses and this without being prejudicial to the individual learner.

The approach selected to achieve this purpose was to provide teachers with a flexible guide allowing them to design and administer individualized learning programmes according to their individual requirements, and above all according to the particular situations in which they are placed.

An experiment was carried out in order to assess the effectiveness of the general model. The samples for the study consisted of 187 students and eight teachers in the fifth grade distributed in three Schools, in School District Number Thirteen, Moncton, New Brunswick, Canada. In a first step, the teachers in the experimental group were provided with appropriate training in the design and administration of an individualized learning programme according to the proposed general model. At the same time, the teachers in the control group were provided with a weekly seminar dealing with subjects related to the teaching-learning process in general. In a second step, the teachers in both the experimental and control groups administered their own instructional programmes; individualized learning programmes for the teachers in the experimental group and traditional instruction programmes for the teachers in the control group.

Four major instruments were used to collect data for the study: a Mathematics achievement test developed by the Montreal Catholic School Commission; the Subject Perception Test Developed by the author; the Minnesota Teacher Attitude Inventory developed by Cook, Leed and Callis (1951); and the Teaching Strategies Inventory also developed by the author.

The major findings of the study indicate that:

(i) The Mathematics academic achievement of students who have been involved in individualized learning programmes designed according to the new general model proposed in this study is higher than that of students involved in more traditional programmes.

(ii) The students who have been involved in individualized learning programmes designed according to the new general model have more positive attitudes towards Mathematics than the students involved in more traditional programmes.

(iii) The teachers who have been involved in individualized learning programmes designed according to the new general model have more positive attitudes towards students than the teachers involved in more traditional programmes.

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INTRODUCTION

The main object of this study is to develop and test a general model for individualizing instruction.

1. Definition of the Problem.

The most important single variable in the learning process is the individual learner. The most important single principle in psychology is that no two individual learners are identical. These statements are hardly new discoveries, but they do point up what many educators perceive as one of today's most challenging problems: the individualization of instruction.

There is, indeed, a wide range of individual differences among students. Students differ among themselves physically, intellectually, socially and emotionally. They differ, sometimes widely, in their interests and attitudes, their values and their goals, their talents and needs. They differ in their backgrounds and in the varieties of previous experiences they have accumulated.

In addition to these rather obvious differences, students differ in another way which, for the purposes of the present study, might be considered the most significant of all: they differ in their learning styles. That is, they differ in their modes of acquiring, retaining and applying knowledge. They differ in the ways they respond to particular methods of instruction.

The truth of these observations is evident in the classroom where some students learn more easily through reading, others through listening, and others through doing things. Some prefer to work under pressure, others prefer a more leisurely pace. Some need constant direction, others do better in a more informal classroom. In fact, as reported by Riessman (1972), each student has a distinctive style of learning, as individual as his personality.

For reasons such as these, there is no one best way of teaching nor can there be. This is why educators have tried and are still trying to find ways of instructing individuals as individuals.

The individualization of instruction is not a new theme in education. Looking back to the pre-Christian era, one finds that Plato and Socrates recognized the existence of human variabilities in the education process. During the early middle ages, Charlemagne and Rabelais paid particular attention to individual differences. During the Renaissance in Italy and the Reformation in England, it was recognized that different students had different interests and students were encouraged to do anything for which they had natural inclination.

The movement toward individualization was strongly influenced during the eighteenth century by Rousseau who criticized the teachers of his day for destroying special individuality in the classroom and by Pestalozzi who forcefully expressed his belief in individuality.

During the first half of the twentieth century, the educational system has benefited from the philosophical and practical contributions of a large number of educators, notably Montessori, Dewey, Froebel, Ferrière, Reddie, Dottrens, Frenet, Lubienska, Wasburne, Kilpatrick and Parkhurst.

Since 1959, the movement toward individualization has further intensified and Piaget, Bruner, Skinner, Bloom, and many others have made major contributions to it.

In the last two decades in particular, most educators have made at least some attempt to recognize and provide for individual differences among students. Consequently, a large number of models have been developed for the purpose of individualizing or helping to individualize instruction.

As we shall see, all the current models of individualization aim at fitting the teaching to the learner while very few models adequately consider the role of the teacher in the act of individualization and none has tackled so far the basic problem of fitting the teaching method to the teacher. In other words, the need to individualize teaching as opposed to the individualization of learning has been overlooked. As a direct consequence, all the procedures (programmes, techniques, strategies) implemented for the purpose of individualizing instruction have been directed toward the individualization of learning rather than the individualization of teaching.

A further analysis will also show that each of these procedures has its uses as well as its limitations. Just as there is no one best way of teaching in general, neither is there any one best way of individualizing learning.

The most common and most important limitation of these procedures for individualizing learning is that they are often not applicable by the average teacher in the average school. While all the procedures pursue the same goal which is to individualize learning, they have been developed to be used under very specific and predetermined conditions. Therefore the majority of the proposed procedures for individualizing learning cannot be adapted to every situation (teachers, students, schools). Consequently, only a minority of teachers can benefit from any one procedure on any one occasion.

On the basis of the foregoing, one may deduce an urgent need for a general model aimed at understanding individualized teaching and at the same time catering to individualized learning. The main purpose of such a model would be to provide teachers with the opportunity to exercise their particular strengths in teaching and a chance to compensate in some way for their individual weaknesses and this, without being prejudicial to the individual learner.

The approach to a model of individualization of instruction proposed in this study, is to provide teachers with a flexible guide allowing them to design and administer individualized learning programmes according to their individual requirements and above all according to the particular situations in which they are placed.

2. Major Trends of the Present Study

Before introducing and assessing the effectiveness of the new general model for individualizing instruction, it was felt necessary to review the main procedures commonly used for the purpose of individualizing or helping to individualize instruction. In order to make up for an evident lack

of generally accepted synthesis at this level, these procedures are classified under five major categories: those centred on organizational patterns; those centred on curriculum development; those centred on the instructional process; those centred on educational facilities; and those student-centred. Next, a description and critical analysis of the major procedures representative of each category is made. The rationale for doing this is that the relevance of a new general model for individualizing instruction could be better understood within the perspective of existing procedures.

A review of the effects in terms of educational outcomes of the major procedures for individualizing instruction is also presented. This is done in order to make observations that could help in the design of a meaningful assessment of the effectiveness of a new model for individualizing instruction.

This is followed by a descriptive analysis of a pilot study made in an effort to justify the theoretical and practical elements proposed in the new model for individualizing instruction, and in an effort to perfect the experimental plan used to test the new general model.

The new general model for individualizing instruction is then introduced and shown to emphasize flexibility by means of alternatives which allow each teacher to design and administer his own programme of individualized learning according to his individual requirements and above all according to the particular situations in which he is placed.

The conceptual framework of the general model is then presented, followed by the translation of this framework into operational elements.

The empirical part of the study is an assessment of the effectiveness of the general model in terms of its effects on students' academic achievement, students' attitudes towards a subject and teachers' attitudes towards students.

In order to test the effectiveness of the new general model for individualizing instruction, data were gathered in three schools of School District 13, New Brunswick (Canada) where the teachers in four experimen-

tal classrooms applied the general model while the teachers in four control classrooms delivered regular instruction. The basic research design used for the study is the "non-equivalent control group design" proposed by Campbell and Stanley (1966) in which the tests are given twice, once at the beginning of the experiment (pretests) and once at the end of the experiment (posttests).

The findings are presented in three sections, the results of testing hypothesis I (the effects of the general model on students' academic achievement); the results of testing hypothesis II (the effects of the general model on students' attitudes towards a subject); the results of testing hypothesis III (the effects of the general model on teachers' attitudes towards students).

In the final chapter a summary of the study and general conclusions are presented.

In conclusion, as has been suggested here, the main objet of this thesis consists first in uniquely classifying and analysing existing procedures for individualizing instruction to illustrate the strengths and weaknesses of the procedures developed by a variety of educators. Second, the author seeks to present an original eclectic model for individualizing instruction whereby each teacher is able to design his own programme of individualized learning according to his individual requirements and above all according to the particular situations in which he is placed.

CHAPTER 1

A CLASSIFICATION AND ANALYSIS OF PROCEDURES

FOR INDIVIDUALIZING INSTRUCTION.

The interest raised by individualized instruction, particularly in the last two decades, has led educators to develop and implement a large number of procedures for individualizing instruction or at least providing for differences among students in a manner that might facilitate individualization. Most procedures have the same general orientation, that is toward the individual instead of the group or class. However, the implementation of that general orientation takes different forms in practice.

In the following pages a descriptive and critical review of the main procedures for individualizing instruction is made in an effort to make observations about possible future developments. In order to introduce some synthesis into this endeavour, the procedures which are being reviewed in this chapter are classified in five major categories: those centred on organizational patterns; those centred on curriculum development; those centred on the instructional process; those centred on educational facilities; and those student-centred.

It must be noted here that while reviewing the literature on individualized instruction, the author was seeking procedures implemented for the purpose of individualizing teaching (aimed at fitting the teaching method to the teacher) as well as procedures directed toward individualizing learning (aimed at fitting the teaching to the learner). The rationale for doing this is that both teaching and learning are considered basic components of the instructional process.

1.1 Procedures Centred on Organizational Patterns.

Some methods of individualizing instruction concentrate on re-arranging the organizational or structural features of a school. Such programmes are fundamentally organizational, although they obviously have their roots in the curriculum and may greatly influence curriculum development within the school.

Two particular techniques are representative of the organizational approach: team teaching and non-grading in instruction.

1.1.1 Team Teaching.

Team teaching as a method and specific team programmes have dominated the education literature for the past several years. The first experimental projects were launched in the United States in 1956 by the National Association of Secondary School Principals, which established the Commission on Curriculum Planning and Development. Other major contributions to the progress of team teaching were provided by the Committee on Staff Utilization, Harvard University and Claremont College of California.

All these projects were instigated to devise new approaches to the critical problems confronting the schools: the continuing curriculum explosion, the population boom and the acute shortage of teaching personnel.

The main objectives of team teaching programmes have been summarized by Singer (1964), Fraenkel and Gross (1967) and York (1971). They are:

- a) More intelligent use of the teacher's specialized talents, interests, training, time and energy.
- b) Differentiated instruction more closely associated with and effectively geared to individual student abilities and learning styles.
- c) More freedom for teachers to prepare lessons, develop curricula, read, be creative and keep abreast of new developments during school hours.

Simply, team teaching can be defined as the use of at least two teaching personnel at the same time, for any given group of students in a given instructional area. Not surprisingly there is no commonly agreed team teaching programme; the structure of teaching teams varies widely, according to the needs and goals of individual schools. The common, universal tenet of team teaching is co-operation by several professional teachers, with or without assistant teachers and technicians.

According to Singer (1964) and Hanslovski, Moyer and Wagner (1969), there are two typical models of team teaching. The first of these takes three distinct forms: the single-discipline team usually consists of two or three teachers from the same department who jointly instruct a group of students. In an inter-disciplinary team the teachers offer instruction in different disciplines to a shared group of students in classes of flexible size, arranging the timetable to suit the students. In a school-within-school team, teachers from all disciplines are responsible for the instruction of the same group of students, usually for two to four years, with due flexibility in class size and schedule.

The second typical model for team teaching, as proposed by Bair and Woodward (1964), Lobb and Delbert (1964), Shaplin and Odds (1964), Chamberlain (1969) and Warwick (1971) consists of the hierarchical and the co-operative type. The former usually entails a set of hierarchies based on ability, responsibility and specialized training, with proportionate rewards and prestige. In the latter, teachers work together voluntarily as a team without any hierarchy and any member may have to assume the role of leader when a situation arises requiring his particular abilities.

Of course teaching teams can be organized in many ways, but if they are to succeed, the members must be compatible and willing to expend sufficient energy to meet the demands of individualized instruction. Furthermore, all team members must work towards true co-operation. In relation to this point Engman's (1973) research revealed that the most frequent causes of failure in team teaching are personality clashes and a lack of planning time.

Team teaching is an organizational scheme which was not primarily intended as a means of individualizing instruction. The practice of having several teachers working together as a team can, nevertheless, be a useful instrument for individualization. If nothing else, team teaching can increase the probability that a given student will encounter, at least for a while, a teacher whose style of teaching matches his style of learning.

The most direct contribution of team teaching to the problems caused by individual differences is its creation of opportunities for teacher-

student interaction and for instructional flexibility.

The major limitation of team teaching is encountered in its implementation. There may be problems with respect to organizational restructuring and available funds, time and personnel.

1.1.2 Non-Grading in Instruction.

In the search for better ways to organize schools, a first experimental non-graded school was initiated in 1934 at Western Springs, Illinois under the heading of the Flexible Progress Plan. Since then, as reported by Goodlad (1955), Slater (1955), Austin (1958), Goodlad and Anderson (1958), Dean (1960), The National Education Association Research Division (1961), and Alexander (1968), countless experimental projects have been launched all over America. Today the non-graded movement pervades the educational scene from the nursery schools through the secondary schools.

Programmes in most traditional schools are based on the assumption that all students should be subjected to the same content, at the same time and at the same rate simply because they are in the same grade and are approximately the same chronological age. The focus is on the content to be covered. In a non-graded programme, there is instead an acceptance of the notion that there is no such thing as an entire class of students at one level of learning. The focus is on the individual needs of each student and his quest for self-discovery.

Hillson (1971) suggests several basic tenets drawn from the literature which may serve to clarify the philosophy behind non-graded education. These tenets are summarized as follows:

a) In every group of learners there are wide differences in quality, desire and intent.

b) Certain undesirable growth characteristics, unrealistic school programmes, and poor progress in schools are associated with non-promoted students more frequently than with slow-learning promoted children.

c) Every student in the elementary and secondary schools should be judged by the best that he can do.

d) No student should be judged by the median performance of a non-select group.

e) No student should be judged solely on the basis of his chronological age.

f) No student should be judged on a grade standard that is clearly indefensible and that cannot be defined in realistic terms related to the research on child growth and development.

Simply, non-grading in instruction can be defined as an organizational and administrative rather than an instructional device which does away with conventional age-grouping in favour of grouping according to the individual student's needs. A non-graded school is one in which grades are replaced by levels that a student accomplishes at his own speed; promotion and non-promotion are eliminated.

Because of the very decentralized nature and self-determination of most educational systems, there is no one "model" non-graded school. Various plans of non-grading exist. Tewksbury (1967) suggests three different ways of implementing a nongraded programme. They are:

a) To provide multilevel instruction in a self-contained, heterogeneous classroom.

b) To assign students to self-contained classes according to performance levels.

c) To regroup a large aggregate of children from time to time to form classes that work at different levels under different teachers.

Such organizational settings imply that students are instructed at their own levels of ability and may proceed at their own rate. It also implies that most of the time the teacher retains responsibility for content

selection and that a standardized curriculum sequence is required for all students.

Non-grading in instruction is not just a simplistic method of teaching, nor should it be just an administrative or organizational reshuffling. Ideally, non-grading in instruction should create a framework in which better methods can be used and in which fluidity and flexibility allow exploitation of various activities that further learning.

Like team teaching, non-grading in instruction does not attack the problem of individual differences in the most direct way possible. There is yet no direct evidence that simply placing a student in a non-graded school is a guarantee that he will learn anything of consequence or that his particular educational needs will be met, neither does the practice of having him skip a grade or repeat a grade, or that of grouping him with others of like ability.

Although non-graded programmes provide experiences appropriate to each student, it seems that most of them have so far achieved individualization in only one respect: students proceed through the same material in pretty much the same way, but they do so at their own individual rate. In this respect, it is important to note the verdict of Wilt (1971) and McLoughlin (1972) who both disagree with the idea that the instructional problems posed by individual differences are to be solved only by tailoring groups accordingly.

As with team teaching, the major limitation of non-grading in instruction is its implementation. There may be problems with respect to the complex administrative and organizational restructuring, and the available funds, time, space and personnel.

1.2 Procedures Centred on Curriculum Development.

Some non-graded schools, as well as others that remain graded in the traditional manner, make use of systematic, formalized programmes of individualization.

It has long been one of the goals of education to transform the traditional curriculum into appropriate learning activities in order to meet the needs and interests of the students. From 1920 to 1950, child study and the ideas of Dewey (1913) were a strong influence on the refinement of educational procedures. Childhood was recognized as a period distinct from later development, with concerns, interests and developmental needs not necessarily related to preparation for adult life. This led to a search for content relevant to the student's needs, and to the development of plans, like the "project method", in which topics of interest to students became the centre of organization of learning experiences. After 1950, reactions to this "progressive" approach suggested that learning had become too incidental; much content was omitted or lacked logical sequence. Participation of academic scholars tended to move curriculum into subject areas again, although active participation of learners and direct experiences were still seen as appropriate learning strategies. Less emphasis was given to interests and problems as primary determinants of content. At the same time, another trend with important curricular implications was the "Open Education" approach supported by the ideas of Bruner (1966) and Piaget (1969) who claimed that it is essential to plan all areas of curriculum in terms of child growth and development. Proponents of this approach pointed out that each child learns best when enabled to learn at the pace, and in the sequence, that meet his unique needs.

Since 1965 the major trend has been toward matching individual student needs with appropriate learning activities. The focus is on the individual student and his continuous progress. The emphasis is on goal setting or instructional objectives. The major characteristics of this "continuous progress" approach are the planning of curriculum in terms of the individual student's needs, interests, and capacities, and the careful and individual evaluation of his progress to stimulate and assist his continuing evolution.

The "continuous progress curriculum" has been introduced in an attempt to match course content with the individual student, instead of moulding the student to a general programme.

This curriculum is made up of personalized units of instruction which allow the individual student to progress in each subject at his own pace, according to his background, interests and abilities. There is very little emphasis on competition.

There are two main requisites for a continuous progress programme: first the curriculum must allow students to work through the content in logical order without interruption by artificial barriers, and second the curriculum must allow each student to work through the content at his own pace, according to his abilities, interests and individual characteristics.

Many attempts have been made to design a continuous progress curriculum, perhaps the most notable being the use of individualized learning materials, known as "Learning Packages", which according to Bishop (1971) comprise two types of material: teacher-prepared material developed within a specific school programme, and commercially-prepared material developed outside a school programme and more general in format.

1.2.1 Teacher-Prepared Material.

Several independently developed sets of material are representative of this procedure, namely Individual Study Units (Lewis, 1971), Learning Activity Packages (Kapfer and Kapfer, 1972), Booklets for individual Progress (Wilkins and Frase, 1972), and UNIPAC (Ringis, 1971). Despite the variation in names, these learning guides are all similar in design and intended use.

Typically, these learning guides consist of one or more objectives stated in behavioural or performance terms, a set of learning activities for achieving the objectives, and criterion-referenced tests for measuring entry behaviour, student progress, and terminal achievement.

For the present study, the Learning Activity Package developed at Nova High School, Fort Lauderdale, Florida, is a fine example of an attempt to develop teacher-prepared material. The LAP covers Mathematics and

Sciences. McNeil and Smith (1968) define it as a broadly-based set of materials providing each student with alternatives of how, what, when and where to learn along with a wide range of learning resources. In fact, its primary function is to guide the student through a highly-structured programme of learning material.

Like most learning packages, the LAP comprises the following:

- a) Unit's title (topic to be studied),
- b) Unit's purpose (reason for studying the topic),
- c) Objectives (intended learning outcomes),
- d) Performance measures (pre-evaluation, self-evaluation, post-evaluation),
- e) Learning activities (material and methods for achieving the objectives),
- f) Enrichment activities (learning opportunities beyond the objectives).

The usual procedure with an LAP is well described by Arena (1971) and Cardarelli (1972). Briefly: on receipt of an LAP, the student must first read the rationale, which usually describes the significance of the topic and justifies the study of it. Then the student must read the list of behavioural objectives, so as to have a clear idea of what he is expected to do when the LAP is completed. Third, the student takes the pretest, which anticipates any weaknesses and directs the student to necessary and relevant activities. After the pretest, the student can work through the LAP's programme of varied activities, which can be followed individually or in large or small groups. A teacher is constantly available for consultation. When the student has worked through the programme of activities to his own satisfaction he takes the posttest, to determine which objectives he has mastered and which still need to be reinforced by remedial work. Once the posttest and the teacher's own evaluation confirm successful completion of

the package, the student can proceed to another LAP, taking the unit test to establish a grade and get a unit credit, if he wishes.

In such a complex programme of individualized instruction, the teacher's function is very different from that in a traditional programme, as Flynn and Chadwick (1970) showed in a survey conducted in the Nova public school's complex in Fort Lauderdale, Florida. In fact, the LAP tends to reduce the teacher's direct control over the subject matter acquired in class. In short, the teacher's role becomes more exploratory than didactic or dominant.

Most learning packages contribute directly to the solution of the problem posed by individual differences. Indeed, the use of the "multi's" approach (multi media, mode, content and activity experiences) allows each individual student to work at his own pace and in ways that are unique to him.

One of the obvious limitations of the learning packages is the requirement of an appropriate environment (laboratories and educational facilities) for its implementation. There may be problems as regards available funds and time and the size of the class.

1.2.2 Commercially-Prepared Material.

Several kits are available for teacher's use in individualized learning units, notably the Individually Prescribed Instruction (IPI), an instructional system based on specific objectives and correlated with diagnostic tools, teaching material, and methods; the Programme for Learning in Accordance with Needs (PLAN), a co-operative demonstration programme in computer-managed individualized instruction; and the Individually Guided Education (IGE), featuring a multi-unit organizational structure, a model of instructional programming for the individual student, a model for measurement and evaluation, a programme of home/school communications, and continuing research and development.

For the present study, the IPI system provides a good example of an attempt to develop commercially-prepared material. Scanlon (1970) defines it as an instructional system based on a set of behavioural objectives correlated with diagnostic instruments, curriculum material and teaching techniques.

The IPI system aims to improve learning in general on the basis of five major objectives. These objectives are: to enable each student to work at his own pace through units of study in a learning sequence; to develop a demonstrable degree of capability in each student; to develop initiative and self-direction; to develop a capacity for problem-solving; to encourage self-evaluation and motivation for learning.

The IPI system usually entails the following:

- a) Specification of educational objectives,
- b) Organization of relevant methods and material,
- c) Evaluation of each student's current competence in a given subject and evaluation of his achievement in terms of the educational objectives, by means of placement tests, pretests, posttests and curriculum embedded tests.
- d) Daily evaluation and guidance of each individual student.
- e) Frequent monitoring of progress for the benefit of student and teacher alike.
- f) Continuous evaluation and improvement of curriculum and instructional procedures.

Hosticka (1972) and Gronlund (1974) give an excellent description of the IPI system. To summarize: the student first takes a placement test; then he is pretested on all the skills found within the work unit he is embarking on; next he faces a skill lesson plan, usually called the prescription, which describes the order in which to proceed through the

objectives in the unit and the work required to reach each objective. If the test results show the teacher that the student knows most of the material and only needs rapid revision to master the objectives, the prescription is arranged accordingly. But if it seems the student needs a better conceptual framework within which to attain the objectives, the teacher may assign a more comprehensive prescription to the student. Also, as the student proceeds through a lesson, he undergoes curriculum-embedded tests to check his progress. Once he has mastered this step, he proceeds to the next step mapped out for him. On completion of a unit, the student takes a posttest and proceeds to the next unit if a satisfactory score is attained. If not, the student does further work to reinforce weak points and takes the posttest again.

According to Lindvall and Bolvin (1970), IPI teachers do very little lecturing to the entire class. They spend most of their time administering tests, diagnosing individual needs, preparing prescriptions, evaluating students' progress, helping individuals on a one-to one basis or instructing small groups of students experiencing the same particular difficulties. In short, the IPI system requires the teacher to know the student better and guide his education more closely than the traditional system.

As is the case with the majority of learning packages, most commercially-prepared individualized learning units contribute in as direct a manner as possible to the solution of the problem posed by individual differences. There are however distinguishing features with regard to individualization, that characterize each of the three major units mentioned above. Thus under IPI, there is no individualization with respect to the student's choice of objectives. The objectives are prescribed for him. However each student is allowed to work toward the prescribed outcomes at his own pace and, to a degree under his own direction. Under the IGE system, there is individualization with respect to the student's rate and style of learning, level of motivation, and unique educational needs. Nevertheless, most instructional decisions are made by the teachers. Project PLAN seems to allow more freedom for student selection of learning than does IGE. In contrast with IPI, where the learning experiences are prescribed by the system, and with IGE, where teachers make most of the decisions, project PLAN stresses teacher and student decision making.

As is the case for most of the attempts reviewed so far, the major limitation of the majority of the commercially-prepared individualized learning units is encountered in their implementation. A common limitation is the requirement of an investment of resources in the neighbourhood of \$10 per student annually for the IPI and IGE systems and of \$100 per student annually for project PLAN. In addition, the IPI system requires a heavy investment in students' cognitive skill development, especially for special education and slow learners; on the other hand, the IGE system requires a willingness to restructure the school organization completely, and a commitment to a three-year staff development programme; and finally, project PLAN requires a staff commitment for a few weeks of in-service training in the PLAN system.

1.3 Procedures Centred on the Instructional Process.

Two techniques for individualizing instruction that concentrate on the instructional process are independent study and mastery learning.

1.3.1 Independent Study.

Independent study is essentially a variation of differentiated assignments which teachers have been giving for years and of student-teacher contracts which have long been used at the college level and more recently at the high school level.

Usually, in independent study, students are given maximum freedom, with the emphasis on independent, self-directed learning. According to Hollick (1970), independent study programmes are designed to prepare students for teaching themselves outside the school setting, in a much less passive way than in the traditional educational context. In such programmes, teachers must not only recognize individual students' differences but also devise individualized learning systems to accommodate the differences. As Denby (1969) suggests, if a student is encouraged to be self-directed, he

becomes more involved in the purposes of his study and work and more aware of its value and relevance.

Although effective independent study strategies have been developed only recently, the idea of using independent study as a teaching strategy is quite old. In the 1920s there were at least two major attempts to produce independent, self-directed learning. One was the Stanford Plan developed and initiated by Robinson (1937) at Stanford University in 1925. Since 1960, use of independent study strategies has spread throughout North America and whole school systems remodelled their school plants and reorganized instructional formats to accommodate independent study situations for students. Among some of the most recent and important programmes of independent study at the elementary, secondary and college level are the Kahala Elementary School Programme in Honolulu, Hawaii (National School Public Relations, 1971); the Claremont High School Programme in California (Bishop and Wiley, 1968); and the University of Chicago Project (Congreve, 1965).

Not surprisingly, there is no one "model" of independent study. Nevertheless, according to Patrick (1965) and Hoover (1974), at the elementary level, an independent study programme may embody three distinct phases or levels of independence. The first phase is essentially teacher-directed or teacher-oriented, in preparation for the subsequent progression toward independence. This phase is particularly helpful for students with specific learning difficulties and uses a combination of teaching aids and individual tutoring.

The second phase of the independent study programme is also partly teacher-oriented, but assignments are left open-ended, with no limit on what students may do, thus enabling them to work at their own pace according to their ability. Students are given guidance in planning the constructive use of their unscheduled time but they decide themselves on the actual timing of their studies.

The third and final phase of the independent study programme is the most independent. All study is undertaken and evaluated by the students themselves, who have to work out their own programme.

Naturally, as suggested by Patrick (1965) and Lonnon and Bodine (1971), in an independent study programme the teacher's role changes from that of a taskmaster to that of counselor, guide and friend. Independent study in some form can be used at any level from kindergarten through graduate school. It can be used either regularly or just occasionally, and with or without any special material, space and facilities.

Independent study is probably one of the most direct ways of individualizing instruction. When used in its absolute form, independent study provides each individual student with maximum freedom to choose what, how and when to learn; if not used in its purest form, a modified programme of independent study will, at the very least, foster the development of responsibility, initiative and self-direction.

However, as is the case for the majority of procedures for individualizing instruction reviewed so far in this study, there may be problems when implementing an independent study programme. One of them is the requirement of a low student-teacher ratio for adequate planning, counselling and supervision. Independent study can also be expensive if used on a comprehensive basis in a school, mainly because the strategy may require adjustment in the use of space, personnel and material.

1.3.2 Mastery Learning.

Mastery learning is one of the plans proposed by educators who believe in behaviourist psychology. Essentially, mastery learning is an instructional strategy designed to bring all or almost all students to a specified level of mastery.

Proponents of mastery learning base their plan for revising teacher behaviour on the notion that most students can attain a high level of learning capability if instruction is approached systematically, if students are helped when and where they have learning difficulties, if they are given sufficient time to achieve mastery, and if there is some clear criterion of what constitutes mastery.

The plan itself is not new. According to Block (1971), as early as the 1920s, there were at least two major attempts to produce mastery in students' learning. One was the Winnetka Plan of Carleton Washburne and his associates (1922); the other was an approach developed by Henry C. Morrison (1926) at the University of Chicago's laboratory school. During the 1930s, the idea of mastery learning disappeared, mostly as a result of the lack of technology required to sustain a successful strategy. It did not resurface until the late 1950s and early 1960s, this time as a corollary of programmed instruction. Programmed instruction worked very well for some students, but it was not effective for all or even almost all students. Furthermore, programmed instruction did not produce a useful mastery learning model. It was only in 1963 that Carroll (1963) produced what is recognized today as the first useful conceptual model of mastery learning. Carroll's model was based on the assumption that most learning tasks in a school curriculum can be mastered by all students if each student is given the time he needs. He viewed the time needed by a student to learn a school task as a function of the complexity of the task, the aptitudes and prior learning of the student, his ability to understand instruction, his perseverance in mastering the task, and the quality of the instruction. In fact, Carroll proposed that the quality of instruction depends on such elements as how clearly the learning tasks are defined; how well the materials are sequenced and graded; and how effectively tests are used to provide encouragement, praise and cognitive feedback. Then, Bloom (1968) incorporated these elements into his personal approach and transformed Carroll's model into an effective working model for mastery learning.

Nowadays, there are many versions of mastery learning in existence. However there are two basic strategies from which most approaches to mastery derive. These approaches are Bloom's learning for mastery strategy and Keller's (1968) personalized system of instruction.

Bloom's and Keller's approaches differ from each other in a number of respects. The major differences between the two strategies concern their conception of mastery, the size and sequences of their learning units, the form, mode and pace of their instruction, the nature of their feedback instruments, their mastery requirements, and their modes of correction.

Although they differ in these specific ways, Bloom's and Keller's strategies also share a set of common features which are considered essential to any mastery learning strategies. These essential features have been described by Block (1974) and can be summarized as follows:

- a) The belief that most students can master what they are taught.
- b) The importance of defining mastery and mastery standards.
- c) The specification of detailed instructional objectives.
- d) The organization of content into small sequences of learning units.
- e) The design and use of original instructional forms and modes.
- f) The importance of giving students all the time and help they need to learn.
- g) The development and use of specific feedback-correction procedures.
- h) The belief that each student should be graded on what he has learned in absolute terms rather than how well he has learned relative to his classmates.

The contribution of mastery learning strategies to the solution of the problems posed by individual differences is evident. Indeed, most mastery learning strategies adjust for individual differences by adding special feedback-corrective techniques to regular classroom instruction; by providing additional learning time for those students who need it; and by supplementing carefully prescribed individual study for those students who fail to achieve mastery in the group-based setting. However, there is no individualization with respect to learning objectives, which are prescribed for students and imposed on them by the teachers rather than selected by the students themselves.

When implementing a mastery learning strategy, there may be problems as regards available time and the provision for alternative learning correctives and alternative learning material. One could also question the presumption that all that is to be learned can be identified with a performance criterion, as well as express doubts about the possibility of extending the mastery learning strategy beyond the cognitive domain to the psychomotor and affective domains.

1.4 Procedures Centred on Educational Facilities.

Some methods of individualizing instruction concentrate on the design and utilization of educational facilities.

Since 1950, the many attempts to refine the school curriculum, instructional process and organizational pattern have led to the realization that it is difficult for teachers to engage in individualized instruction or tutor individual students without proper facilities. From this realization came the important concept of educational technology.

Duane (1973) declares educational technology essential for individualized instruction. Visual aids, closed-circuit television, films, tapes, records, and other mechanical and electronic facilities are important here. Even more significant, however, are programmed instruction and the more specialized computer assisted instruction, in which the technological impact on education in general and on individualized instruction in particular has reached its highest point.

1.4.1 Programmed Instruction.

Programmed instruction is essentially an attempt to provide instruction that is more individualized, more tailored to each student's unique learning abilities and needs.

The originator of programmed instruction is generally considered to be Sidney Pressey (1932), the inventor of the teaching machine. This early teaching machine offered the student problems together with multiple choice questions. It caused little excitement in educational circles. The man most responsible for the excitement that later surrounded programmed learning and furthered its development was B.F. Skinner (1954). A major modification of programmed material was later introduced by N.A. Crowder (1961, 1963).

Generally, programmed instruction entails a self-tutoring serial process which the individual student undergoes at his own pace. Programmes are available to teach concepts, facts and skills in such subjects as chemistry, logic, grammar, vocabulary, punctuation, spelling, mathematics and science. There is however no programme for developing such things as values, attitudes, creative writing skills, and the ability to organize ideas and examine them critically.

In programmed instruction, the material to be learned (content) is usually broken down into a small number of units, each typically consisting of a small amount of information, followed by or sometimes incorporating a question which the learner is required to answer, usually in not more than a few words.

A basic assumption underlying the organization of content into programmed learning units is that most human behaviour is learned and that learning of any behaviour rests upon the learning of a sequence of less complex component behaviours. Therefore, according to Skinner (1954), by breaking down a complex behaviour into a sequence of component behaviours, it is possible to learn the most complex skills. The effectiveness of organizing content into programmed learning units depends on the nature of the content itself; for some materials or contents it may result in decreased continuity, and where such continuity is necessary learning could suffer. On the other hand, with some types of content where continuity is not necessary it may facilitate learning.

There are two popular kinds of programmed instruction: the linear programme and the branched programme.

In the linear programme advocated by Skinner (1958), the learner proceeds through a sequence of small units of instruction. After each unit, the learner is required to answer a question. If the answer is incorrect his error is immediately corrected so that misunderstandings are not propagated. Thus, the material to be learned is broken down into very small units, each one requiring an active response on the part of the learner, and after each response the learner immediately learns whether he is correct or not.

The main advantage of the linear programme is that each student can proceed at his own pace. The main disadvantage is that each student has to proceed through identical sequences of units, progressing in very small steps which can cause frustration and boredom.

In the branched programme advocated by Crowder (1960), the learner also proceeds through a sequence of units and also has to answer a question at the end of each unit. The main difference between linear programmes and branched programmes is that in the latter the basic sequence of units generally proceeds in larger steps than is common with linear programmes, and if the learner makes an error he proceeds to a subsequence of the programme which customarily reviews in more detail the material on which he erred.

The advantages of the branched programme are that each student can proceed at his own pace and that students do not necessarily proceed through exactly the same sequence of units. Thus, the branched programme can be adapted to the needs of a wider range of students.

The major contribution of programmed instruction to individualizing instruction is that it provides for letting students progress at their own individual rates. Another prominent feature of programmed instruction is that it is largely self-instructional.

The implementation of programmed instruction implies precise specification of behavioural objectives as well as the use of continuous, progressive evaluation, diagnosis, and prescription. Thus, in this view, if instruction is to be programmed and prescribed on the basis of individual diagnosis, the school must have a workable taxonomy of behavioural

specifications and student characteristics. Teachers must have available a large inventory of instructional materials and media from which to make prescriptions. To implement such a system requires major efforts and investments.

1.4.2 Computer-Assisted Instruction.

Programmed instruction is a teaching medium which in some important but clearly restricted ways can be adapted to the needs of individual students. Some of the restrictions can be overcome with the use of computer-assisted instruction (CAI).

Since the early 1960s, large sums of money have been spent on research in order to develop an effective computer-assisted instruction system.

Basically a CAI system includes a computing centre together with a number of student terminals. Typically the learner interacts with the computer programme by means of a typewriter keyboard and/or a video-screen that reacts to a light pen. The machine in turn communicates with the learner via audio and/or video systems.

A CAI system can be put to several uses: one of the most common involves solving computational and logical problems; a second use involves drill and practice; a third application involves using the computer as a source of information. A fourth application involves the use of computers for simulation and for games; finally, a CAI system can be used for tutorial instruction.

The computer has several distinct advantages over more conventional instructional media. These include its almost unlimited storage capacity, its ability to retrieve information accurately and rapidly, its problem-solving capacity, and its versatility in terms of possible modes of presentation. Thus, Loughary (1969) and Torkelson (1972) both suggest that technology provides new educational tools which revolutionize the teaching

process and change the role of teachers, who instead of being generalists responsible for the total process become professional specialists responsible for devising instructional programmes for individual students.

Computer-assisted instruction is not widely used in education, particularly as an instructional system. However it seems appropriate to mention that in some instructional systems where the computer serves a management function, it improves quality and saves teacher time in the most crucial areas of individualization (Cooley and Glaser, 1969; Dagnon and Spuck, 1977).

In theory, CAI has enormous potential and there is a wide range of ways in which teaching by computer can be flexible and adaptive to the particular needs of the learner. According to Stolurow (1968), of all the instructional media, the computer is the only one that communicates on a completely individualized basis.

That computers are not more widely used as instructional systems is due partly to the expense of preparing individualized instructional materials (programmes), and partly to the prohibitive cost of the computers themselves. Furthermore, the implementation of a computer-assisted instruction system may cause various practical problems.

1.5 Student-Centred Procedures.

The final approach to the individualization of instruction reviewed in the present study is more free and unstructured than any of the procedures presented so far. It concentrates on the individual student and its fundamental characteristic is informality.

Two particular procedures are representative of the student-centred approach: open education and open space.

1.5.1 Open Education.

Open education is an example of an approach to individualized instruction which has been implemented in many British primary schools, and many schools in America are experimenting with the idea.

Whatever its label, be it informal education, open classroom, or free school, open education entails a special approach to the learning process. Advocates of open education argue, for example, that learning is a personal matter that is different for different children. They also recognize that children learn over varying periods of time, in repeated encounters with concrete material and experiences and in exchanges of different points of view.

The whole idea of open education has many historical roots. In fact, many of the attitudes that are basic to its formulations are consistent with the rhetoric that fills the literature of education. Thus, many ideas supporting the open education system are found in the philosophical and psychological writing of Jean-Jacques Rousseau, Johann Pestalozzi, Maria Montessori, Friederich Froebel, and John Dewey, as well as in the more contemporary works of Piaget (1969), Bruner (1966), Holt (1967), Kohl (1970), and Featherstone (1971).

In English primary schools, the movement toward more informal styles of teaching and learning took place over a forty-year period. The changes first appeared in the nursery and infant schools following publication of the Hadow Report (1933), and studies of Susan and Nathan Isaacs (1930) on child development. The successful experiment in the infant schools, as well as publication of the Plowden Report (1967), an extensive study on children and their primary schools, fostered changes in the junior schools, and in the 1960s informal practices became more common.

In the United States, it was not until the Plowden Report (1967) that large scale interest was generated. The main advocates of open education were Silberman (1970), Featherstone (1971), and Weber (1971).

According to Walter and Miriam Schneir (1971), the essence of open education is an enriched, carefully planned environment which fosters the natural instinct for learning. Students teach themselves, learning from each other, from books, and from encounters with the world about them. Silberman (1973) also stresses the fact that open education sets great store by youth and puts considerable emphasis on the quality of the school experience as an experience in itself, not merely as a preparation for subsequent study and later life. Classrooms must therefore be congenial, for the experience of youth should not be sacrificed to a race to reach adulthood.

Because teachers and students are at many different stages in their development and have different levels of experience and different personal interests, open education classrooms tend to develop their unique qualities. Space and material as well as the school community environment also make a difference. Still, there tend to be many common attributes.

In an open education classroom, students no longer sit in rows facing the blackboard; they work in groups or individually although occasionally a whole class has a formal lesson before the blackboard. It is common to see a variety of learning activities going on at the same time. Some children may be reading, others acting out a play, working at math, or painting. The mobility of children is apparent.

The classroom is typically decentralized into a variety of learning areas each representing a subject or a domain of activity. Commercial and homemade material of considerable range and diversity are found in abundance. Along with the use of common material, open education teachers place stress on the outside environment, which they view as too rich to be ignored. It serves as an excellent base for children to gain significant skills in observing, recording and interpreting what goes on in the world.

The day is no longer divided into periods according to a time-table, but is integrated. While some teachers may insist on some regular reading and writing, there are generally no required assignments and no required subjects that students must, at some time, concentrate on. Rather, students

work at their own pace on a topic of their choice from the range of subjects carefully planned by the teacher. There are generally no examinations or report cards as such. Rather, parents receive detailed histories reporting what each student has accomplished. Indeed, one of the teacher's major tasks is record keeping. This is important because children are at so many different levels and working on so many diverse topics. Planning and provisioning would be less constructive without a careful record-keeping system. The teachers attempt to write something each day about each child. And the children also maintain a variety of records. They record their activities for the day and place some of their writing, math, and other projects into files for the teacher to review.

Teachers play a far more active and creative role in open education than in the traditional educational setting. Barth (1973) considers it most important for teachers to do everything in their power to keep each student fully occupied in his particular daily activity for as long as possible, in as active and exploratory a way as possible. In this catalytic role teachers must do the following:

- a) Respect children as individuals.
- b) Organize the classroom to extend the range of possibilities children can explore.
- c) Select and provide appropriate material.
- d) Enhance children's self-expression.
- e) Provide direct instruction when appropriate.
- f) Encourage children's activity and exploration.
- g) Encourage responsibility and independence.

There is direction and structure in an open education classroom. Teacher direction and child direction are clearly balanced. Early in the year, teacher direction is greater, but it decreases during the course of the

year. By the end of the academic year, the balance has usually shifted even more toward child direction.

Open education holds considerable promise as a vehicle for individualization. Indeed, in the open education curriculum the emphasis is on each student's interests and needs. Furthermore, the open education system allows students to have different speeds and styles of learning. It is also evident that open education classrooms offer maximum freedom for the student's selection of learning experiences. In short, open education implies an "atmosphere" different from that generally found in the traditional classroom. This new atmosphere is characterized by students making decisions; selecting, at least partially, their own objectives; resolving conflicts; experiencing freedom to direct themselves; and most important, being responsible for their activities.

There are however some difficulties ahead for those who wish to implement an open education system. First, one must be fully aware that an open education system cannot survive in an environment that does not support openness, individuality, participation and trust. As such, it implies that teachers, as well as parents and administrators, are willing to "let go" of children and allow them freedom to explore, to initiate, and occasionally to be wrong. Open education also demands careful preparation and restructuring as well an environment where support services (physical and intellectual) are available. This may cause some practical problems.

1.5.2 Open Space.

During the last decade, as an extension of the open education concept, open space schools have been implemented throughout America. Most advocates of open space schools have a tendency to confuse open space, an architectural notion, with open education, a pedagogical notion. It is therefore essential to specify that open space refers to an architectural arrangement which may or may not be conducive to open education.

The main assumption underlying the open space concept is that young children need to move about and interact with people and the environment. As such, open space schools are designed to extend the learning environment and to use it more effectively.

A feature of many open space schools is the arrangement of classrooms in pods around a library and large multipurpose area. Within each pod there are classrooms which open directly into a large work centre that contains instructional media appropriate to the designated levels of instruction. Such an arrangement makes it possible to take advantage of various patterns of organization and grouping.

The major difference between open space schools and traditional schools is that in the latter, space is divided into rooms that are assigned on a permanent basis without much flexibility in use. Open space is flexible and, given proper furniture and equipment, the use of the space can change almost instantly. Students and teachers may move from a large group activity to small-group or individual study, and learning activities can flow from one place to another.

As a vehicle for individualization, the open space concept provides tremendous opportunities for students to work independently. As such, when properly planned and utilized, open space schools may foster the development of responsibility and self-direction.

The major limitation of the open space concept is encountered in its implementation. First, one must be fully aware that in open space schools, neither the goals of the programme nor the teacher roles are yet well conceptualized. As such, the organization of open space tends to be confused and confusing. Open space also implies architectural and organizational rearrangements which may cause problems as regards available funds, time, space and personnel.

1.6 Summary and Conclusions.

A large number of procedures have been developed and implemented particularly in the last two decades, for the purpose of individualizing or helping to individualize instruction. Those procedures have been analysed and classified under five major categories: those centred on organizational patterns; those centred on curriculum development; those centred on the instructional process; those centred on educational facilities; and those student-centred.

While they are all oriented towards the individual, each set of procedures concentrates on a different aspect of the educational system. The procedures centred on organizational patterns, namely team teaching and non-grading in instruction, concentrate on rearranging the organizational or structural features of a school. The procedures centred on curriculum development, namely the project method and the continuous progress approach, concentrate on the utilization of systematic, formalized programmes of individualization. The procedures centred on the instructional process, namely independent study and mastery learning, concentrate on rearranging the traditional instructional strategies. The procedures centred on educational facilities, namely programmed instruction and computer-assisted instruction, concentrate on the design and use of relevant educational facilities. The student-centred procedures, namely open education and open space, concentrate on the individual student and are characterized by informality.

Having studied the state-of-the-art in individualized instruction, one realizes that all the procedures for individualizing instruction are directed toward fitting the teaching to the learner (individualized learning) and none is directed toward fitting the teaching method to the teacher (individualized teaching).

One also realizes that there are many procedures for individualizing learning, several elements involved in each procedure, and many considerations which are dictated by the very nature of each procedure.

One characteristic of every procedure for individualizing learning is that it makes explicit the philosophical and/or pedagogical principles underlying its general orientation and practical organization. Another characteristic common to all procedures is that they allow, implicitly or explicitly, each student to proceed at his own pace. Indeed, if instruction is group-paced it cannot at the same time be individualized.

Not surprisingly, there is no "one way" of achieving individualization. As a matter of fact, all procedures analysed in this study have achieved individualization in different respects and in different ways, each of them having its uses and its limitations.

Clearly, the most common and important limitation of the majority of procedures for individualizing learning is encountered in their implementation. Indeed, most procedures have been developed to be used under very specific and predetermined conditions. Therefore the majority of the proposed procedures for individualizing learning cannot be adapted to every situation (teachers, students, schools, etc...). Consequently, only a minority of teachers can benefit from any one procedure on any one occasion.

In conclusion, a comprehensive model for individualizing instruction should therefore blend the strong points of existing procedures while trying to overcome common limitations. Such a procedure might also discover new dimensions in individualized instruction.

CHAPTER 2

EVIDENCE OF EFFECTS OF PROCEDURES FOR

INDIVIDUALIZING INSTRUCTION

The assessment of procedures for individualizing instruction should, in theory, give indications as to their relative effectiveness.

Each procedure described and analysed in Chapter 1 has to some extent been studied by research workers. Most studies were conducted mainly to give indications of educational outcomes (namely cognitive and affective) when those procedures were applied in classrooms and/or schools.

In the following pages, a review of research findings concerning the effects in terms of educational outcomes of procedures for individualizing instruction is made in an effort to make observations that could help in the design of a meaningful assessment of the effectiveness of a new general model for individualizing instruction.

Given that the procedures classified and analysed in Chapter 1 focused exclusively on individualized learning, the following review of research findings concerning the effects of procedures for individualizing instruction will concentrate solely on those procedures implemented for the purpose of individualizing learning. Therefore it must be noted that although the term individualized instruction usually refers to either individualized learning or individualized teaching, in this chapter it shall refer only to individualized learning.

2.1 Procedures Centred on Organizational Patterns.

Two particular techniques representative of the procedures centred on organizational patterns were identified in Chapter 1: team teaching and non-grading in instruction.

2.1.1 Team Teaching.

Research evidence on team teaching is scanty particularly, according to Armstrong (1977), concerning the question of whether it is demons-

trably more effective in producing learning than the conventional classroom situation with only one teacher who operates independently. Most studies (Becker, 1962; Ginther and Shryer, 1962; Bair and Woodward, 1964; Georgiades and Bjelke, 1964; White, 1964; Christensen, 1965; Holmes and Harvey, 1965; Zweibelson, 1965; Georgiades and Bjelke, 1966; Robinson, 1968; Schlaadt, 1969; Sterns, 1969; Gamsky, 1970; Lutenbacher, 1970; Burchyett, 1972; Gooper and Sterns, 1973) emerging so far suggest little, if any, consistent difference in achievement between team teaching and the more traditional approaches. Only a few studies (Riggle, Jensen and Noall, 1961; Thomson, 1963; MacCalla, 1964; Lambert, Goodwin, and Wiersma, 1965; Burningham, 1968) show that more effective learning occurred under the team approach. Lambert and his associates (1965) and Rhodes (1971) found team teaching to be somewhat less effective than the traditional approach.

While specific advantages and superiority in academic achievement have not yet been demonstrated, some other studies report a favourable student attitude toward the team approach (Zweibelson, 1965; Samuels, 1969; Bowering and Splaine, 1974) and a positive teacher attitude toward the innovation (Rhodes, 1971).

Research concerning team teaching procedures and situations is not very comprehensive, nor are the results definitive. Clearly, much remains to be done. Long-term evaluation is lacking, as are appropriate measures designed to evaluate team teaching approaches against the correct objectives.

Overall, the research to date indicates that team teaching is at least as good as the traditional procedures. There is no evidence to suggest that team teaching has resulted in detrimental effects on cognitive or affective outcomes and there is some indirect evidence to suggest that various benefits are derived from successful team programmes. Teams provide greater opportunities for teacher-student interaction, as well as opportunities for more instructional flexibility than is typically manifested in the conventional self-contained classroom.

2.1.2 Non-Grading in Instruction.

A very large number of research studies appraising the effectiveness of non-graded school organizations is now available in the literature.

Research studies conducted before 1970 are inconclusive and sometimes contradictory. McLaughlin (1967), Johnson (1968), Ward (1969), and Otto and others (1969) found some studies that reported the advantages of non-graded over graded programmes, some that favoured graded classes, and others that reported no difference in achievement. An isolated study of students' achievement conducted by Hopkins, Oldridge and Williamson (1965) in non-graded and graded schools also failed to demonstrate any significant advantage for either plan.

Curiously enough, most studies conducted after 1970 indicate that student progress is better and higher levels of academic performance are achieved in non-graded programmes. Generally, students in non-graded programmes have been doing as well as or better than their peers in the graded programmes; usually better according to several comparative studies conducted by Brody (1970), Ward (1970), Bowman (1971) and Chalfant (1972). In all cases, where students were matched for IQ, the non-graded achievement scores were significantly higher. In a comprehensive review of research on non-grading, Pavan (1973) concluded that there should no longer be concern that placing students in non-graded programmes will be detrimental to their academic achievement.

There are unfortunately very few studies giving indications of affective outcomes. However, according to the conclusions of studies conducted by Remacle (1971) and Wilt (1971), non-graded programmes also foster positive attitudes among children.

It is probably safe to conclude from these studies that non-graded programmes can enhance academic achievement and foster positive attitudes among children. Once again, it must be remembered that research concerning non-grading in instruction is not yet fully comprehensive, nor are the results definitive. Clearly, much remains to be done, particularly in the

design of more rigorous non-graded projects and in the development of more controlled research studies.

2.2 Procedures Centred on Curriculum Development.

Two particular types of material representative of the procedures centred on curriculum development were identified in Chapter 1: teacher-prepared material and commercially-prepared material.

2.2.1 Teacher-Prepared Material.

Many attempts have been made to create teacher-prepared material taking into account the factors necessary for the individualization of learning activities. Unfortunately, no research reports were found to be readily available. With the tremendous energy expended by various schools throughout America in developing the necessary materials and management procedures, little time appears to have been spent in describing and evaluating them.

Although it is impossible, at this time, to make any conclusive statements concerning the effectiveness of teacher-prepared material, it seems appropriate at least to present some assumptions about potential effects on cognitive and affective outcomes. These assumptions are summarized in the following:

- a) Since they are asked to work on realistic objectives, and since they are allowed to work at their own rates, students should be able to achieve successfully.
- b) Since they are allowed to work in their own cognitive styles and at their own levels of ability, and since they receive individual and small group teacher assistance, students should become more highly motivated.

c) Since they are being given opportunities to make decisions relative to what and how they are to learn, students should become increasingly more self-directed.

Clearly, much remains to be done in relation to the assessment of effect of teacher prepared material, particularly in the development of controlled research studies.

2.2.2 Commercially-Prepared Material.

Three major programmes representative of commercially-prepared material were identified in Chapter 1: Individually Prescribed Instruction (IPI), Programme for Learning in Accordance with Needs (PLAN), and Individually Guided Education (IGE).

Of the three major programmes, IPI seems to be the only one for which clear indications exist regarding both cognitive and affective outcomes.

With respect to the cognitive domain, progress report II (1971) indicates that IPI students achieve as well as or better than non-IPI students on standardized tests. IPI students also demonstrate higher achievement than non-IPI students on IPI tests.

Rockey and Valdes (1972) have compared IPI schools and matched control schools with respect to the affective domain and concluded that:

a) IPI and control teachers did not have significantly different perceptions of their teaching roles, attitudes toward students, perceptions of teacher-student relationships, or perceptions of students' interaction.

b) IPI teachers had a significantly more positive perception of the aide's role than did the control teachers.

c) Parents perceived that IPI students were more highly motivated, self-directed, and independent than non-IPI students.

d) IPI had a positive effect on middle-level students' self-concepts, creative tendencies, and attitudes toward school.

e) There was no significant difference between the creative tendencies of lower-level control students and those of lower-level IPI students. However, lower-level IPI students had significantly better attitudes toward school and better self-concepts than did lower-level students in the control schools.

In an early evaluation of project PLAN conducted by Lipe and Steen (1970), there were no indications regarding cognitive and affective outcomes.

As far as the IGE programme is concerned, a few field studies (Quilling and Frayer 1971; Schall, Mohan and Hull, 1973) report positive results in academic achievement. There is however no indication regarding affective outcomes.

There is no doubt that more specific and systematic testing is needed to provide definitive evaluation data concerning the commercially-prepared material. It seems reasonable, however, to assume from research studies to date that commercially-prepared material can produce high quality learning and foster positive attitudes among students and teachers.

2.3 Procedures Centred on the Instructional Process.

Two particular strategies representative of the procedures centred on the instructional process were identified in Chapter 1: Independent study and mastery learning.

2.3.1 Independent Study.

Very few independent study programmes have been evaluated scientifically.

In the area of cognitive achievement, most studies emerging so far suggest no consistent difference between independent study and more traditional approaches (Jensen, 1954; Milton, 1962; Concreve, 1964; Hollick, 1970). Only a few studies (Aiken, 1970, Postlewait, Novak and Murray, 1969) showed that more effective learning occurred under the independent study approach.

Some studies of affective outcomes showed that the independent study approach tended to generate positive interest in and positive attitudes toward the programme (Postlewait, Novak and Murray, 1969; Chickering, 1964; Hollick, 1970; Richason, 1971).

Overall, the research to date seems to indicate that independent study is at least as good as and sometimes better than more traditional procedures in producing learning. These results are very encouraging but too limited in scope to permit convincing conclusions. There are still many questions to be answered concerning independent study, particularly in relation to the assessment of cognitive and affective outcomes.

2.3.3 Mastery Learning.

Research studies on the effectiveness of mastery learning strategies have been reviewed by Block (1971, 1974). In terms of their relative impact on student achievement, the available research indicates that mastery approaches to teaching can yield substantially greater student achievement in particular subjects than the usual lecture-recitation or lecture-discussion approaches (Hesse, 1971; Hubbard, 1971; Kim, 1971; Lee et al., 1971; Sheppard and MacDermot, 1970).

There have been relatively few studies on the retention and transfer of learning. However, these studies do hint that mastery approaches to instruction may generate greater transfer of training than comparable non-mastery approaches (Hapkiewicz, 1971; Tierney, 1973; Arlin, 1973; Anderson, 1973), and may yield greater retention than comparable non-mastery approaches (Block, 1972; Kersh, 1971; Corey, Valente and Shamow, 1970; Corey, McMichael and Tremont, 1970; Moore, Hauck and Gagné, 1973).

Studies of affective outcomes showed that the mastery learning approach tended to generate positive interest in and positive attitudes toward the subject. Students also showed greater confidence in their ability to learn under the mastery learning approach (Block, 1973).

In short, research evidence to date indicates that mastery learning strategies provide an efficient and effective means to transform traditional group instruction into instruction of optimal quality per learner. However, it must be remembered, as suggested by Block (1974), that the results of research studies bearing on the effects of mastery strategies on academic outcomes, which are reported here, should be treated cautiously since they represent only those studies that have been published or disseminated in one form or another. Studies reporting positive results are more likely to be published than studies reporting negative results. There is also the fact that most studies come from instructional situations wherein mastery learning strategies might be expected to work best.

2.4 Procedures Centred on Educational Facilities.

Two particular methods representative of the procedures centred on educational facilities were identified in Chapter 1: Programmed instruction and computer-assisted instruction.

2.4.1 Programmed Instruction.

The literature is flooded with extensive reports (Porter, 1959; Lumsdaine and Glaser, 1960; Schramm, 1964; Feldhusen, 1963) on programmed instruction.

Programmed instruction has many times been shown to be highly effective (Schramm, 1964; Glaser, 1965; Decote, 1967).

In relation to its effectiveness relative to more traditional modes of instruction, the evidence can be summarized in the following conclusions:

a) Some comparisons of programmed instruction with traditional forms of instruction reveal no clear-cut advantages or disadvantages for either procedure (Feldhusen, 1963; Poppleton and Austwick, 1964; Owen, 1965; Feldman, 1965).

b) In a majority of studies, programmed instruction has produced more learning than traditional instruction (Barlow, 1960; Porter, 1959; Van Atta, 1959; Ferster and Sapon, 1960; Komoski, 1960; Roe, 1960; Klaus and Lumsdaine, 1961; Hough, 1962, Hughes, 1962; Browaeys, 1963).

c) From other experimental studies on programmed instruction, the evidence is that it takes as little as two-thirds of the time for average students to cover the same ground as compared with traditional instruction (Stavert and Wingate, 1966; Teather, 1968).

d) There are very few studies giving indications of affective outcomes. However, a study conducted by Blyth (1960) showed that programmed instruction has produced considerable progress in students' motivation. In another study conducted by Naumann (1964), the evidence shows that programmed instruction has produced favourable students' attitudes to their work.

It seems reasonable enough to conclude from the research to date that programmed instruction is at least as effective as traditional instruc-

tion in producing learning. It is however obvious that much remains to be done in terms of research. More rigorous studies should be designed in order to indicate the conditions that determine the effectiveness of a programme or machine in general. It is also obvious that more studies are needed to give indications of affective outcomes.

2.4.2 Computer-Assisted Instruction.

There is little reliable information about the relative merits of computer-assisted instruction.

Most available research reports concerning its relative impact on student achievement show, as reported by Bundy (1968), that students learn as well with CAI as with conventional classroom instruction. A few studies (Bitzer, 1963; Grub and Selfridge, 1964; Martin, 1964; Schurdak, 1965; Suppes, 1966; Atkinson, 1968) indicate that greater learning and retention can occur with CAI.

On measures of affective outcomes, research reveals that students are generally interested in and like the computer-assisted form of instruction (Mitzel and Wodke, 1965; Wilson, 1971; Bitzer, 1963; Schurdak, 1965; Wing, 1964).

In short, the evidence so far indicates that students in computer-assisted instruction classrooms are doing as well as or better than those in more conventional classrooms on measures of cognitive and affective factors. It must however be remembered, as is the case with the majority of procedures for individualizing instruction, that research concerning computer-assisted instruction is not very comprehensive and the results are not definitive. Clearly, much remains to be done. Long-term evaluation is lacking, as are studies involving sizeable numbers of students.

2.5 Student-Centred Procedures.

Two particular procedures representative of the student-centred approach were identified in Chapter 1: open education and open space.

2.5.1 Open Education.

There really has been little intensive evaluation of open education classrooms. Part of the problem lies in the lack of instruments which measure adequately such goals of open education as critical thinking, independence, responsibility, self-confidence and self-discipline.

In spite of this problem, research studies on cognitive and affective outcomes have been conducted in England and in North America.

The area of student achievement, as measured by standardized tests of cognitive ability is probably of greatest concern to educators. This concern for achievement in open education classrooms is heightened by the nature of the open learning processes and environment which are unfamiliar to most adults in terms of their own school experience. Most studies completed in England and in America support the informal, open practices, showing equal or superior achievement in nearly all academic areas of study (Gardner, 1968). Shapiro (1971) found that students in the open classrooms attained superior scores on achievement tests even though the only available traditional control students were in high-ability classes and had been in school longer. Perrone (1972) in three years of testing in North Dakota also found that students in the more open classrooms tend to achieve at levels equal to, and sometimes higher than, students in reference populations. Numerous other comparison studies corroborate the findings that students in the open programmes are doing as well as or better than those in traditional programmes on standardized tests of achievement (Godde, 1973; Greener, 1973; Rosner, 1973; Williams, 1970).

A major study conducted by Bennett (1976) at the University of Lancaster questions the value of informal, open methods. The main conclusion emerging in the study is that formal methods of teaching lead to more progress in basic subjects than do informal. The publication of the study in Britain and in the United States has attracted a great deal of attention and raises issues which are of vital importance to every teacher, parent and administrator in a position to change the schools on the basis of this. For this reason, Rogers and Baron (1977) have carefully and critically analysed the study. As a result of their analysis, they point out flaws in its author's research and methodology. In summary, they report the following weaknesses:

- a glaring inconsistency in the author's description of the way in which his sample of teachers was selected;
- a considerable confusion about the similarity and differences among children, teachers and schools;
- unwarranted liberties taken by the author with his test data;
- the fact that five of the 12 formal classes took the 11-plus examination during the experimental year, while only three of the informal classes took the exam, and that this variable is uncontrolled in the study;
- the use of a possible incorrect unit of analysis;
- the incorrect assumption, with no evidence, that all children in formal classrooms were treated identically, and that all children in informal classrooms were treated identically; and
- the fact that 50 percent of the teachers who took part in the study agreed that the tests favoured formal teaching.

Some studies on creativity in the open classrooms are showing positive findings for the development of this intellectual capacity. Comparative studies of open and traditional classrooms conducted by Wilson (1972) and Shapiro (1972) have indeed found significant differences in creativity

favouring the open classroom, and these differences seem to increase with time spent in the open programme. According to Bennett (1976), there is little evidence to support the widely held view that informal teaching produces students who are more imaginative in writing than those who are taught formally. However, he reached this conclusion by assessing imaginative writing through the formal assignment of a topic to all children, and this procedure violates most of the principles governing the production of creative responses in children.

On measures of affective factors, research reveals significant differences favouring children in the more open settings. On self-concept and self-esteem measures, the open-classroom children far surpass the traditional classroom children in many comparative studies. In addition, it appears that with increases in age and grade level, the differences become more pronounced (Krenkel, 1973; Wilson, 1972; Purkey, 1970). Attitudinal scales have also been administered, showing significantly more positive attitudes toward teachers, school, and the curriculum in open classrooms than in traditional ones (Shapiro, 1972; Tuckman et al., 1973; Weiss, 1972; Wilson, 1972). Perrone (1972) also reports that data relating to interest in and enjoyment of school, parental attitudes about their children's classrooms, and school attendance, as well as teachers' attitudes, tend to favour the more open settings at significant levels.

Overall, the evidence to date indicates that students in open education classrooms are doing as well as or better than those in more traditional classrooms on measures of cognitive and affective factors. It must be remembered however that, in general, research in education rarely proves anything once and for all and that, in particular, reviews of open education classrooms are often criticized for their lack of empirical research findings.

Thus, the support for open education evidence here should provide a rationale for continued interest in the approach and a basis for further development and research in this area.

2.5.2 Open Space.

It was noted in Chapter 1 that in open space classrooms and schools, neither the goals for the programme nor the teacher roles are yet well conceptualized. Because of this imprecision and confusion in descriptive terms and programme outcomes few consistent benefits of open space can be seen.

In fact, studies comparing open space and traditional classrooms conflict regarding cognitive and affective outcomes.

In the area of cognitive achievement, Killough (1971) found that after students remained in the open space programme for at least two years the main achievement gains of students in the third year of an open space programme were significantly better during that year, and for the total three-year period, than were those of students in another type of programme and facility. However, Warner (1970) found no significant differences between open space and self-contained classroom students on standardized achievement measures; and lower achievement gains for open space students were noted by Sackett (1971) and Townsend (1971).

In the area of self-concept, attitude and personality of the students, studies also show conflicting results. Some comparative studies conducted by Burnham (1971), Jeffreys (1971), Laforge (1972) and McCallum (1972) show no overall differences in self-concept, attitude, and personality of the student. However, two other studies conducted by Beckley (1973) and Beals (1972) show more positive attitudes toward school and self in the open space school. Moreover, a study conducted by Sackett (1971) shows that the self-concept mean score in the open space schools he studied was significantly lower than that in the self-contained schools.

In short, the studies as a whole do not find that open space school organization promotes any real differences in learning and teaching outcomes and it appears that studies will go on showing conflicting results until a definite philosophy and organization is determined and accepted by all.

2.6 Summary and Conclusions.

Each procedure used for individualizing or helping to individualize instruction described, analysed and classified in Chapter 1 has to some extent been studied by research workers.

Not surprisingly, there is no definite evidence concerning the effectiveness of those procedures. There is however a consistent body of research giving useful indications of some of their educational outcomes, both cognitive and affective.

While reviewing research studies concerning the effectiveness of procedures for individualizing instruction, certain limitations have been identified and should be kept in mind in view of future developments. Terms are often loosely defined in the research literature. Moreover, there is no universal formula either for implementing or evaluating these procedures, and there is little consistency in research designs used for assessment. Findings are seldom generalizable, because they are affected in unpredictable ways by variations in teachers, students, objectives, learning activities, materials, and so on. Finally, long-term effects of these procedures have seldom been thoroughly researched.

Despite these problems, and despite the fact that research studies on the effects of procedures for individualizing instruction are scanty, it does appear that in general these procedures do not result in detrimental effects on educational outcomes.

Overall, the research to date indicates that, with respect to the cognitive domain, the majority of the procedures for individualizing instruction reviewed in this chapter are at least as good as and sometimes better than more traditional procedures in producing learning. In relation to the affective domain, research results are less conclusive. Nevertheless, it seems reasonable enough to assume that, in general, procedures for individualizing instruction can produce positive attitudes among both students and teachers.

Once again, results have to be interpreted cautiously, because of the wide range of variables which prevents isolation of teaching modes as the only difference between classrooms or schools compared in the research. Clearly much remains to be done. Long-term evaluation is lacking in all areas, and definite answers are still not available in many areas, particularly in relation to effects on affective outcomes.

CHAPTER 3:
THE PILOT STUDY

As mentioned in the introduction, the main object of the present study is to develop and test a general model for individualizing instruction. The realization of such a project requires, on the one hand, the development of a general model for individualizing instruction and, on the other hand, the establishment of a relevant experimental plan in order to assess its effectiveness.

This chapter presents a descriptive analysis of a pilot study which was made in an effort to justify the theoretical and practical elements proposed in the new general model for individualizing instruction which will be presented in Chapter 4, and to perfect the experimental plan used to test the final general model, which will be presented in Chapter 5. Therefore, this chapter comprises two general sections: the first presents a concise description of the pilot general model for individualizing instruction, and the second describes and analyses in detail the various steps of the pilot experiment.

3.1 The Pilot General Model for Individualizing Instruction

In Chapter 1, the review of literature on individualized instruction showed that all the procedures implemented for the purpose of individualizing instruction are directed toward fitting the teaching to the learner (individualized learning). It was also shown that there is no absolute way of achieving individualization but rather that all the procedures analysed, while directed toward individualizing learning, achieve individualization in different respects and in different ways, each of these having its uses and its limitations. Most important of all, it was clear that the majority of existing procedures share one important limitation, that of having very specific and predetermined requirements which may cause practical problems as regards their implementation.

Therefore, the development of a general model aimed at individualizing teaching, with emphasis on flexibility by means of alternatives, should overcome this common limitation and thereby allow each teacher to design his own individualized learning programme irrespective of the situations in which he is placed.

The pilot general model for individualizing teaching is divided, as shown in Table 3.1, into four distinct sections: the first introduces the main competences required of a teacher in the design and administration of an individualized learning programme; the second proposes three steps for the design of an individualized learning programme; the third proposes six steps for the administration of an individualized learning programme; and the fourth section summarizes the necessary components for an effective individualized learning programme. Each section is described briefly in the following pages.

Table 3.1: The Pilot General Model for Individualizing Instruction

3.1.1	Main competences required of a teacher in the design and administration of an individualized learning programme.
3.1.1.1	General abilities.
3.1.1.2	Specific domains of knowledge.
3.1.2	Three steps for the design of an individualized learning programme.
3.1.2.1	Diagnosis of students' individual differences.
3.1.2.2	Curriculum design.
3.1.2.3	Instructional design.
3.1.3	Six steps for the administration of an individualized learning programme.
3.1.3.1	Placement of each student along the learning continuum.
3.1.3.2	Selection of individual programmes.
3.1.3.3	Selection of individual learning activities.
3.1.3.4	Guidance of each student.
3.1.3.5	Assessment of performance achieved by each student.
3.1.3.6	Record-keeping.
3.1.4	Necessary components for an effective individualized learning programme.
3.1.4.1	Individualized pacing.
3.1.4.2	Individual instructional objectives.
3.1.4.3	Variety of learning paths.
3.1.4.4	Individual student evaluation.
3.1.4.5	Teacher and student involvement.

3.1.1 The Main Competences Required of a Teacher in the Design and Administration of an Individualized Learning Programme.

The first section of the pilot general model introduces two categories of competence required of a teacher in the design and administration of an individualized learning programme. One category of competence refers to general abilities and the other refers to specific domains of knowledge. It is obvious that teachers will not be equally competent, and their handling of the next stages will vary in these respects.

3.1.1.1 General Abilities.

The main general abilities are:

- a) The ability to diagnose individual student differences.
- b) The ability to design individual curricula.

(c) The ability to design individualized learning, that is: the ability to assess student achievement of learning goals, to plan learning programmes with students, to guide students in their learning tasks, to support each individual student, to enhance development, and finally to evaluate the programme.

3.1.1.2 Specific Domains of Knowledge.

The specific domains of knowledge are mainly related to:

- a) The ongoing development of the student.
- b) The nature and conditions of learning in general.

c) School learning in particular, coupled with competence in subject matter.

3.1.2 Main Steps for the Design of an Individualized Learning Programme.

The second section of the pilot general model proposes three steps for the design of an individualized learning programme. They are: the diagnosis of students' individual differences, the curriculum design, and finally the instructional design.

3.1.2.1 First Step: The Diagnosis of Students' Individual Differences.

The first step emphasizes the importance to the teacher of understanding how to identify each student's individual profile. The importance of doing so is reinforced by the assumption that the more a teacher knows about each student, the more he is able successfully to individualize his instruction.

In this first step, nine categories of individual differences are described. They are:

- a) Physical condition.
- b) Intellectual capacities.
- c) Academic knowledge.
- d) Cognitive abilities.
- e) Learning styles.
- f) Emotional condition.

- g) Social attitudes.
- h) Interest and motivation.
- k) Family and community background.

Two means for identifying individual differences are also proposed and analysed. They are systematic observation and measurement instruments.

3.1.2.2 Second Step: The Curriculum Design.

The second step proposes and analyses four elements to be considered when designing a curriculum in the perspective of an individualized learning programme. These elements are:

- a) The philosophy of the programme.
- b) The determination of the content areas.
- c) The specification of instructional objectives. Here, special attention is given to: the importance of specifying behavioural objectives; a way of stating behavioural objectives; a taxonomy of behavioural objectives; and the characteristics of a clear and adequate objective.
- d) The task analysis. Here, special attention is given to the ordering and sequencing processes.

3.1.2.3 Third Step: The Instructional Design.

The third and final step is made up of two important aspects; they are the development of learning activities and the evaluation of the individual student.

The first aspect stresses the importance of making provision for individual learning activities. In this perspective, a system of alternatives is proposed in the following fields:

- a) Instructional methods.
- b) Instructional materials.
- c) Educational facilities.

It is also suggested here to take into account the following elements:

- a) The nature of the instructional objectives.
- b) The school and environmental resources.
- c) The teacher's personal characteristics.

The second aspect of the instructional design is devoted to the evaluation of the individual student. Here, special attention is given to the importance of evaluating each student by comparing him with himself rather than with the rest of the students in the classroom. In this respect it is proposed to report the information obtained from the evaluation in terms of "criterion-referenced" scores rather than in terms of "norm-referenced" scores.

Finally, some practical guidelines as to the construction of evaluation techniques are also proposed.

3.1.3 Main Steps for the Administration of an Individualized Learning Programme.

The third section of the pilot general model proposes six progressive steps for the administration of an individualized instruction programme.

3.1.3.1 Testing for Placement of each Student along the Learning Continuum.

3.1.3.2 Testing for the Selection of Individual Programmes by Each Student.

3.1.3.3 Testing for the Selection of Individual Learning Activities by Each Student.

3.1.3.4 The Guidance of Each Student while Performing the Learning Activities.

3.1.3.5 An Evaluation Testing for Assessing the Kind of Performance Achieved by Each Student in Terms of the Pre-established Criteria.

3.1.3.6 Keeping all the Relevant Records Concerning each Individual Student

3.1.4 The Necessary Components for an Effective Individualized Learning Programme.

The fourth and final section of the pilot general model summarizes some of the necessary components of a truly individualized learning programme. A brief description of each component follows.

3.1.4.1 Individualized Pacing.

The first component refers to individual pacing. Pacing means that each student takes the necessary amount of time to progress through the curriculum.

3.1.4.2 Individualized Instructional Objectives.

The second component stresses the importance of formulating instructional objectives which can be easily adapted to individual differences.

3.1.4.3 Variety of Learning Paths.

The third component is an invitation to the individual teacher to make provision for a variety of learning activities so that each student can take his own path toward achieving the objectives.

3.1.4.4 Individual Student Evaluation.

The fourth component refers to the student's evaluation. Great emphasis is laid on the fact that evaluation should be individualized; that is, the information collected should tell how well an individual is performing a particular learning task instead of how he compares to others in doing it.

3.1.4.5 Teacher and Student Involvement.

The final component deals with the quality of teacher and student involvement in the programme.

3.2 The Pilot Experiment.

In the first section of the present chapter, a concise description of the pilot general model for individualizing teaching was presented. This

section concentrates on a detailed description and analysis of the various steps included in the pilot experiment which was carried out to test the proposed pilot general model. Special attention is given to the experimental plan used in the pilot experiment. Therefore, the present section is made up of the following elements: hypotheses and dependent variables, research design, samples, implementation of the pilot general model, experimental procedure and data collection, instruments, plan of the statistical analysis, description and analysis of results, main findings and conclusions.

3.2.1 Hypotheses and Dependent Variables.

The main purpose of the pilot experiment was to implement the proposed pilot general model for individualizing instruction and assess its effectiveness, compared with more conventional methods.

In Chapter 2 the review of the effects of procedures for individualizing instruction (learning) showed that there is no definite evidence concerning the relative effectiveness of such procedures. However, it has been shown that most procedures for individualizing instruction (learning) can produce positive educational outcomes. Educational outcomes can be cognitive, affective and psycho-motor. In the pilot study, it was decided to confine the measured outcomes to academic achievement and certain attitudes, only in instruction in the curriculum subjects French (the first language of the students) and Mathematics.

For the purpose of the present study, it has been decided to formulate and test three research hypotheses.

3.2.1.1 Effects on Students' Academic Achievement.

Hypothesis I: The academic achievement of students who have been involved in individualized learning programmes is higher than that of students involved in more traditional programmes.

By assigning and exposing groups of students to the experimental treatment (individualized learning programmes) it should be possible to observe an increase in academic achievement. It has indeed been stated in Chapter 2 that, to date, most procedures for individualizing instruction (learning) are as good as or better than more traditional procedures at producing learning.

There are several reasons for the selection of academic achievement as the dependent variable in hypothesis I. One is the general concern of educators for academic achievement. This general concern is usually heightened in individualized instruction situations because of the very nature of individualized instruction which is unfamiliar to most educators, and indeed to most adults in terms of their own school experience. There is also the fact, according to Thorndike and Hagen (1969), that measures of academic achievement are usually used and considered useful in appraising the effectiveness of a programme or of a method.

One would expect hypothesis I to hold true for every form of academic achievement performed by students in individualized learning programmes. However, for the purpose of this study, two specific areas have been chosen; they are French and Mathematics. These two subjects have been selected as being the two most basic subjects taught in French-Canadian schools. One could also mention that of all subjects these two occupy the greatest amount of lesson time. A third subject, Art, had initially been chosen to represent the more peripheral subjects, but it was rejected because there is no formal programme of Art at the upper elementary level. Consequently it would be practically impossible to control variations in application among teachers as they would be dealing with numerous variables that are difficult to measure accurately.

3.2.1.2 Effects on Student's Attitudes towards a Subject.

Hypothesis II: The students who have been involved in individualized learning programmes have more positive attitudes towards a subject than the students involved in more traditional programmes.

By assigning and exposing groups of students to the experimental treatment (individualized learning programmes), it should be possible to observe an increase in positive attitudes towards a subject. According to the conclusions of some of the research studies reviewed in Chapter 2, it seems reasonable to assume that procedures for individualizing instruction (learning) can generally foster the development of positive attitudes toward learning by providing for individual differences and by creating a pleasant learning atmosphere.

The main reason for selecting the more specific attitude towards a subject as the dependent variable in hypothesis II is based on the assumption that the attitudes of students towards a subject is a valid indicator of a more general attitude towards learning.

3.2.1.3 Effects on Teachers' Attitudes towards Students.

Hypothesis III: The teachers who have been involved in individualized learning programmes have more positive attitudes towards students than the teachers involved in more traditional programmes.

By assigning and involving a group of teachers in individualized learning programmes (experimental treatment) it should be possible to observe more positive attitudes towards students. According to the conclusions of some of the research studies reviewed in Chapter 2, it seems reasonable to assume that procedures for individualizing instruction (learning) can generally enhance the development of teachers' positive attitudes toward students by creating situations where the teachers are more involved in the students' education and by providing greater opportunities for teacher-student interaction.

The teachers' attitudes towards students therefore have been adopted as the dependent variable in hypothesis III.

3.2.1.4 Summary.

Hypotheses I and II will show whether there are significant differences in academic achievement and in attitude towards a subject between groups of students exposed to two different types of instructional programmes. Hypothesis III will show whether there are significant differences between two groups of teachers each involved in a different type of instructional programme. The three hypotheses should offer a basis on which to reach a conclusion regarding the effectiveness of the pilot general model for individualizing instruction.

3.2.2 Research Design.

Studies and experiments comparing teaching methods usually rely, for sampling purposes, either on equivalent randomized groups, or on non-equivalent naturally-occurring groups. This study makes use of non-equivalent naturally-occurring groups.

The basic research design used in the present study is the quasi-experimental "Non-equivalent Control Group Design" proposed by Campbell and Stanley (1963).

Table 3.2 shows this basic design. The X represents the experimental treatment, and the O's represent observations. The first row represents the experimental group to which the X is assigned at random, and the second row represent the control group. The O's vertical to one another are simultaneous.

Table 3.2: Basic Non-Equivalent Control Group Design.

O_1	X	O_2
O_3		O_4

This classic design requires that, before the experimental group is submitted to the experimental treatment, both groups, experimental and control, are pretested (O_1 and O_3) on a given variable. The experimental group is then submitted to the experimental treatment X, and finally both groups are posttested (O_2 and O_4) on the same variable. A comparison can hence be made between O_2 and O_4 to see whether the experimental treatment has affected the experimental group to the point of making the test results different from those of the control group which was not submitted to the treatment.

The main reason for choosing and using the non-equivalent control group design in the present study is its effectiveness in controlling the major factors jeopardizing the internal validity of such studies, thus allowing the experimenter to be surer of his conclusions about whether treatment has had an effect. The main threats to internal validity are controlled in the following manner: the control group ensures against confounding effects of history, maturation, testing, and instrumentation with the experimental effect; the pretest scores give a check on differential selection of subjects and may be used to modify post-test scores. Mortality effects, namely loss of subjects during the experiment, may be ascertained by examining pretest and post-test records.

It is important to mention at this time that this basic design has little control of factors jeopardizing the external validity of the research as it does not necessarily sample randomly from, for example, all types of cultural background of all teachers. Therefore, the conclusions of the pilot experiment will be applicable only to the conditions of the present research. The three research hypotheses stated in section 3.2.1 of the present pilot study may be tested, however, with validity appropriate to these conditions.

3.2.3 Samples.

The main sampling objective of this pilot study was to find classes where the pilot general model for individualizing instruction could be implemented, and others that could serve as control groups for the testing of the three research hypotheses.

All the teachers of the upper elementary level (fourth, fifth, and sixth grade) in School District Number Thirteen, Moncton, New Brunswick, Canada, were invited to participate in the experiment on a voluntary basis. District Thirteen is a French district where approximately 10,000 students are educated and there are twenty-two elementary schools employing approximately 218 teachers. The teachers have spent an average of two years part-time at the university but the professional experience of the teachers varies. Within this district can be found a wide range of schools and environmental contexts. There are small schools and larger schools; there are old schools and new schools; and there are schools serving a large city, schools serving smaller cities, and schools serving villages though they are of the same educational system. In all these schools, the majority of teachers arrange that their students sit separately at individual desks and students remain in the same seats for most work in the classroom which consists mostly of large group activities.

It was decided to limit the invitation to participate in the pilot experiment to teachers in the upper elementary level on the assumption that students at this level had sufficiently mastered the necessary skills (reading and writing) permitting them to respond to the tests and questionnaires used to collect the data for this pilot experiment. Four schools were contacted and as shown in Table 3.3, twelve teachers representing them and the three grades of the upper elementary level manifested their desire to participate in the pilot experiment on a voluntary basis. After their principals had agreed, these teachers were then invited by the experimenter to attend an information session. At the end of the session, each teacher was assigned to a group (experimental or control) and to a subject (French or Mathematics). In the notation of Campbell and Stanley's design, X represents the experimental treatment which is "individualized learning".

Table 3.3: Distribution of Teachers in Schools According to Grade

School	Grade	Number of Teachers
(1)	5th	2
	6th	2
(2)	4th	2
	6th	2
(3)	4th	2
(4)	5th	2

One must note at this point that before assigning each teacher to a group and to a subject, the experimenter had made the following decisions concerning the distribution of the sample:

a) Of the twelve teachers who responded to the invitation to participate in the pilot experiment there were four in each of the three grades of the upper elementary level. Therefore, it was decided that in each of the three grades two teachers would be assigned to French and two others to Mathematics, thereby providing for six comparisons namely experimental and control for French in the fourth, fifth and sixth grades, and Mathematics in the fourth, fifth and sixth grades.

b) In each of the four schools represented in the sample there were at least two teachers in the same grade, although each grade was not necessarily represented in each school, thus each of the six combinations to be compared would be composed of two teachers from the same school. It was believed that such an arrangement could insure a minimal experimental control of the possible interaction effects of the variable "school" with the main effects of X (individualized learning programmes) on the dependent variables of the present study. It will be noted that the analysis has been carried out for each separate pair of teachers. No attempt has been made to analyse school effect. For the reason that school effect tends to be confounded with grade, no attempt has been made to compare grades.

The assignment of each teacher to a group and to a subject was then made at random (drawing names from a box) and in the following order: at first, for each of the combinations of comparison one teacher was selected to represent the experimental group and the other to represent the control group. Finally, for each of the three grades one of the two teachers selected to represent the experimental group was assigned to French and the other to Mathematics.

The final distribution of the sample for the pilot experiment is shown in Table 3.4.

Table 3.4: Distribution of the Sample for the Pilot Experiment.

Grade	Subject	Experimental Group	Control Group
4th	French	1 teacher 24 students	1 teacher 24 students
4th	Maths	1 teacher 25 students	1 teacher 25 students
5th	French	1 teacher 24 students	1 teacher 22 students
5th	Maths	1 teacher 16 students	1 teacher 16 students
6th	French	1 teacher 28 students	1 teacher 25 students
6 th	Maths	1 teacher 20 students	1 teacher 25 students

3.2.4 Implementation of the Pilot General Model.

The pilot general model for individualizing instruction was presented and explained to the teachers of the experimental group over a period of ten weeks extending from the beginning of October to mid-December, 1974.

The main purpose of the briefing was to provide the teachers of the experimental group with appropriate training in the design and administration of an individualized learning programme according to the proposed pilot general model.

The training in the principles of the pilot general model conducted by the experimenter consisted mainly of lectures, discussions, practical assignments, and answers to questions asked. Briefly, the teachers in the experimental group had to attend a two-hour meeting each week for ten consecutive weeks; they also had to work on the design of their own individualized learning programme. It is important to note that, at this time, each teacher was given a handwritten transcription of the pilot general model.

The content of the sessions included training relevant to the four general sections of the pilot general model which were briefly described in section 3.1 of the present chapter. The four sections are:

- a) The main competences required of a teacher in the design and administration of an individualized learning programme.
- b) Three steps for the design of an individualized learning programme.
- c) Six steps for the administration of an individualized learning programme.
- d) The necessary components of an effective individualized learning programme.

During the same period of time, the teachers in the control group attended a weekly seminar. The main reason for providing the teachers in the control group with such an activity was to bring a minimal experimental control to the well known "Hawthorne effect" discussed by Isaac and Michael (1971).

The main subjects discussed in those weekly seminars are:

- a) The nature and conditions of learning.
- b) Intelligence and learning.
- c) Motivation and learning.
- d) Discipline in the classroom.
- e) Transfer of learning.

At the end of the period of time allowed for the training in the pilot general model, both groups of teachers (experimental and control) were requested to carry out the programme to which they had been assigned for the rest of the year. Thus individualized learning programmes (the independent variable in the present study) were used by the teachers in the experimental group, and traditional instruction programmes (a control variable) by the teachers in the control group.

3.2.5 Experimental Procedure and Data Collection.

The pilot experiment was carried out between the beginning of January and the end of April, 1975.

It must be mentioned here that according to the regulations of the New Brunswick School System, the teachers (in the fourth, fifth and sixth grades) assigned to the subject Mathematics were allocated five periods of fifty minutes each, and this every week, for teaching Mathematics and the

teachers (in the fourth, fifth and sixth grades) assigned to the subject French were allocated eight periods of fifty minutes each, and this every week, for teaching French. A summary of the content of the French and Mathematics programmes for each of the three grades of the upper elementary level is presented in Appendix A.

During the experiment, the experimenter met twice with the teachers of the experimental group in order to answer their questions and to make sure that they were acting according to the proposed pilot general model.

Measuring instruments used to collect the data in the present study were administered at the beginning (first week in January) and at the end (third week in April) of the pilot experiment. Three different instruments were used: achievement tests (in French and Mathematics) and a subject perception test which were administered to the students and the Minnesota Teacher Attitude Inventory which was administered to the teachers. The same tests were administered under similar conditions to both the experimental and the control group. All tests were administered in groups.

3.2.6 Instruments,

Three main instruments for data collection were used in the pilot study, as described in the following pages: their reliability and validity are also discussed.

3.2.6.1 The Standardized Achievement Tests.

Standardized achievement tests (French 4, 5 and 6, and Mathematics 4, 5 and 6) developed by the Montreal Catholic School Commission (M.C.S.C.) were used to test the first hypothesis in the pilot study. All the tests used were survey-type objective tests composed of 35, 40 or 45 questions. Each group of students responded to a specific test according to

his grade and study subject. All the tests were administered in groups by the experimenter. The instructions given to the students were the same for the six tests (a copy of the instructions can be found in Appendix B). For each question, a correct answer was assigned a score of one.

The six achievement tests used in this study were standardized by the M.C.S.C. over a French-speaking population. The main justification for the use of standardized instruments in this study is that, according to Thorndike and Hagen (1969), such instruments have proved valuable in situations where the results of testing are used to compare achievement between schools or classes; that was precisely the case in the present study. At the same time, however, the experimenter was aware that standardized tests are sometimes considered biased against informal teaching and that consequently the use of such instruments could possibly favour the students in the control classes who, during the experiment, were exposed to traditional instruction programmes.

The six standardized achievement tests developed by the M.C.S.C. were selected in preference to other instruments to measure achievement in French and Mathematics largely on the basis of their high applicability to the samples in the present study. The main reason for selecting them are:

- a) There were no such tests for the French-speaking population of New Brunswick.
- b) The tests were standardized with a French-speaking population.
- c) The items of the tests were chosen from instructional programme equivalent to those used in the French-speaking schools of New Brunswick.

Studies as to the reliability and validity of the standardized achievement test used in this study were conducted by the M.C.S.C..

According to the information supplied by this organization, internal consistency reliability was calculated for each of the six instruments from

the answers of 600 students. The Kuder-Richardson (formula 21) reliability estimates for the six instruments were all over 0.90.

From this source also, evidence for content validity was available through their use of item analyses. Evidence for predictive validity was provided through correlation studies among the different achievement tests for different grades. The results of the correlation studies (see Table 3.5) are as follows: the French achievement test for the fourth grade has a correlation coefficient of 0.84 with the French achievement test for the fifth grade and a coefficient of 0.83 with the test for the sixth grade; the French achievement test for the fifth grade has a correlation coefficient of 0.86 with the French achievement test for the sixth grade; the Mathematics achievement test for the fourth grade has a correlation coefficient of 0.82 with the Mathematics achievement test for the fifth grade and a coefficient of 0.78 with the test for the sixth grade; and the Mathematics achievement test for the fifth grade has a correlation coefficient of 0.85 with the Mathematics achievement test for the sixth grade. These correlations are significant.

Table 3.5: Correlations for Parallel Test Reliability

	French			Mathematics		
Grade	4	5	6	4	5	6
4		.84	.83		.82	.78
5	.84		.86	.82		.85
6	.83	.86		.78	.85	

A copy of each achievement test used in the pilot study is given in Appendix B.

3.2.6.2 The Subject Perception Test.

The subject perception test constructed by the author was used to test the second hypothesis in the pilot study. The subject perception test is a questionnaire measuring the attitude of the students towards the subjects they learn in school.

The questionnaire is composed of eight items representing each of the eight subjects learned in the upper elementary level of the French-speaking schools in New Brunswick. Each subject is listed in alphabetical order in the questionnaire. The administration of the questionnaire can be described in the following manner: first, the experimenter reads the subjects to the students; second, he asks the students to assign a numerical value from one to eight to each subject listed. The numerical value of one should correspond to the subject the students perceive as being the least interesting to learn, and the numerical value of eight should correspond to the subject the students perceive as being the most interesting to learn. Students are told by the experimenter not to assign a particular numerical value to more than one subject. A copy of the detailed instructions can be found in Appendix C.

The various steps included in the construction of the subject perception test can be briefly described in the following manner: at first, the experimenter thought of asking individually each student whether or not he was interested in learning Mathematics or French. It soon became obvious that this direct individual approach (the experimenter asking each students to answer individually) could greatly influence, in one way or another, each student's answer and that it would be practically impossible to control its effects on a large sample. As a second attempt, it was therefore decided to adopt a more indirect approach in order to minimize the above-mentioned bias. The final step resulted in the construction of the subject perception test (written test administered in groups) in which each student

is asked to assign a rank to all subjects learned in school rather than to only one or two subjects. It was believed that this indirect approach would permit a more valid measurement of the attitude of each student toward French and Mathematics. This method also has disadvantages as the intensity of the attitude is not necessarily measured. For example, when Mathematics is given a score of eight by one student, he might consider it the best of a number of subjects none of which he liked very much, whereas eight given by another student could imply great enthusiasm for Mathematics.

Studies as to the reliability and validity of the subject perception test were conducted by the author. Evidence was obtained for criterion-related validity and estimate was obtained for one form of reliability, the stability of the instrument. It has to be borne in mind that rankings are not measures and subsequent statistical methods which depend on normality of distribution of the quantities analysed may be invalid.

The validation of the instrument was conducted with a sample composed of 101 students of the fifth and sixth grades in four different schools. Students in the fourth grade did not participate in the validation of the instrument because, at that time, they were writing special examinations administered by school psychologists. Evidence for criterion-related validity in the mathematics scores was obtained by comparing the teachers' classifications of students as being very or little interested in learning Mathematics with the numerical values assigned by the same students to Mathematics. The results obtained are as follows: of a sample of 20 students classified by the teachers as being very interested in learning Mathematics 14(70%) had assigned a numerical value superior to the mean value (4.55) assigned to Mathematics by all the students (101) in the sample; of a sample of 20 students classified by the teachers as being little interested in learning Mathematics 17(85%) had assigned a numerical value inferior to the mean value assigned to Mathematics by all the students in the sample. These results are interpreted as being very satisfactory and the subject perception test is therefore treated as though it were a collection of valid measures of students' attitudes towards the subjects they learn in school.

A stability estimate was obtained by the retest method (three-week interval) with the same sample of 101 students who participated in the validation of the instrument. The stability index was calculated for the numerical value assigned by each of the 101 students to Mathematics. The result obtained was $r=0.74$.

This stability index is considered acceptable despite the fact that a three-week interval is not long in terms of the usual time-lag of about four weeks used in a test-retest investigation. For these age groups, attitudes themselves tend to change rapidly and the low correlation could easily be due to changes in the criterion measured. In other words, it is not the test which is at fault but the criterion is unstable.

A copy of the subject perception test is given in Appendix C.

3.2.6.3 The Minnesota Teacher Attitude Inventory.

The Minnesota Teacher Attitude Inventory (M.T.A.I.) developed by Cook, Leeds and Callis (1951) was used to test the third hypothesis in the pilot study. The M.T.A.I. was designed mainly to measure those attitudes of a teacher which predict how well he will get along with students in interpersonal relationships.

The M.T.A.I. is practically self-administering. The teachers read the directions on the front page of the booklet and then proceed to answer each of the 150 items. The possible range of scores is from plus 150 to minus 150. Each response scored "right" has a value of plus one, and each response scored "wrong" has a value of minus one. The raw scores obtained can be transformed into percentiles but for the purpose of the present study only the raw scores were considered.

The reliability and validity of the M.T.A.I. were studied by its authors. Evidence was obtained for criterion-related validity by comparing the responses of a group of 100 teachers to the test with the responses to another test known as, "My teacher". The result obtained was a correlation

coefficient of 0.93. The stability estimate determined by the retest method was $r=0.87$.

A copy of the Minnesota Teacher Attitude Inventory is given in Appendix D.

3.2.7 Plan of the Statistical Analysis.

The result of testing the three hypotheses of the pilot study were all analysed by means of covariance analysis using the pretest scores as the covariate. The computer programme used to perform the analyses is the BMD 04V programme edited by W.J. Dixon (1974).

The techniques of analysis of variance and covariance are now regarded as the best means by which to evaluate the results of "methods" experiments.

One way of dealing with data arising from this model is to compute for each group (experimental and control) pretest-posttest gain scores and to compute a "t" between experimental and control groups on those gain scores. However, according to Campbell and Stanley (1963) and Gourlay (1953), in order to increase the precision of the experiment, an analysis of covariance with pretest scores as the covariate is better than simple gain-score comparisons.

Analysis of covariance has an advantage over analysis of variance insofar as it may sometimes happen that experimental errors cause variability which is irrelevant to the experiment and which may change the conclusions. For instance, in the present study, there could be a bias in the post-test results due to random differences in the initial achievement of students in the two groups. According to Winer (1970), there are two methods of controlling variability due to experimental error: the direct method which consists of matching equally the groups of students and the indirect method which is to use a statistical method of control. In the present study, the experimenter was not authorized by School District

Number Thirteen to match equally the groups of students. To overcome this difficulty use was made of covariance analysis to assess test results at the end of the pilot study.

In summary, covariance analysis was used to increase the precision of the study by controlling variability due to experimental error.

The method of covariance analysis is described by Ferguson (1959), Lindquist (1970), and Winer (1970). Essentially, it consists of taking initial reading of a measure of any property which the experimenter estimates may affect the results, and in making an adjustment on the final readings to allow for the differences in the initial ones.

The level of significance for all the analyses performed in the pilot study was fixed at 0.05.

3.2.8 Description and Analysis of Results.

This section of Chapter 3 is devoted to a summary description and analysis of the results obtained in testing each of the three hypotheses of the pilot experiment. Each research hypothesis is rephrased in null form for the purposes of statistical testing.

3.2.8.1 Effects on Students' Academic Achievement.

Hypothesis I: The academic achievement of students who have been involved in individualized learning programmes is not different from that of students involved in more traditional programmes.

Table 3.6 reports the means and standard deviations of the achievement test (French and Mathematics) scores obtained by all the students in the experimental and control groups.

Table 3.6: Means and Standard Deviations of the Achievement Tests (French and Mathematics) Scores Obtained by the Students in the Experimental and Control Groups.

Group	Test	Pretest		Posttest	
		M	SD	M	SD
Experimental					
A	French 4	18.54	7.23	22.33	7.09
B	Maths 4	14.40	7.15	18.56	7.72
C	French 5	15.67	6.17	17.25	7.49
D	Maths 5	16.38	6.09	21.13	5.99
E	French 6	18.32	8.36	20.79	9.58
F	Maths 6	19.55	8.56	22.50	7.13
Control					
G	French 4	17.29	6.51	20.29	7.09
H	Maths 4	17.44	6.19	20.80	6.38
I	French 5	16.86	5.60	18.45	6.57
J	Maths 5	18.25	7.14	21.44	6.21
K	French 6	17.88	6.48	21.20	7.64
L	Maths 6	17.00	8.30	20.08	9.34

The results obtained in testing hypothesis I were analysed by means of a one-way analysis of covariance using the pretest scores as the covariate.

The F tests for the main effects are presented in Table 3.7. A study of this table indicates that the differences obtained between the scores of the students in the experimental groups and those of the students in the control groups on the French and Mathematics achievement tests are not significant and that there is no sufficient evidence to reject the null hypothesis at a 0.05 level of significance.

Table 3.7: One-Way Analysis of Covariance for the Students in the Experimental and Control Groups for the Achievement (French and Mathematics) Tests.

Source	SS	df	MS	F
Teaching methods, French, 4th grade	11.32	1	11.32	0.561
Error	098.83	45	20.19	
Teaching methods, Maths, 4th grade	2.10	1	2.19	0.129
Error	763.53	47	16.24	
Teaching methods, French, 5th grade	0.04	1	0.04	0.005
Error	467.21	43	10.86	
Teaching methods, Maths, 5th grade	10.01	1	10.01	0.871
Error	333.35	29	11.49	
Teaching methods, French, 6th grade	9.94	1	9.94	0.605
Error	822.20	50	16.44	
Teaching methods, Maths, 6th grade	0.00	1	0.00	0.000
Error	373.85	42	8.90	

The means are not always in the expected direction expressed in the first research hypothesis since the scores obtained by the students in the experimental groups are not higher on the achievement tests than those obtained by the students in the control groups. Taking into account the differences in initial ^{END FINAL} scores (see Table 3.6) as a crude measure of the relative efficiency of experimental and control procedures, we note that the mean differences (see Table 3.8) are larger in the experimental group than the control group at three levels (French 4, Maths 4, Maths 5), that

they are larger in the control group than the experimental group at two levels (French 6, Maths 6); and that there is no difference between the two groups at one level (French 5).

Table 3.8: Mean Differences in Two Groups of Pre-Post Test Scores (French and Mathematics Achievement Tests).

	Experimental	Control	Groups Showing Greater Gain
French 4	3.79	3.00	Experimental
Maths 4	4.16	3.36	Experimental
French 5	1.58	1.59	-----
Maths 5	4.75	3.19	Experimental
French 6	2.47	3.32	Control
Maths 6	2.95	3.08	Control

Though in all cases the more refined covariance procedures showed that none of these differences was significant (see Table 3.7), it is of some interest to note that the trend with grades is in the direction of suggesting that the experimental method becomes less efficient with the older students.

3.2.8.2 Effects on Students' Attitudes Towards a Subject.

Hypothesis II: The students who have been involved in individualized learning programmes do not have attitudes towards a subject different from those of the students involved in more traditional programmes.

Table 3.9 reports the means and standard deviations of the numerical values assigned to the subject (French and Mathematics) perception tests by the students in the experimental and control groups.

Table 3.9 Means and Standard Deviations of the Numerical Values Assigned to the Subject (French and Mathematics) Perception Test By the Students in the Experimental and Control Groups.

Group	Subject	Pretest			Posttest		
		N	M	SD	N	M	SD
Experimental (A, C, E)	French	76	3.99	2.15	76	3.63	2.29
Experimental (B, D, F)	Maths	61	5.83	2.31	61	5.28	2.38
Control (G, I, K)	French	71	3.92	2.26	71	3.66	2.01
Control (H, J, L)	Maths	66	5.90	2.17	66	4.95	2.19

The results obtained in testing hypothesis II were analysed by means of a one-way analysis of covariance using the pretest scores as the covariate.

The F tests for the main effects are presented in Table 3.10. A study of this table indicates that the differences obtained between the numerical values assigned by the students in the experimental groups and those assigned by the students in the control groups on the Subject (French and Mathematics) Perception Test are not significant and that there is not sufficient evidence to reject the null hypothesis at a 0.05 level of significance.

Table 3.10: One-Way Analysis of Covariance for the Students in the Experimental and Control Groups for the Subject (French and Mathematics) Perception tests.

Source	SS	df	MS	F
Teaching methods, French 4, 5 and 6 grade	0.14	1	0.14	0.04
Error	535.24	144	3.43	
Teaching methods, Maths 4, 5 and 6 grade	5.44	1	5.44	1.51
Error	562.81	124	3.60	

The changes in attitude means are not in the expected direction expressed in the second hypothesis and crude difference scores are inspected.

As shown in table 3.11, the mean differences of the Subject Perception Test (French) are very small in both groups but in favour of the control group, and the mean differences of the Subject Perception Test (Mathematics) are quite large for both groups but in favour of the experimental group.

The consistent reduction in attitude over the experimental period is difficult to explain, though the more refined covariance procedures suggest that the differences are not significant (see Table 3.10). As the mathematics (control group) fall is largest, it is perhaps worth pursuing whether the experimental method has some advantage over the control method in regulating the lowering of attitude towards Mathematics.

Table 3.11: Changes in Means of Subject Perception Test

	Experimental	Control	Difference
French	-.36	-.26	Very small, but in favour of control group
Mathematics	-.55	-.95	In favour of experimental group.

3.2.8.3 Effects on Teachers' Attitudes Towards Students.

Hypothesis III: The teachers who have been involved in individualized learning programmes do not have attitudes towards students different from those of the teachers involved in more traditional programmes.

Table 3.12 reports the means and standard deviations of the Minnesota Teacher Attitude Inventory scores obtained by the teachers in the experimental and control groups.

The results obtained in testing hypothesis III were analysed by means of a one-way analysis of covariance using the pretest scores as the covariate.

The F test for the main effect is presented in Table 3.13. A study of this table indicates that the differences obtained between the scores of the teachers in the experimental group and those obtained by the teachers in the control group on the Minnesota Teacher Attitude Inventory are not significant and that there is not sufficient evidence to reject the null hypothesis at a .05 level of significance.

Table 3.12: Means and Standard Deviations of the Minnesota Teacher Attitude Inventory Scores Obtained by the Teachers in the Experimental and Control Groups.

Group	Pretest			Posttest		
	N	M	SD	N	M	SD
Experimental	6	20.83	29.79	6	28.33	29.92
Control	6	4.83	40.04	6	-1.50	41.93

Table 3.13: One-Way Analysis of Covariance for the Teachers in the Experimental and Control Groups for the Minnesota Teacher Attitude Inventory.

Source	SS	df	MS	F
Teaching methods	383.35	1	383.35	2.91
Error	1185.64	9	131.62	

The results of the analyses do not support the third research hypothesis since the scores of the teachers in the experimental group are not significantly higher than those of the teachers in the control group on the Minnesota Teacher Attitude Inventory, when initial levels are taken into account. However, the direction of change is favourable in the experimental group and unfavourable in the control group since a mean gain of 7.50 is recorded in the first case compared with a loss of 6.33 in the second.

3.3 Summary and Conclusions.

In the present study a pilot study was carried out. One purpose of the study was to gain experience to modify the theoretical and practical elements proposed in the new general model for individualizing instruction which is presented in the following chapter. The experimental plan used to test the modified general model also made use of the experience gained in the pilot study and is presented in Chapter 5.

3.3.1 Main Findings and Conclusions.

The main purpose of the pilot study was to develop and test a pilot general model for individualizing instruction. The main findings, based on the testing of the three research hypotheses, were:

a) That the academic achievement (French and Mathematics) of students involved in individualized learning programmes is not higher than that of students involved in more traditional programmes. But there was some evidence that the experimental method was more efficient in this respect for younger students.

b) That the students involved in individualized learning programmes do not have more positive attitudes towards a subject (French and Mathematics) than the students involved in more traditional programmes. There was a disturbing finding that all mean attitudes of groups deteriorated.

c) That the teachers involved in individualized learning programmes do not have more positive attitudes towards students than the teachers involved in more traditional programmes, though an improvement was recorded for the first group while a fall was measured for the second.

On the basis of these findings, one must conclude that the pilot general model for individualizing instruction proposed in this pilot study did

not prove effective in guiding teachers to design and administer individualized learning programmes producing more positive educational outcomes than more traditional instruction programmes.

3.3.2 Main Limitations and Weaknesses.

It is important that the findings of the pilot study be considered with caution, since, in a strict sense, they are applicable only to the specific conditions of the study. The major limitations hampering the generalization of the findings can be summarized as follows:

a) The teachers involved in the pilot experiment were selected on a voluntary basis and as such may not be representative of teachers, classrooms and schools in general.

b) There were only four schools involved in the pilot experiment.

c) The pilot experiment was carried out with only two academic subjects, French and Mathematics.

d) The pilot experiment was carried out in only three elementary-level grades, the fourth, fifth and sixth.

It is also very important, when discussing the external validity of the present research, to note that during the period of time allocated for the experiment the teachers throughout the province of New Brunswick undertook political action in the form of contract negotiations. It is believed that such an unforeseeable event might have greatly influenced the findings of the research by lowering the motivation of the teachers participating in the experiment. This would primarily have affected the teachers in the experimental groups since their participation in the study was far more demanding than that of the teachers in the control groups. The time of the year may also have affected the findings.

Among the weaknesses of the pilot study that might have contributed to the lack of significant results obtained in testing the three pilot research hypotheses are those related to the content of the pilot general model and those related to the experimental plan used to test the pilot general model.

In relation to the content of the pilot general model, the following weaknesses were identified:

a) The content of the pilot general model placed too much emphasis on technical features and consequently lacked humanistic components. According to the teachers in the experimental groups there was a need for such components, particularly in relation to the creation and maintenance of a favorable climate for individualization.

b) The content of the pilot general model did not allow for sufficient alternatives. According to the teachers in the experimental groups there was a need for more alternatives, particularly in sections 3.1.2 and 3.1.3 of the pilot general model.

In relation to the experimental plan used to test the pilot general model, the following weaknesses were identified:

a) The teachers in the experimental groups were given a handwritten transcript of the pilot general model. This might have had a negative effect (confusion) on the comprehension and interpretation of the model by the teachers.

b) The smallness of the sample (only one experimental group and only one control group for each of the six combinations being compared) could affect the reliability of the results, as the groups came from particular teachers, in particular schools the climate of whose classrooms may have been confounded with the performances of their students.

c) The period of time allocated for the pilot experiment may have been too short. According to Cronbach (1966), studies of instruction should be continued over a substantial timespan. This timespan should be of

sufficient duration to enable students to be familiar with the style of instruction. Moreover the particular time of the year (Winter to Spring) during which it was carried out may have affected the findings.

d) The use of standardized tests to measure achievement may have influenced the results obtained in testing hypothesis one. Standardized tests are sometimes considered biased against informal teaching. Thus, the use of such instruments in the pilot experiment may have favoured the control groups who were exposed to traditional teaching. The use of the same test for pre and post testing may also have affected the findings.

e) There were no adequate controls to insure that the teachers in the experimental groups had indeed designed and administered individualized learning programmes according to the pilot general model.

f) The Minnesota Teacher Attitude Inventory was developed for use in another culture and possibly the non-significant findings are due to lack of relevance of some items to the situation of the present research.

CHAPTER 4

THE NEW GENERAL MODEL FOR INDIVIDUALIZING INSTRUCTION

In Chapter 3 of the present study, a descriptive analysis of a pilot study was made partially in an attempt to justify and consolidate the theoretical and practical elements proposed in a new general model for individualizing instruction.

In this Chapter, the new general model for individualizing instruction is presented. Specifically this chapter includes three general sections: the first presents some theoretical foundations underlying the new general model; the second introduces the conceptual framework of the new general model; the third translates the conceptual framework of the new general model into operational elements.

4.1 Theoretical Foundations

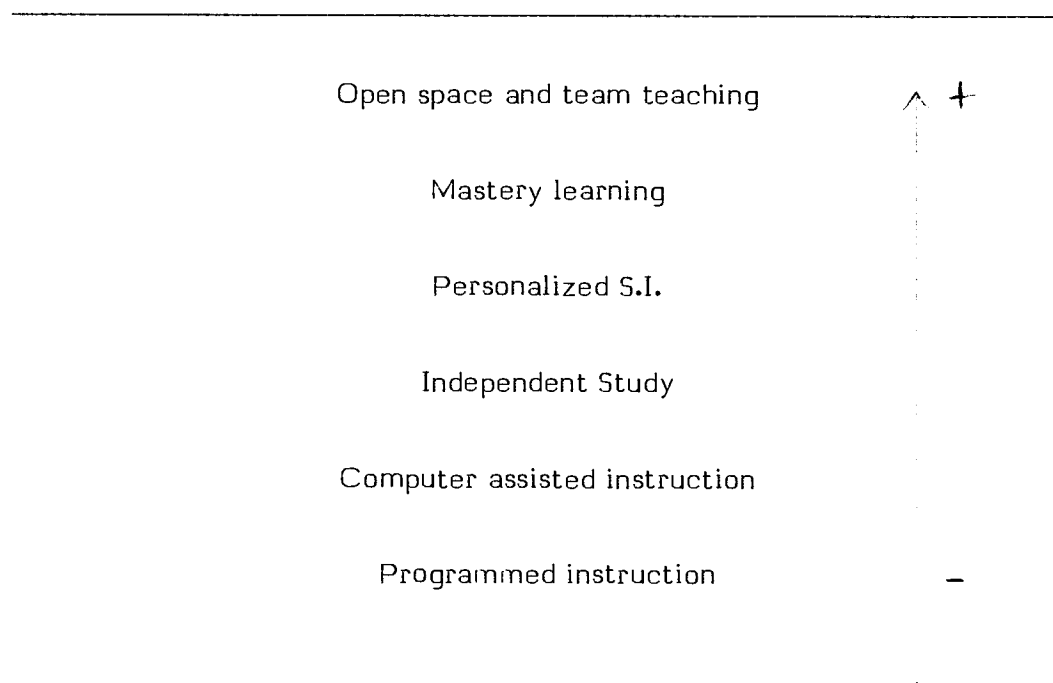
4.1.1 An Analysis of Current Models

Implicit in all models of individualized instruction is the assumption that learning is more efficient when the teaching procedure is fitted to the individual characteristics of the learner.

This idea of fitting the teaching to the learner is at the centre of most modern attempts to redesign the educational procedure and is equally apparent in the group team-teaching approach and in individualized programmed learning.

What distinguishes one model from another is the extent to which it makes use of the social or group pressures in the concrete teaching situation. Indeed one may arrange all the individualized instructional techniques reviewed in the earlier chapters in a hierarchy with those giving minimal attention to social interaction at the base rising to those with a high level of dependence on it. Such a hierarchy could be represented as shown in Table 4.1.

Table 4.1 Teaching models in Hierarchy of Emphasis on Social Forces in Learning.



Any analysis of current teaching models therefore, should take these two separate emphases into account, i.e. to fit the teaching to the learner and to utilize the forces of social interaction in learning. Teaching models, to varying degrees, cater to the characteristics of the learner as an individual and in a group situation. Two vital aspects of the teaching process receive little attention, however. These are, the individuality of the teacher on the one hand and his role in adapting the teaching method to the learner. Taking the individuality of the teacher first, it may be argued that just as different learner characteristics require different teaching techniques for efficient learning, it is reasonable to assume that different teacher characteristics lead to different teaching styles and require different teaching methods for efficient teaching. In other words, the need to individualize teaching as opposed to the individualization of learning has been overlooked. The task is simply one of fitting the teaching method to the teacher.

Evaluation studies, for what they are worth in this field, understandably fail to agree amongst themselves, since such an important factor

as the teacher characteristic has not been controlled. Not only at the empirical level has the problem been ignored, but at the theoretical level no serious attempt has been made to construct a viable model of individualized instruction which adequately incorporates the teacher as an individual. This proves to be the case in spite of the wealth of empirical evidence (Ryans, 1960-61; Fotter, 1963; Gage, 1967; Flanders, 1970; Resenshine, 1970-71; Rosenshine and Furst, 1973; Dunkin and Biddle, 1974; Ashton and others, 1975) supporting the view that teachers' personalities and characteristics influence their decision making and teaching performance.

The unique role of the teacher in fitting the teaching to the learner is the second area so far overlooked. In some models individualization is taken to imply reliance on instrumentation instead of the act of equating the learning task to the learner. This criticism applies more cogently to models towards the base of the hierarchy shown in table 4.1. The emphasis in these models is toward removing artificial constraints upon the learner: time pressure, speed of attainment, competitive grading, imposed objectives, imposed learning techniques and styles, all contrived to impair individuality and efficient learning. Constraints such as these are removed by tailoring the teaching to individual learning needs. However, the question arises, who does the tailoring in the classroom? Even when tailoring is reduced to a minimum, as in the case of programmed learning, the teacher is still involved. In other words, constraints are removed from the learner and placed on the shoulders of the teacher.

From this brief analysis of current models of individualization, four essential points stand out:

- a) All models aim at fitting the teaching to the learner.
- b) Few models adequately utilize the known social forces in learning.
- c) Still fewer models adequately consider the role of the teacher in the act of individualization.

d) None has tackled so far the basic problem of fitting the teaching method to the teacher.

4.1.2 Purpose of the General Model

From the foregoing analysis, one may deduce an urgent need for a general model aimed at understanding individualized teaching and at the same time catering to individualized learning. The main purpose of such a model would be to provide teachers with the opportunity to exercise their particular strengths in teaching and a chance to compensate in some way for their individual weaknesses and this, without being prejudicial to the individual learner.

A number of alternative approaches to achieve this purpose can be considered. Firstly, there is the need-satisfaction approach similar to that described by Hosticka (1972) and Gronlund (1974), for the individualization of learning. The procedure is first to identify the teachers' competences on suitable placement tests and second to identify the type of individualized programme which best fits the teaching skills. Such a strategy would only work if the learners are subsequently chosen to match the teaching programme subsequently decided upon. This analysis immediately exposes a fundamental weakness in the way in which individualization models conceptualize teaching. Teaching is not a static process which permits one to fit the method to the learner, holding the teacher constant, or to fit the method to the teacher, holding the learner constant. It is a dynamic process in which all the basic elements continually interact. The need-satisfaction approach though apparently feasible requires a higher degree of methodological sophistication than is evident in the area to date.

A second approach to a general model of individualization of instruction would be to provide teachers with a flexible guide allowing them to design and administer individualized learning programmes according to their individual requirements and above all according to the particular situations in which they are placed.

Such an approach seems to be a logical answer to the urgent need (deduced from the analysis of current models) for a general model aimed at understanding individualized teaching and at the same time catering to individualized learning. Indeed, it would allow every teacher to design and administer individualized learning programmes, thereby overcoming the major and common limitation of existing procedures (these were reviewed in Chapter I) which, because they have been developed to be used under very specific and predetermined conditions, cannot be applied by the majority of teachers. It would also satisfy the need of each individual teacher to develop and use his own style of teaching according to his own capacities, abilities and interests. This need was inferred from a well accepted and fundamental assumption which is that no two living organisms are alike. This assumption leads to the recognition of another basic assumption, more closely related to the educational purpose, which is that no two teachers are alike and as such that no two teachers have the same style of teaching.

There is also another dimension included in the second approach to a general model of individualization of instruction which must not be overlooked. It is the one specifying that, although teachers will be given the opportunity to design and administer learning programmes according to their individual requirements and according to the particular situations in which they are placed, these programmes shall be directed toward the individualization of learning, thereby providing for students' individual differences in learning. Such insistence in individualized learning is justified by the assumption that there is a wide range of individual differences among students. Indeed, each student has combinations of aptitudes, knowledge, achievement levels, interests, learning styles and needs which differ from that of any other student. If one relies on this assumption it is easy to see how learning must be, to some degree, adapted to the requirements of each individual student. Furthermore, one must not forget that there is a consistent body of research studies (these were reviewed in Chapter 2) indicating that procedures for individualizing learning can produce positive effects on educational (cognitive and affective) outcomes.

In short, one could deduce from the foregoing analysis that the approach to a general model of individualization of instruction selected here, will aim at accommodating at the same time, both the teachers'

individual differences in teaching and the students' individual differences in learning. In this perspective the general model for individualizing instruction proposed in this chapter will consist of both essential and optional features. The essential features should insure that the students' individual differences in learning are indeed accommodated and the optional features should, themselves, insure that the teachers' individual differences in teaching are also accommodated.

4.1.3 The General Model: Assumptions

Theoretically, the decision to propose a general model for individualizing instruction in the present study, is based upon six well accepted assumptions, they are:

a) No two individual students have exactly the same style of learning.

b) No two individual teachers have exactly the same style of teaching.

c) Each individual student is more likely to achieve and be successful when permitted to learn at a pace and in a way commensurate with his abilities and interests.

d) Each individual teacher is more likely to perform successfully when permitted to teach at a pace and in a way commensurate with his abilities and interests.

e) Each individual student is more likely to be motivated toward learning when permitted to learn at a pace and in a way commensurate with his abilities and interests.

f) Each individual teacher is more likely to be motivated toward teaching when permitted to teach at a pace and in a way commensurate with his abilities and interests.

Research indicates that students differ in the rate at which they learn. It is also a recognized fact that each student has a distinct style of learning as individual as his personality. Indeed, no two learners achieve in exactly the same way, using the same learning techniques and the same learning materials. As such, if each student is allowed the time he needs to learn and is permitted to learn in his own way using learning techniques and materials commensurate with his abilities and interests, he is more likely to:

- achieve and be successful, and to
- be motivated toward learning.

The findings of research studies (these were reviewed in Chapter 2) do confirm that congruence of elements at this level can in fact generate success in achievement as well as the development of positive attitudes toward learning.

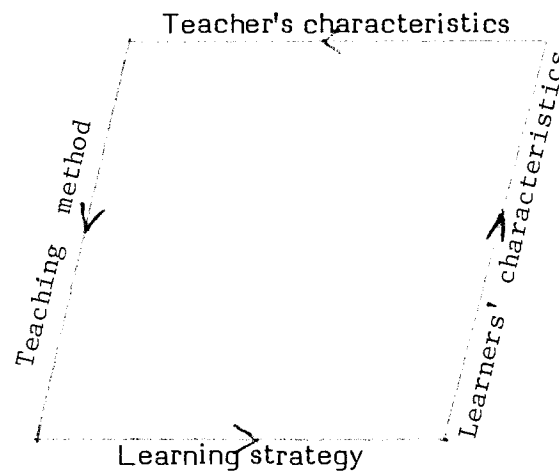
Research also indicates that teachers differ in the rate at which they teach. It is also a recognized fact that each teacher has a distinct style of teaching. Indeed, no two teachers perform in exactly the same way, using the same techniques and materials. As such, if each teacher is permitted to teach in his own way using techniques and materials commensurate with his abilities and interests, he is more likely to:

- perform successfully, and to
- be motivated toward teaching.

As reported in section 4.1.1 of the present chapter, no model of teaching has tackled so far the basic problem of fitting the teaching method to the teacher. Consequently, there has been no direct attempt at studying the effects of congruence of elements at this level. One believes however, that on the basis of the previous assertion concerning the effects of congruence between the learning strategy and the learning characteristics of the learner, it is reasonable to assume that congruence between the teaching method and the teacher's characteristics can generate success in teaching and the development of positive attitudes toward teaching.

4.2 Conceptual Framework of the Model

The six basic assumptions presented in the previous section, spell out a model of instructional congruence. By this is meant the optimal classroom conditions are attained when there is congruence between the four elements in the individualized instruction system. These are the teacher's characteristics, the teaching method, the learning strategy and the learners' characteristics. These are most conveniently illustrated by a "parallelogram of forces".



When the cognitive and personality characteristics of the teachers dictate teaching methods (individualized teaching) which require learning strategies which are themselves congruent with the learning characteristics of the learners (individualized learning), the system (individualized instruction) is in equilibrium.

The value of this form of representation is that it facilitates a number of deductions:

a) It takes all four elements to establish equilibrium in the system; therefore any one of the four elements can disrupt the balance and cause disequilibrium.

As mentioned above, the individualized instruction system is in equilibrium when there is balance between individualized teaching and individualized learning. Balance between the two sub-systems can be disrupted however, by incongruity of elements within either of these two thereby causing disequilibrium in the individualized instruction system.

There could be disequilibrium in the system in a situation in which, for example, a teacher would have to teach using a method (such as inquiry) which requires a learning strategy (interview) which is itself congruent with the learning characteristics (ability to ask questions) of the learners but is not congruent with his own personality characteristics (authoritarian prone). In such a case, incongruity of elements in individualized teaching (the teaching method does not fit the teacher's personality characteristics) could disrupt the balance between the two sub-systems and cause disequilibrium in the individualized instruction system.

Again, there could be disequilibrium in the system in a situation in which, for example, a teacher would decide to teach using a method (such as lecture) which requires a learning strategy (listening) which is not congruent with the learning characteristics (incapacity to listen attentively) of the learners but is itself congruent with the teacher's own cognitive characteristics (ability to express oneself verbally). In such a case, incongruity of elements in individualized learning (the learning strategy does not fit the learning characteristics of the learners) could disrupt the balance between the two sub-systems and cause disequilibrium in the individualized instruction system.

b) Equilibrium in the individualized instruction system generates:

- success in achievement for the student. As previously admitted, the individualized instruction system is in equilibrium when there is balance between individualized teaching and individualized learning. Balance between the two sub-systems is itself achieved as a result of congruence of elements within each one of the two sub-systems. Thus, one can assume that when the individualized instruction system is in equilibrium, there is congruence between the learning strategy and the learning characteristics of the learner. As previously mentioned, the findings of research

studies concerning the effects of congruence of elements at this level indicate that it can generate success in achievement. One can therefore deduce that equilibrium in the individualized instruction system generates success in achievement for the learner.

- success in teaching for the teacher. Again, when the individualized instruction system is in equilibrium, one can assume that there is congruence between the teaching method and the teacher's characteristics. It has already been reported earlier that no model of teaching has tackled so far the basic problem of fitting the teaching method to the teacher and that, consequently, there has been no direct attempt at studying the effects of congruence of elements at this level. However, as was mentioned earlier, if one relies on the findings of research studies indicating that congruence between the learning strategy and the learning characteristics of the learner can generate success in achievement, it seems reasonable to assume that congruence between the teaching method and the teacher's characteristics can generate success in teaching. One can therefore deduce that equilibrium in the individualized instruction system generates success in teaching for the teacher.

c) Unlike other congruence models the result of balance in the system is motivating.

Indeed, equilibrium in the individualized instruction system leads to:

- motivation and satisfaction in the learner. Again, when the individualized instruction system is in equilibrium, one can assume that there is congruence between the learning strategy and the learning characteristics of the learner. As previously mentioned, the findings of research studies concerning the effects of congruence of elements at this level indicate that it can generate the development of positive attitudes toward learning. One can therefore deduce that equilibrium in the individualized instruction system leads to motivation and satisfaction in the learner.

- motivation and satisfaction in the teacher. Again, when the individualized instruction system is in equilibrium, one can assume that

there is congruence between the teaching method and the teacher's characteristics. It was reported earlier that there has been no direct attempt at studying the effects of congruence of elements at this level. However, as was mentioned previously, if one relies on the findings of research studies indicating that congruence between the learning strategy and the learning characteristics of the learner can generate the development of positive attitudes toward learning, it seems reasonable to assume that congruence between the teaching method and the teacher's characteristics can generate the development of positive attitudes toward teaching. One can therefore deduce that equilibrium in the individualized instruction system leads to motivation and satisfaction in the teacher.

d) Hence, teachers' success in teaching and motivations will be closely related to the learners' success in achievement and motivations.

It was shown in (b) and (c) that congruence between the teaching method and the teacher's characteristics generates success in teaching and leads to motivation in the teacher, and congruence between the learning strategy and the learning characteristics of the learner generates success in achievement and leads to motivation in the learner. If these are held to be true, one should therefore, be fully justified to expect that teachers' success in teaching and motivations will be closely related to learners' success in achievement and motivations since, equilibrium in the individualized instruction system implies balance between individualized teaching and individualized learning which is itself the result of congruence of elements within each one of the two sub-systems.

In order to operationalize the model, the approach adopted in this study is to provide the teacher with those principles of individualization which together constitute the essence of the technique and without which teaching cannot be considered as individualized instruction. It was believed that these principles would provide a flexible guide allowing the teacher in practice to fit the teaching method to the requirements of the individual learner without sacrifice to his own preferences. As previously admitted, there are other possible approaches but this one seems a logical outcome of the educational and other constraints.

The new general model comprises six inviolable principles. One is of a philosophical nature while the five others are rather technical. The philosophical principle is concerned with the creation and maintenance of a favourable climate for individualization. The five technical principles dictate the need to make explicit and manifest the philosophy of the educational programme, the identification of students' individual differences, the organisation of the curriculum, the organization of instruction, and finally the students' evaluation.

The main objective of the philosophical principle included in the model is to provide teachers with the necessary conditions and basic attitudes for the creation and maintenance of a favorable climate for individualization. This philosophical principle which was not included in the pilot general model is inserted in the new model following a unanimous remark of the teachers who participated in the pilot experiment, saying that, as a whole, the pilot model placed too much emphasis on technical features and consequently lacked humanistic components.

Hence the main objective of the technical principles included in the new model is to provide teachers with this basic conceptual framework. The essential technical principles that were included in the pilot model can also be found in the new model. However, they are reorganized so that there is no longer a distinction between the design and the administration of an individualized learning programme. The reorganisation is made in an effort to avoid a useless duplication and in an effort to consolidate the internal consistency of the new model.

Each one of the six principles included in the conceptual framework of the new model is introduced in the following pages.

4.2.1 Creation and Maintenance of a Favourable Climate for Individualization.

The concept of individualization goes far beyond technicality. Indeed, as mentioned by Wilhelms (1970) there are essential educational

conditions for an effective individualized learning programme and only achievement of these conditions can insure the success of the programme. In order to achieve these conditions, it is of paramount importance that each teacher create and maintain from the outset, a favourable climate for learning and growth in individuality.

4.2.2 A Statement of the Philosophy of the Educational Programme.

Technically, the point of departure in attempting to individualize learning is a statement of the philosophy of the educational programme. Of particular importance here is the specification of goals as either stated or implied in this philosophy. It is from those goals that the organisation and operation of the programme should develop.

It is of the utmost importance that the teacher specify those goals at the very beginning of the elaboration of his individualized learning programme or he will not have relevant criteria by reference to which he can organize and operationalize satisfactorily the subsequent principles included in the elaboration of this programme.

4.2.3 The Identification of Students' Individual Differences.

Most educators agree that individualizing learning consists in adapting the educational system to the requirements of each individual learner. Inherent in this definition is that all or some of the students' individual differences should be accommodated in one way or another. This means that, when individualizing learning, the teacher has a continuing need for information about each student. Therefore, he should be able, when necessary to identify some of his students' individual differences.

One of the main advantages related to the identification of students' individual differences is that it can provide the teacher with useful information allowing him to choose learning experiences that are more

significant and more appropriate to the needs and requirements of each individual student.

Naturally, it would be unrealistic to pretend that, when individualizing learning, the teacher should identify all of his students' individual differences. It might not be necessary even if it were possible. What is really needed is to identify those individual differences which are more likely to influence the learning experiences of each individual student in the ways and directions of the philosophy of the educational programme.

4.2.4 The Organization of the Curriculum.

In traditional educational systems, the teacher does not have to design the curriculum. Usually, the curriculum is designed by educational specialists and prescribed to the teacher who applies it just as it is.

It is now a recognized fact that such a traditional curriculum is an attempt to adjust each individual student to a programme and that, therefore, the programme is not adapted to each individual student.

It is our belief that, when individualizing learning, the teacher should at least reorganize the prescribed curriculum so that it is more relevant and appropriate in terms of each individual students' needs and requirements.

4.2.5 The Organization of Instruction.

The term individualized learning implies something more than simply recognizing individual differences or taking them into account. It implies either administrative procedures or instructional strategies within a classroom designed to do something to help each individual student.

It is in the organization of instruction that the teacher can best provide for individual differences. Indeed, it is in the organization of instruction, that specific applications of the philosophy of the educational programme are made and that contributions to goals are realized in the classroom. It is also in the organization of instruction that the curriculum takes its operational form and therefore where decisions of how each student will learn the content of the programme are made.

Specifically, it is our belief that the organization of instruction in an individualized learning programme should imply making provision for instructional strategies, instructional materials, and educational facilities so as to help each individual student.

4.2.6 The Students' Evaluation

The students' evaluation is the sixth and final principle included in the conceptual framework of the new model for individualizing teaching. In the context of more traditional programmes of instruction, this principle could probably have been integrated within that dealing with the organization of instruction; however, in the perspective of an individualized learning programme, one believes that it should be given very special attention.

Traditionally, the results of the tests used for evaluation purposes have been used to compare the performance of one student against that of another student or an established standard. The notion that students should be compared to an arbitrary set standard or a group norm has no validity in an individualized learning programme. It is often reiterated that all students are individuals with varying capacities, abilities, interests, and potentials. Therefore, students should be evaluated on the basis of their particular potential for growth and development.

This particular view of evaluation suggests that, when designing his individualized instruction programme, the teacher should contrive new evaluation procedures that are more significant and appropriate in terms of the goals inherent in the philosophy of individualized learning in general and those inherent in the philosophy of his own individualized learning programme.

4.3 Practical Application of the New Model for Individualizing Instruction

In the previous section, the conceptual framework of the new model for individualizing instruction was presented mainly in an effort to identify and justify its major principles. In this section, the conceptual framework of the new model is translated into operational stages in an attempt to give a more precise idea of how the new model is indeed applied.

The conceptual framework of the new model is presented here in the form of a decision-making process involving six different but progressive stages. The six stages are: the creation and maintenance of a favorable climate for individualization; a statement of the philosophy of the educational programme; the identification of students' individual differences; the organization of the curriculum; the organization of instruction; and finally the organization of students' evaluation.

In each one of the six stages, questions are asked and decisions have to be made in relation to the design and administration of an individualized learning programme. In order to guide the teacher in making the necessary and relevant decisions in each one of the six stages, provision is made for alternatives, and/or general guidelines, and/or specific guidelines, and/or practical suggestions.

A summary flow chart of the functioning of the general model as a decision making process is presented in figure 4.2.

4.3.1 Stage One: Creation and Maintenance of a Favourable Climate for Individualization.

In the first stage of the new general model for individualizing learning, it is proposed that, as a first step of the design of his individualized learning programme, the teacher examine how he intends to create and maintain a favourable climate for individualization. Specifically, it is proposed that the teacher answer the following question:

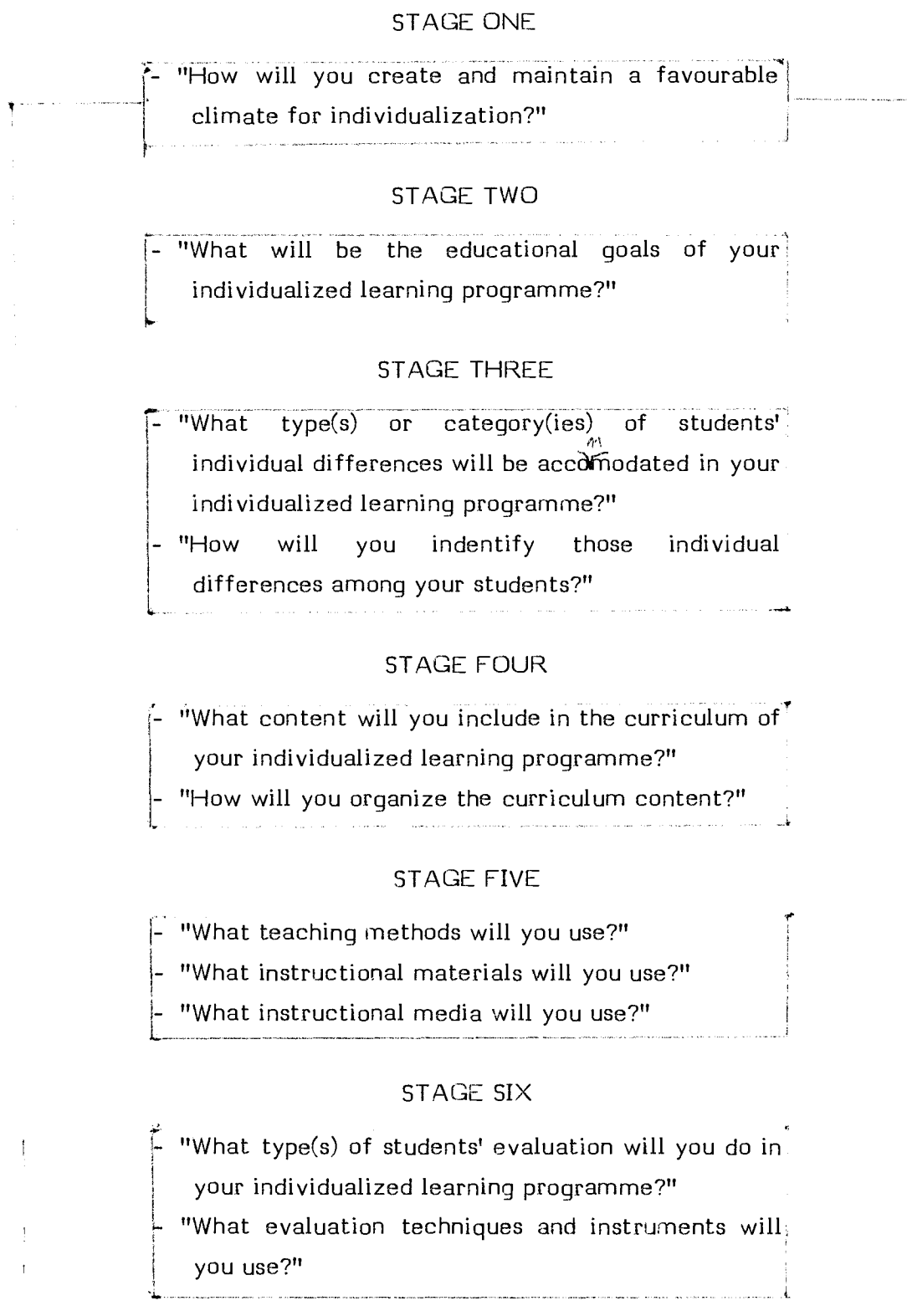


Table 4.2: Summary Flow-Chart of the Functioning of the General Model as a Decision Making Process.

-"How will you create and maintain a favourable climate for individualization?"

In order to guide the teacher in making the necessary and relevant decisions in this first stage of the new model, a presentation of what we believe to be the necessary conditions and basic attitudes for creating a climate for individualization is made.

4.3.1.1 Necessary Conditions for a Climate Favourable to Individualization.

As mentioned earlier, there are very essential conditions for individual learning.

These conditions are:

a) **Individualized pacing:** all individualized learning requires, by definition, individual pacing, If instruction is group paced it cannot at the same time be individualized. Pacing means that each student is allowed the necessary amount of time to progress along the curriculum.

b) **Alternative learning procedures:** perhaps one of the most important requirements for individualization is the availability of a wide variety of instructional materials and media. An individualized learning programme must include alternative learning procedures. If those are not provided for the students to select and use, the very concepts of variety and flexibility on which individualization depends are undermined.

c) **Responsible freedom:** the nature of growth demands a steady increase in the command of one's own life. Without development of personal responsibility freedom is meaningless and meaningful learning cannot be achieved. Growth to maturity will be inhibited unless the individuals concerned are self-motivated to learn, in a climate which offers many choices, including the ultimate option of not trying to learn.

d) Support: stimulation, freedom and responsibility place the students in situations where they must take risks. One can reasonably assume that students will take such risks only if they can afford them and that they can afford them only if they perform in an environment of support.

e) Success: one needs success. The success experience must be authentic, not faked. It does not imply that there shall not be failures, but there is a difference between having some failures occasionally and being a failure. Success does not mean being the best; in an individualized learning programme, it means learning what one needs to learn, making a genuine contribution to oneself and to the group. Individualized learning programmes should provide for a great diversity of ways to succeed. The main prerequisite is simply the recognition that in school and society, it is all right to come to results in different ways and even to arrive at different destinations.

f) Personalization: the last, but definitely not the least important requirement for individualization is personalization. Personalization adds a personal touch to learning. It means that students' needs and requirements are considered and used to make instruction more relevant, meaningful and significant. It also means that special interest is shown in each student as a unique person.

4.3.1.2 Basic Attitudes for Individualization.

Obviously, the above-mentioned conditions for individualization can be partially achieved by means of rather technical arrangements like those proposed in the remaining five stages of the new model. However, it is our belief as it is that of Carl Rogers (1969) that the creation and maintenance of a favorable climate for individualization particularly rest upon attitudinal qualities which exist in the personal relationship between the facilitator of learning (teacher) and the learner (student).

These attitudes are described by Rogers and can be summarized as follows:

a) **Realness:** realness or genuineness is probably the most basic of these attitudes. When the facilitator is a real person being what he is, entering into a relationship with the learner without presenting a front or a facade, he is much more likely to be effective. This means that he comes into a direct personal encounter with the learner, meeting him on a person-to-person basis. It means that he is being himself, not denying himself. Realness is an attitude which allows the student to grow by being in contact with someone who is open and sincere.

b) **Prizing, acceptance and trust:** there is another attitude, not easily named, but which is also successful in facilitating learning. One could call it valuing or "prizing", acceptance or trust. Rogers thinks of it as prizing the learner, prizing his feelings, his opinions, his person. It is caring for the learner. It is an acceptance of the learner as a separate person, having worth in his own right. It is a basic trust, a belief that the learner is somehow fundamentally trustworthy. The facilitator who has a considerable degree of this attitude can accept the student's occasional apathy, his erratic desires to explore by means of knowledge, as well as his disciplined efforts to achieve major goals. He can accept personal feelings which both disturb and promote learning. In summary, this attitude is an operational expression of the facilitator.

c) **Empathic understanding:** another element which establishes a climate for self-initiated, experiential learning is empathic understanding. It is the ability to understand the student's reactions from the inside; it is a sensitive awareness of the way the process of education and learning seems to the student. It also means the ability to understand the learner's feelings without wanting to analyze and judge them. Briefly, it is the attitude of standing in the other person's shoes, of viewing the world through the student's eyes. Such an attitude from the facilitator of learning increases the likelihood of significant learning.

It is evident that the above-described attitudes do not appear suddenly, in some miraculous manner, in the facilitator of learning. Instead,

they come about through taking chances, through acting on tentative hypotheses. Perhaps an essential condition to the development of these fundamental attitudes is a profound trust in the human organism and its potentialities.

4.3.2 Stage Two: A Statement of the Philosophy of the Educational Programme.

Specifically it is proposed here that the teacher answer the following question:

-"What will be the educational goals of your individualized learning programme?"

In order to guide the teacher in making the necessary and relevant decisions in this second stage of the new model, criteria for the selection of educational goals are proposed, and three major trends for educational goals are reviewed briefly.

Before presenting the criteria for the selection of educational goals, one would like to reiterate the importance for each individual teacher of making a personal choice of educational goals. Indeed, the relevance and efficiency of educational practices are closely related to that opportunity of making a personal choice of orientation.

At this time, one would point out to the teacher that the selection of educational goals is an activity which extends from the beginning to the end of a programme. Indeed at the beginning of the design of a programme, educational goals can be selected with reference to theoretical elements such as a philosophy of education or a learning theory, and as the programme progresses, it is possible to make constant adjustments of those goals with reference to more practical considerations such as the needs and requirements of the students involved in the programme or the conditions of the situation in which the programme is administered.

4.3.2.1 Criteria for the Selection of Educational Goals.

The selection of the educational goals of an individualized learning programme should meet several criteria.

a) First, the goals should be in agreement with the more general priority of individualization which is to promote the fullest development of each individual student.

b) Second, the goals should be consistent with the basic principles underlying the various conceptions of learning in individualization.

c) Third, the goals should be consistent with the ability and development levels of the students involved in the programme and they should reflect their needs and requirements.

d) Fourth, the goals should be consistent with the nature of the subject matters included in the programme and with the types of learning which can arise from the study of the subject matters.

e) Fifth, the goals should be consistent with the practical conditions of the situation in which the programme is administered.

4.3.2.2 Major Trends for Educational Goals.

As shown in Chapter I, a large number of procedures have been developed and implemented in the last twenty years for the purpose of individualizing or helping to individualize instruction (learning). Although they have the same general orientation, that being towards the individual, these procedures differ as to educational priorities and goals.

It was observed in the review of these procedures that three major trends for educational goals were emerging in practice.

a) One trend is closely associated with traditional skill and subject matter content. The accent is on productivity and efficiency. Subsumable under this trend are goals related to development and use of modes, methods and processes of inquiry, reasoning ability, critical thinking, problem solving, use of concepts as tools of thinking, and attitudes and values such as open-mindedness, thoughtful skepticism and objectivity in the use of evidence.

Within this trend for educational goals, one considers that the student will become autonomous insofar as he has acquired a certain amount of knowledge and skills. Learning is viewed as a progressive process in which the various steps are predetermined by the very nature of the subject matter. Individualization is achieved through allowing each individual student to progress at his own pace in a series of predetermined learning activities.

b) A second trend is associated with the conception that the world we live in is changing so fast and new knowledge is being developed so quickly that the only hope to meet the demands of the future is to develop independent, lifelong learners. The accent is on autonomy. Subsumable under this trend are goals that refer to independent study skills, competence in self-instruction, use of resources for independent learning, learning how to examine and use information, positive attitudes of intellectual curiosity, and eagerness toward independent and lifelong learning.

Within this trend, one considers that students, because of their potential, are initially autonomous and that they all have various abilities, although at different levels, which only need to be activated and developed. The emphasis is on the process of learning and learning how to learn. Individualization is achieved through allowing each individual student to grow and learn in his own ways and styles.

c) A third and final trend for educational goals is closely associated with the student-centred approach. The accent is on optimum individual development and on the development of a pleasant positive feeling toward learning. Subsumable under this trend are goals related to the development of basic skills, understanding of the social and physical environment, self-respect and wholesome self-concept, use of leisure time, ethical values,

aesthetic interests, taste in literature, music and visual arts, ability to clarify values, development of a zest for learning and personal enrichment.

Within this trend the individual student's needs and requirements are central and great emphasis is given to learning resulting from the interactions between each individual student and his environment. Individualization is achieved mainly through allowing each individual student to choose learning experiences in areas of concern for him.

It would probably be quite unrealistic to pretend that one can propose one of the above-mentioned trends for educational goals as being the best. It is certainly not our intention. However, we do propose that the teacher refer to this review as well as to the criteria presented in section 4.3.2.1 when making his personal choice of educational goals. We believe that this could help him in making a more relevant, meaningful and significant choice.

4.3.3 Stage Three: Identification of Students' Individual Differences.

It was mentioned in the section on the conceptual framework of the new model that, at variable times during the administration of his individualized learning programme, the teacher would have to identify some of his students' individual differences in order to accommodate them. In preparation for this activity, it is proposed, in this third stage of the new model, that the teacher decide which types or categories of individual differences will be accommodated in his programme and how he intends to identify those individual differences among his students.

Specifically, it is proposed that the teacher answer the following questions:

- "What type(s) or category(ies) of student's individual differences will be accommodated in your individualized learning programme?"

-"How will you identify these individual differences among your students?"

In order to guide the teacher in making the necessary and relevant decisions in this third stage of the new model, a classification of students' individual differences is proposed, and a description as well as a discussion of the relative merits of a variety of techniques for identifying individual differences among students are made.

Before proposing a classification of students' individual differences, one would like to mention once again that the need to identify individual differences among students can arise at variable and sometimes unpredictable times during the administration of a programme, and therefore it is important for the teacher to be constantly prepared.

4.3.3.1 A Classification of Students' Individual Differences

It is now a recognized fact that students differ among themselves in numerous and various ways. The majority of students' individual differences can be classified into the following categories:

a) **Physical condition:** this category refers to three important factors related to learning. These factors are the sensory functioning, the motor development and the general health of the student.

b) **Intellectual capacities and aptitudes:** this category refers to those mental abilities which are important and sometimes essential for scholastic achievement. It includes general abilities such as comprehension, memorization, application, synthesis, analysis, evaluation, problem-solving, and critical thinking.

c) **Academic abilities:** this category includes basic academic skills such as the ability to speak, write, read and count.

d) **Past learnings and experiences:** it is a common fact that a

student does not come to any learning situations without having had prior learning and experiences.

e) Learning styles: one of the most frequent fallacies made by schools is to consider and treat students as if they all had the same study habits and the same learning styles. The reality is quite different. Students differ in the ways they respond to particular methods of instruction. Some students prefer to work alone, others to work in small groups. Some students learn best through manipulation, others through listening and still others through seeing. Some students need concrete examples and others learn better at a more abstract level. All students absorb varying amounts of content at different rates varying from moment to moment and from task to task. Students also differ in the amount and type of content they retain.

f) Motivation and interests: the term motivation refers to a general disposition to regard something in a positive or negative way. It might include general attitudes towards school, teachers, learning and subjects. The term interest refers to more specific attitudes towards more specific things. It might include specific attitudes towards specific learning tasks, teaching methods and materials.

g) Emotional condition and social attitudes: the term emotional condition refers to affective behaviours such as hostility, timidity, anxiety, guilt, inferiority, insecurity and inadequacy. The term social attitudes refer to social behaviours such as communication, participation and cooperation.

h) Family and community backgrounds: this category refers to the racial, cultural, socio-economic and specific family background of the student.

It was mentioned earlier that, when individualizing learning, what is really needed is that the teacher identify only those individual differences which are more likely to influence the learning experiences of his students in the ways and directions stated in the educational goals of his programme.

4.3.3.2 A Variety of Techniques for Identifying Individual Differences among Students.

There are various ways of identifying individual differences among students. In this section, a description and a discussion of the relative merits of the most important techniques are made, considering when appropriate, how teachers may vary in their usage of these techniques.

a) Direct approach: this technique consists of asking each student to identify personally some of his individual requirements and needs. Specifically, this technique consists of asking the student questions such as: "What do you like?, what do you feel when I tell you what to do?, what do you like best, to work alone or with others?, among those books, which one would you prefer to work with?". For some teachers, this information could be obtained easily, for others it would be more difficult, and the latter category of teachers might prefer a method not involving face to face contact.

The advantages related to the use of this technique for identifying individual differences among students, if it suits the teacher, are numerous. In the first place, it increases the significance and relevance of the information collected by offering opportunities to probe in depth. It also provides opportunities for more personal relations between the teacher and each student. Finally, it might even promote the development of responsibility and independence since it requires a personal commitment from each individual student.

There are also some disadvantages related to the use of this technique; the most important one being the requirement of an investment of a considerable amount of time for obtaining what is often considered a minimum of information. One must also mention that this technique is limited as regards the possibilities of using it for obtaining information in all of the categories of students' individual differences. Moreover this would not necessarily suit particular teachers if their method of eliciting the information did not necessarily lead to valid responses. A student could easily be too shy to answer when confronted by certain teachers or even give them a socially desirable answer which did not really apply to him.

b) **Systematic or goal-oriented observation:** this technique consists of observing and noting individual students' behaviours in the natural setting of the classroom. Systematic observation can be used for collecting information in a variety of real school-life situations. For instance, it can be used to identify the interest of a student towards a particular learning activity and to identify the working pace of a student when performing a variety of learning activities.

There are various advantages related to the use of systematic observation as a technique for identifying individual differences among students. Among the most important ones are: it allows for the collection of relevant information directly from real school-life situations; it does not call for any artificial and complex organization; it allows for the identification of various factors and for the study of their relationships; and finally, it can be used at any time during a school day.

There are also some limitations and disadvantages related to the use of this technique; the most important limitation being the observer's interpretations and bias which can be minimized by special precautions but cannot be totally eliminated. One of the major disadvantages of systematic observation lies in the considerable amount of time required in making the recordings. Moreover, some teachers will find it more difficult to observe so many students at once than others do.

Before presenting another technique for identifying individual differences among students, one would like to mention here that, even though the uses of systematic observation are numerous and various, this technique is likely to be more useful for the identification of students' interests, learning styles, emotional and social behaviours than to inform about their learning progress.

c) **Measurement tests:** so much has been written about measurement tests that no attempt is made here to review them all in detail. However, in order to guide the teacher in making a more appropriate and relevant choice, a brief description and a discussion of the relative merits of the major categories of measurement tests that can be used for identifying individual differences among students are made. There are three major

categories of measurement tests: one measuring the student's intelligence and aptitudes; a second category measuring personality; and finally, a third category measuring scholastic achievement.

Tests of intelligence and aptitude measure the student's abilities. For educational purposes, these tests can be used to predict accomplishment, mainly scholastic achievement. A major limitation associated with these tests is that they measure only some of the student's mental abilities and that the scores can sometimes be very misleading.

Standard tests of personality are designed to measure directly some aspect of behaviour. These have the advantage that they can be scored as directly and objectively as ability tests. However, these tests are complex to develop and have rather modest reliability. Furthermore, these tests are not readily adaptable to many of the aspects of personality in which one is interested.

Achievement tests are intended to measure what a person has learned to do after he has been exposed to a specific kind of instruction. There are two general categories of achievement tests, the standardized tests for which the achievement criteria are primarily normative and the teacher-made tests for which achievement criteria are usually set in terms of what is to be learned; they do not rely on a comparison of student performances. Both categories of tests can be used as diagnostic instruments. For diagnostic purposes, where specific appraisals of accomplishment are needed, the use of teacher-made criterion-referenced tests is recommended. However, in situations where a more general appraisal of level of accomplishment is needed, standardized survey tests are recommended if supplemented by other diagnostic procedures such as informal teacher appraisals. It need hardly be said that the ability to construct tests could be very varied among teachers. They will not all feel equally disposed to use this method of measuring student differences.

d) Other sources of information: in addition to the above-described techniques for the identification of individual differences among students, are more indirect sources of information which, when needed, can supplement very relevant indications about each individual student. Among

the most important ones are the official records of the school, teacher-parent meetings and consultation with the school specialists such as the school nurse and the school psychologist.

The official records of the school can supply very useful information particularly concerning the past achievements of the students. Consultations with the school specialists can provide valuable information in relation to the physical and emotional condition of the students. Finally, teacher-parent meetings provide tremendous opportunities to gather information about the students' family and community backgrounds.

It is important to mention here that, as is the case for the other techniques, there are some disadvantages related to the use of indirect sources of information as a means of identifying individual differences among students; the most important one being the possibility of creating negative effects in terms of subjectivity and prejudice. In order to prevent such negative effects, it is recommended that the information gathered from indirect sources of information not be used as the only basis for educational decisions. In any case individual teachers are likely to vary greatly in their ability to extract valid information by this method.

As was shown in this section, there are numerous and various techniques for the identification of individual differences among students; each one having its uses and limitations. For this reason and also because of the many factors involved in such a decision, one cannot propose any single one of them as being the best and most appropriate technique. Indeed, this decision must be made by each teacher on the basis of the following reference marks: the nature (category and kind) of the individual differences to be identified; the availability of techniques for identifying individual differences; the validity and reliability of available techniques; and finally the advantages, disadvantages and/or limitations related to the use of available techniques. There will obviously be personal differences in the emphasis each teacher gives to them.

4.3.4 Stage Four: Organization of the Curriculum.

In relation to content, it is proposed that the teacher answer the following question:

- "What content will you include in the curriculum of your individualized learning programme?"
- "How will you organize the curriculum content?"

In order to guide the teacher in making the necessary and relevant decisions in this fourth stage of the new model, major orientations for curriculum organization are reviewed briefly and criteria for the selection of content are proposed. A description and a discussion of the relative merits of a variety of procedures for organizing curriculum content are also made.

4.3.4.1 Major Orientations for Curriculum Organization.

In Chapter 1, while reviewing the main procedures for individualizing instruction (learning), it was observed that three major orientations for curriculum organization were emerging in practice. Before presenting these major orientations for curriculum organization, one would like to mention, here, that each one of these is directly related to either one of the three major trends for educational goals (these were reviewed in section 4.3.2.2 of the present chapter) which were also emerging in practice in the review of the main procedures for individualizing instruction (learning).

a) One orientation uses content from the disciplines on which areas of the curriculum are based as the point of departure for organizing the curriculum. The guiding principle of this subject-matter orientation, is to bring together content and skills from any subject that will help to attain educational goals such as those inherent in the first trend for educational goals which was presented in section 4.3.2.2 of the present chapter.

Within this orientation, content may be selected from any discipline of the total curriculum and organized in broad fields such as science and language arts, or in separate subjects such as mathematics and spelling.

b) Another orientation takes an aspect of social change that has been given great attention, that is the explosion of knowledge, as a point of departure for organizing the curriculum. The guiding principle of this orientation is to emphasize content which encourages students to learn how to learn, how to adapt and how to change. Specifically, this orientation recommends the selection of content that will help to attain educational goals such as those inherent in the second trend for educational goals which was presented in section 4.3.2.2 of the present chapter.

Within this orientation, content may be selected from any area that is useful in handling problems, topics and issues that arise as students interact with their environment. Content is organized so it can be fitted into life situations or areas of living under study.

c) A final orientation takes the student as the point of departure for organizing the curriculum. The guiding principle of this orientation is to select content in terms of interests, felt needs, basic drives and concerns of individual students that will help to attain educational goals such as those inherent in the third trend for educational goals which was presented in section 4.3.2.2 of the present chapter.

Within this orientation, content may be selected from persistent life situations in which the problems confronted by a particular student are the focus of instruction for this individual. The organization of content is often characterized by a day to day, teacher-student planning.

The above review of orientations for curriculum organization is merely an illustration of how curriculum can be organized in an individualized learning programme.

4.3.4.2 Criteria for the Selection of Content.

In the actual educational system, the teacher usually does not have to select the content of the curriculum which is in fact prescribed by educational specialists. However, considering it might not be a general rule and considering it is desirable for every teacher to become individually involved in all aspects of curriculum organization, it is proposed in this fourth stage of the new model, that, whenever it is possible, the teacher select the content of his individualized learning programme using the following principles:

a) Usefulness in contributing to the attainment of educational goals as implied or stated in the philosophy of the educational programme.

b) Adaptability in terms of students' needs and requirements.

c) Applicability to various learning activities in a variety of learning situations.

d) Availability in textbooks, audio-visual resources and other instructional materials.

4.3.4.3 A Variety of Procedures for Organizing Content.

There are various procedures for organizing content in an individualized learning programme. In this section, a description and a discussion of a variety of procedures for the organization of curriculum content are made.

a) One procedure suggests that, once a possible framework for a subject area has been selected, the next step should be that the teacher write a related specification of educational objectives.

Techniques for stating and writing behavioural objectives have been described by Mager (1962), Lindvall (1964), Drumheller (1971) and others, and may be useful to those initiating such a procedure. Taxonomies of objectives prepared by Bloom et al., (1956) in the cognitive domain, Krathwohl et al., (1964) in the affective domain and Harrow et al., (1972) in the psychomotor domain, are also available.

This specification leads to identifying behaviours that students should develop. Consequently, it is made clear to each student what he is expected to do. Materials and learning experiences needed can then be communicated, together with supplying diagnostic and evaluation instruments to the student.

There are also some limitations and disadvantages related to the use of this procedure. The major limitation is that this procedure does not have a universal application and much of what is central to education lies outside its scope. Indeed, according to educators such as Alpren and Baron (1974), the only and truly effective application of the behavioural objectives procedure is in the area of basic skill development. Another limitation is that it is not always possible to specify and write with clarity and certitude high-order objectives. Among the most important disadvantages related to the use of this procedure are some of the following; stated objectives are often exterior to the student; and most of the time, the student does not participate in the specification of behavioural objectives he must attain.

b) Another procedure for curriculum content organization suggests, in order to optimize each student's learning, sequencing curriculum content in a manner that is consistent with the logic of the subject-matter. This procedure combines three types of organization: the organization from the concrete to abstract, the organization from the simple to complex and the organization in terms of prerequisite learnings.

The organization from the concrete to abstract is supported by Piaget's (1969) theory of intellectual development. In his theory, Piaget asserts that processes of logical thought develop in a sequence from the concrete to abstract and that the attainment of a level of development presupposes the attainment of the prior level.

The organization from the simple to complex is supported by Gagné's theory of learning. The essence of his theory is that learning progresses from simple to complex and that each type of learning is conditioned by the acquisition of another more simple type.

The organization in terms of prerequisite learnings is supported by the more general assumption that there is a hierarchical organization of learning, that is each one could be analysed to reveal prerequisite learnings.

One of the main advantages of organizing curriculum content into logical sequences of learning is that it promotes transfer of learning. In terms of individualization, this procedure offers great opportunities for adjusting curriculum content to the individuality of each student. A major limitation is that such a systematic planning cannot be organized in all areas of content included in the curriculum. It is indeed limited to the conceptual, skill and process components of the curriculum.

c) Another procedure for curriculum content organization suggests breaking curriculum content into smaller and smaller parts. The rationale of this endeavour is that, according to Skinner (1954), most human behaviour rests upon the learning of a sequence of less-complex component behaviours. Therefore, by breaking down a complex behaviour into a sequence of component behaviours it would be possible to learn the most complex behaviour.

The effectiveness of this procedure depends on the nature of the content itself. For some content it may result in decreased integration and where such integration exists, learning could suffer. For other content, where such integration does not exist, it may facilitate learning. In terms of individualization, this procedure offers great opportunities for setting up individual programmes of studies. However, as was the case with the preceding procedure, it can be applied only with the conceptual, skill and process components of the curriculum content.

d) Still another procedure suggests organizing curriculum content around the educational experiences of each student which arise as the student interacts with his environment. This type of organization is

supported by Rogers's (1969) theory of meaningful learning which asserts that significant learning takes place when the subject is perceived by the student as having relevance to his own personal projects. Such organization implies that each student participates actively and contributes responsively to the organization of the curriculum content.

e) A fifth and final procedure for curriculum content organization suggests integrating the various elements of a programme. Integration of content merely consists of relating the various elements of a programme so that students can profit from more integrated learning experiences. Integration can be accomplished in various ways. For example in mathematics, elements of geometry and algebra can be fused with various aspects of arithmetic; some aspects of biology can be related to real life problems such as health, safety and pollution. Integration of content is contrasted with the fragmentation and compartmentalization of content which are artificial and do not reflect the essential unity of reality.

Each method has a function in relation to the different types of educational goals specified in section 4.3.2.2.(a), (b) and (c) are likely to lead to skill acquisition with optimum efficiency, whereas (d) and (e) will be associated with developing independence and improved attitudes respectively.

4.3.5 Stage Five: Organization of Instruction.

It was mentioned in the section on the conceptual framework of the new general model that it is in the organization of instruction that the curriculum takes its operational form, that is where decisions of how each student will learn the content of the curriculum are made.

It is therefore proposed, in this fifth stage of the new model, that the teacher organize his instruction. Specifically, it is proposed that the teacher answer the following questions:

- "What teaching methods will you use?"

- "What instructional materials will you use?"
- "What instructional media will you use?"

A description and discussion of the relative merits of a variety of teaching methods, instructional materials and instructional media are given. General guidelines about the organization of the classroom are also proposed.

4.3.5.1 General Guidelines for the Selection of Teaching Methods.

Teaching methods are useful and in some ways essential in running an individualized learning programme. However, teaching methods alone, without serious and systematic thoughts about education, could turn a teacher into a mere technician with a bag of sterile tricks. No methods should be used unless the teacher has thought about why it is being used, what he hopes to accomplish with it and how it could affect the students. Thus, in selecting teaching methods, the teacher should refer to the following guidelines:

The major guideline suggests that the teacher select teaching methods that are adaptable in terms of each student's individual differences.

The nature of the adaptation may involve matching methods to the various levels of development of different individuals. However, the types of content will also determine appropriate teaching methods. The extent to which these considerations interrelate will be discussed in the following review of available methods.

4.3.5.2 A Variety of Teaching Methods.

In this section, a description and a discussion of the relative merits of six general categories of teaching methods are made. The discussion is made, whenever possible, with reference to the general guidelines for the selection of teaching methods proposed in the preceding section.

a) Large-group procedures: it is frequently assumed that one of the most flagrant violations of the principle of individualization is the large group. However, when placed in proper perspective with other methods, large-group instruction can become a functional and important aspect of any learning system. Large-group instruction usually refers to any group (whole class) of students brought together because they all need to be involved in a common activity or because other needs common to the group are to be met.

There are two types of large-group procedures: one which is teacher-centred and one which is student-centred.

Teacher-centred procedures include activities which are essentially teacher-dominated; the role of the students is one of listening and viewing.

Teacher-dominated procedures are particularly useful for achieving the following activities: orientation at the beginning of a year or a term, presentation of theoretical contents, presentation of new concepts and principles, presentation and explanation of instructional materials and media, presentation of films and slides, recapitulation, diagnosis and evaluation, synthesis and enrichment.

Teacher-centred procedures are appropriate to any content or subject.

Student-centred procedures include activities in which all the students are involved; the role of the students is one of participating.

Three examples representative of student-centred procedures are described and discussed here.

The first example is brainstorming. The purpose of brainstorming is to promote a quantity of ideas bearing upon a particular subject by identifying all possible aspects related to it. It involves the cooperative thinking of all the students in the group.

Brainstorming is useful in stimulating interest and active participation. It also contributes to the development of an understanding and appreciation of the thoughts and points of view of others. Brainstorming is most appropriate to subjects dealing with real-life situations and social problems.

The second example is problem-solving. Problem-solving is a technique involving the presentation and analysis of a real or hypothetical problem to arouse curiosity, interest and student activity which culminates in a scientifically determined conclusion or solution. Problem-solving contributes to the development of reflective thinking, creative expression, critical analysis and logical reasoning.

This particular technique is appropriate to subjects dealing with real-life situations and social problems. It is also appropriate to subjects like mathematics, science and environmental studies.

The third and last example of student-centred techniques is story-telling or conference. It is the narration to the whole class by each student in turn of incidents or events, true or fictitious, read or told. Its general aim is to present a message or to inspire reading and expression. Story telling or conference encourages the development of good listening skills, stimulates imagination and provides opportunities for creative expression.

This technique is particularly appropriate to subjects such as reading and literature. It can also accommodate students' individual differences such as interests and capacities when students are allowed to choose the subjects of their stories or conferences.

b) Small-group procedures: it includes activities involving interactions among students. Essentially, small-group procedures are student-centred; the role of the students is one of participating. The teacher usually acts as a resource person.

Three examples representative of small-group procedures are described and discussed here.

The first example is discussion. Small-group discussion generally consists of a small number of students exchanging ideas and points of view on a given subject. Some discussions culminate in a unanimous conclusion or solution and others are left open-ended. The subject or topic of the discussion can be imposed by the teachers or selected by the students. Some discussions are very well structured and others less structured, depending on the maturity and ability of the students, and depending on the types of animation used.

Discussions not only give facts and information but also self-confidence and practice in expressing thoughts and feelings. According to a study conducted by McKeachie (1969), discussion develops positive attitudes toward the material learned. Small-group discussions can be used at all grade levels and for a variety of subjects.

The second example is small-group workshop. It usually consists of a small number of students grouped together for constructing maps, charts, and models in relation to a specific school subject.

The workshop involves the active participation and cooperation of all the students in the group. It is appropriate to a variety of school subjects including history, geography and sciences.

The third and last example of small-group procedures is committee work. It consists of a small number of students exploring the phases of a particular problem or topic through the problem-solving approach.

The committee work encourages creative investigation, critical thinking and independent observation. It can also be used at all grade levels for various subjects and with small and large groups.

c) Individual procedures: individual procedures include activities emphasizing the role of each individual student in learning. They are usually associated with activities providing opportunities for the development of responsibility, independence and personal competences. There are three categories of individual procedures.

The first category refers to those activities which are imposed by the teacher on all students in the classroom, but are carried on by each student individually.

A typical example of this category of individual procedures is the creative writing composition. It consists of a type of composition imposed by the teachers but involving some degree of self-initiative, spontaneity, and exercise of the imagination by each individual student. The creative writing composition is useful for developing skills in word selection, verbal expression, organization and logical thinking. It is also a stimulus for creative expression.

Generally, the first category of individual procedures can be used at all grade levels and for all school subjects.

The second category refers to those learning activities which are negotiated by each student on an individual basis and can be carried on individually or in interaction with others.

A typical example of this category of individual procedures is the student-teacher contract. It usually specifies what the student will do and what he will receive in return. Under this system each student negotiates his own contract on an individual basis or selects one of several that the teacher offers as alternatives. Some form of contracting can be used at any grade level including kindergarten and for all school subjects. It can also be used regularly or occasionally.

The second category of individual procedures can accommodate not only the students' individual abilities but also their individual interests and learning styles.

The third and last category of individual procedures refers to those activities which are freely chosen by the individual student and which can be carried on individually or in interaction with others. It is characterized by the freedom given to the student to choose any activity he wishes to undertake.

This category of individual procedures can be used at any time during a school day. It can also be adapted to any grade level and to any school subject.

The third category of individual procedures, like the first two, can accommodate a large number of students' individual differences. It also provides opportunities for the development of responsibility and independence.

d) Programmed instruction: programmed instruction is closely related to the concept of learning-as-conditioning. The basic essentials of this method have already been described in section 1.4.1 of Chapter 1.

e) Discovery methods: in discovery learning, the material to be learned is not presented to the learner in its final form. It generally implies finding or figuring things out by and for oneself. Discovery learning is characterized by the learner's own observations and explorations based on his own curiosity, his own experimentation, his own analytical and intuitive thinking.

Discovery occurs when a student perceives a situation in a new way, or when he restructures his experience in such a way that new-patterns or relationships emerge.

The purpose of discovery methods is not to transmit to the students bodies of knowledge that someone else has organized. It is rather to enable the students to participate as fully as possible in the process of knowledge acquisition. The emphasis is not on the product or the outcomes of learning experiences as it is on the process of learning itself. Teaching by discovery is more concerned with attitudes; it aims to engender intrinsic interest; and it also emphasizes the satisfaction of learning independently.

For cognitive theorists like Bruner (1973), the main assumptions underlying discovery methods are first that the most important and most uniquely personal knowledge is that which the learner himself discovers and second, that the students have natural tendencies to explore, manipulate, experiment, inquire, guess and act independently.

There are no prescriptions for discovery teaching. Therefore, each teacher has to discover for himself when and how to employ this approach. Essentially discovery methods imply providing facilities, encouragement, challenge and opportunities, which permit the individual to find out for himself, or to think for himself. It also implies an atmosphere of freedom and support that is conducive to independent thinking.

Dearden (1976) proposes five ways of encouraging discovery learning. The first way consists of encouraging and providing opportunities for free exploration. The second way consists of providing learning tasks or activities which are left open. The third way consists of asking many questions to stimulate research. The fourth way consists of providing opportunities to see things and visit places which arouse and stimulate interest and curiosity. The fifth and last way consists of providing for and arranging materials that stimulate exploration, manipulation and experimentation.

The advantages of discovery methods are numerous. For Bruner (1973), discovery helps students learn how to learn, how to acquire information that might be needed in a particular situation later in life. He believes that discovery methods help develop curiosity, sharpen reasoning abilities and power of observation, and make the student more self-reliant and less dependent upon the teacher or textbook. Bruner (1966) also believes that discovery methods help build problem-solving skills. Discovery also fosters imagination and independence.

Discovery methods can be used at any grade level and for any school subject. The method can be used individually, in groups, as a class and even as a school. Advocates of this method usually associate it with the goal of achieving independent learning (see section 4.3.2.2).

f) Out-of-school activities: it is possible and often desirable that the teacher release his students from rigid adherence to a five-hour-a-day schedule in the classroom, so that they may explore the environment outside the classroom. In this way a whole world of possibilities opens up and the entire environment becomes the "locus" of the students' learning.

For Barth (1973), wherever there is a school, there is a community which is rich in potential learning experiences. The country-side offers a study of nature, creatures of every kind, plants and streams; the suburbs offer opportunities to explore various forms of transportation; and cities offer opportunities to view all forms of construction. All give access to weather, food, buildings, movement, change, pattern and excitement.

There are subjects which obviously lend themselves to activities out of school, in which activities out of school should play an essential part. These subjects are geography, history and biology. In geography, visits can be arranged to places of local interest such as the post-office, the bus station, the fire station. In history, visits can be arranged to places of historical interest such as museums. In biology expeditions can be arranged to collect items of the flora or to study different trees and bushes. It is also possible to arrange out-of-school activities for subjects such as arts and even arithmetic.

Out-of-school activities can promote the integration of learning, bridge the gap between school and the real world, and provide opportunities for exploration, investigation and discovery in real life situations which amplify and extend theoretical studies.

It need hardly be emphasized again that teachers have varying personal preferences for these methods and will use them flexibly as they consider individuals will benefit most in particular circumstances.

4.3.5.3 General Guidelines for the Selection of Instructional Materials.

Teaching methods are useful and in some way essential in running an individualized learning programme. However, if they are to be effective, they must sometimes be supplemented by appropriate instructional materials. In selecting instructional materials, the teacher should refer to the guidelines already discussed in section 4.3.5.1 when considering teaching methods.

The major guideline suggests that the teacher select instructional materials that are adaptable in terms of each student's individual differences, consistently with the consideration that they are appropriate to the types of content included in the curriculum of his programme and its general goals.

Materials that support and/or complement the teaching methods used in his programme must of course be selected.

Another guideline suggests that occasionally, the teacher encourage his students to supply and even construct instructional materials. Not only does this foster independence but it is believed that by doing this, the teacher could create additional opportunities for accommodating some of his students' individual differences.

In this context, however, the teachers will vary in their skills of guiding the construction of materials and this will not necessarily be used frequently by teachers who lack manual skills themselves.

4.3.5.4 A Variety of Instructional Materials.

There is obviously a wide range of instructional materials. In this section, a description and a discussion of the relative merits of six categories of instructional materials are made. The discussion is made, whenever possible, with reference to the general guidelines for the selection of instructional materials proposed in the preceding section.

a) Books and other publications: books are not eliminated by individualization, on the contrary, teachers need a wider range of diversified books than is usually used in a traditional programme, in order to provide support for the various techniques that are basic to individualized instruction. The fact that so much of classwork is done in a small group or on an individual basis necessitates this kind of provision.

A reasonable arrangement might include a collection of multi-purpose topic books which provide support for research and reference; it might include encyclopaedias and other reference books valuable for investigation and research; it might include biographies and autobiographies valuable for examining interesting lives and noteworthy accomplishments; and it might also include magazines, periodicals, journals, newspapers, and even comics which are interesting and valuable for providing useful and often stimulating information.

b) **Workbooks and programmed textbooks:** workbooks and programmed textbooks are particularly useful to support classwork done on an individual basis. Workbooks provide the drill and the specific problem-solving practice the students need for learning. Programmed textbooks are an essential complement to programmed instruction. Indeed, they provide small learning steps, and immediate and frequent reinforcements.

c) **Displays and models:** the value of displays and models cannot be too greatly stressed. They are of various sorts and the wide range available meets the requirements of every subject.

Displays and models can be provided or even constructed by the students and teacher with very simple materials such as plasticine, paper and cardboard, and with very common materials such as boxes, cigarette packetts, cloth, buttons, toilet roll cores and newspapers. Their construction provides opportunities for class participation in groups or individually.

Displays and models offer scope for a more realistic approach. They can be invaluable in the teaching situation as a point of reference for demonstration and understanding of processes and construction.

d) **Kits and learning packages:** kits and learning packages are very popular and there is a wide choice available. They are particularly useful to support classwork done on an individual basis. Furthermore they are invaluable to the teachers whose preparation time is perforce limited.

e) **Academic games and puzzles:** the use of games and puzzles should be a major feature of Education. There is a wide range of games and

puzzles. They can of course be provided and also constructed by the teachers and the students in order to meet the requirements of every subject. The well known "Scrabble" for instance could be used to consolidate spelling and vocabulary and to promote the use of dictionaries.

Games and puzzles are most of all interesting and motivating. Furthermore they can be used by large groups, small groups and individuals.

f) The real object: the supreme instructional material is of course the article itself, the authentic object. When students are given opportunities to meet the genuine article, to handle the authentic specimen, it bridges the gap between school and the real world and it permits to extend theoretical studies. Teachers can provide for these experiences by making visits and excursions out of school but also by bringing, whenever possible, the real object into the classroom.

4.3.5.5 General Guidelines for the Selection of Instructional Media.

Instructional media are extremely useful tools. They can help the teacher enrich and enliven his teaching and stimulate in his students the desire to learn.

In selecting instructional media the teacher will again consider his general guidelines relating to the need to accommodate individual differences while maintaining appropriateness in respect of goals, content and methods.

4.3.5.6 A Variety of Instructional Media.

There is a wide range of instructional media for which teachers have individual preferences. In this section, a description and a discussion of the relative merits of three categories of instructional media are made. The discussion is made, whenever possible, with reference to the general guidelines for the selection of instructional media proposed in the preceding

section. It will be noticed that within the teacher preferences, the media available are likely to appeal differently to different types of students, so that individualized instruction will involve a comprehensive knowledge of what will best suit them as individuals coupled with the teacher's own skills in their usage.

a) **Visual media:** visual media are usually used to fill out and to render more exact certain specific things first communicated by language. For purposes of teaching they may complement what has been communicated to the students by the teachers.

Among the variety of visual media available to the teachers are the blackboard, pictorial aids and projected aids.

The blackboard (sometimes called a chalkboard) is obviously the most common of the visual media. It is a vehicle for the teacher's instructions and for the information and illustrations he wishes to impart.

The main advantages related to the use of the blackboard are: it is always available, alterations and amendments are easily made; and it can be adapted to the requirements of any subject. The use of the blackboard is not limited to large-group instruction. It can also support classwork done in small groups or on an individual basis.

Pictorial aids include pictures such as charts, maps and diagrams. According to Cable (1965) pictorial aids could probably be regarded as the backbone of the visual media available to the teacher.

The main advantages related to the use of pictorial aids are: an enormous variety is available, every subject can be covered; and they can be adapted to any teaching situation, in any accommodation.

Projected aids available to the teachers include the slide projector, the episcope, and the overhead projector.

Projected aids are usually designed to enable a large number of students to see an illustration. Like all the other visual media they can be

adapted to support the needs of any subject. A major advantage related to the use of projected aids is that they create an atmosphere which aids interest and anticipation.

b) **Aural media:** among the variety of aural media available to the teacher are record players and tape recorders.

Record players are widely used in school today, and more and more educational material on disc is becoming available. The main uses are for: dancing, music and movement, songs and mimes, musical appreciation, story, prose, verse and drama. They are also used to supplement printed materials with language recordings on disc. Record players are very valuable to support activities performed in groups or on an individual basis.

Tape-recordings are now regarded as absolutely essential to the attainment of recognized education goals. The educational uses of the tape-recorder are countless: it can be used for individual activities such as speech and reading training; it can be used for large-group activities such as auditions of selected pieces of music, poems and stories; and it can be used for small-group activities such as discussions and dramas. In fact, tape-recorders could meet the needs of any teaching or learning situation.

c) **Audio-visual media:** audio-visual media include those media which have both an aural and a visual appeal, like the cine-sound film and the television. Cine-sound films and television programmes are the closest approximations to actual experience that an aid can give.

Some of the advantages related to the use of the audio-visual medium are: it has movement; it can show processes, methods, and procedures; it can create the impression of space and time; it makes it possible to give meaning to abstract notions and scientific theories; and it admits the voice of the expert and the performance of the specialist.

There is a wide range of films and television programmes available for classroom uses. They cover most subjects and can be used for large-group, small-group and individual procedures.

4.3.5.7 General Guidelines about the Organization of the Classroom.

Teaching methods, instructional materials and media are all useful and in some ways essential ingredients of a truly effective organization of instruction. However, none of these will contribute effectively to the running of an individualized learning programme without an appropriate setting for learning in the classroom.

Three key concepts should be considered when planning classroom organization for individualized learning. They are accessibility, usability and flexibility.

One can arrange for accessibility and usability by organizing the classroom in such a way that it becomes a self-stimulating room; that is a room where there is a permanence of stimulations in terms of instructional materials and media. The need for such an organization is reinforced first by the fact that students need to be continuously stimulated in various manners, that is they need to be in contact with a variety of instructional materials and media, and second by the fact that since they are engaged in an individualized programme, one cannot expect all of them to contact and use the same instructional materials and media, nor at the same time.

Provision can be made for flexibility by organizing the classroom in a manner which permits the strategic dispersal of various types of teaching methods to accommodate the various needs of students engaged in similar or different activities. Thus, the organizational pattern of the classroom could be flexible enough to accommodate at the same time, if need be, large-group, small-group and individual procedures. It also means that instructional materials and media could be arranged in such a way to permit an easy flow of traffic to accommodate students who need quiet solitude as well as those involved in group activities.

The teacher may also have preferences about his or her own position within the group, and whether students are helped better when the teacher circulates or the students move towards the teacher's base. Obviously, active students like to move about but others are not so easily

motivated to ask for help if it is left to them to come to the teacher. The result must be a compromise between the teacher's preferences and those of the students.

4.3.6 Stage Six: Organization of Students' Evaluation.

Students' evaluation, as is the case with most learning programmes, is an integral part of an individualized learning programme. It is therefore proposed in this sixth and final stage of the new model that the teacher organize his students' evaluation.

Specifically, it is proposed that the teacher answer the following questions:

- "What type(s) of students' evaluation will you do in your individualized learning programme?"
- "What evaluation techniques and instruments will you use?"

In order to guide the teacher in making the necessary and relevant decisions in this final stage of the new model, general guidelines for the organization of students' evaluation are proposed and two types of students' evaluation are reviewed briefly. Finally, specific guidelines for the selection of evaluation techniques and instruments are proposed.

4.3.6.1 General Guidelines for the Organization of Students' Evaluation.

In an individualized learning programme, students' evaluation plays a role quite different from that which it usually plays in more traditional programmes. Thus, when organizing his students' evaluation, the teacher should refer to the following general guidelines:

- a) The first guideline suggests, since individualized learning is an attempt to accommodate some of the students' individual differences, that

the teacher not use the evaluation of his students to make comparisons among them.

b) The second guideline suggests that the teacher view student evaluation as an integral and continuing part of his instruction. This means that students' evaluation should not be used only as a means for assessing students' achievement of the educational goals of the programme but also as a means for assessing and guiding the progress of each individual student in the programme.

c) The third and final guideline suggests that the teacher allow for and encourage self-evaluation. Self-evaluation is a key component of an effective programme of evaluation. Such goals as learning how to learn and the development of responsibility and independence call for continuing growth in the ability to make self-appraisals.

4.3.6.2 Two Types of Students' Evaluation.

In the perspective of the new model for individualizing teaching proposed in the present chapter, one considers that an effective individualized learning programme requires two different but interrelated types of students' evaluation. They are formative evaluation and summative evaluation.

a) **Formative evaluation:** formative evaluation provides information necessary to individualize instruction. It refers to tests or other evaluation techniques applied in the course of learning. The main purpose of formative evaluation is to track each student's progress during the course of the programme, and to provide him with appropriate feedback of information whether he is to be praised for accomplishment or to identify where he is having difficulties. In other words formative evaluation is used to guide each student's progress during the course of the programme.

In keeping with its aim, formative evaluation should occur frequently during learning and appropriate feedback of information should be as

immediate as possible. If a student has to wait too long before he discovers that he is progressing well or that he has learning difficulties, being praised or informed will benefit him little. Furthermore, if data collected by formative techniques are to be useful in a formative sense, they should be put in a form that provides specific information about the magnitude and direction of each student's learning progress. The main purpose of formative evaluation is not to certify performance nor to produce a grade, but to guide each student's progress in the course of learning.

Formative evaluation can take many forms. However, regardless of the type of evaluation instruments used, it is essential that the students feel free to make mistakes without being penalized. It is therefore recommended not to grade formative evaluation instruments.

b) Summative evaluation: the primary purpose of summative evaluation is to assess students' achievement of goals at the end of a unit or programme. It usually seeks to certify performance and produce a grade.

Summative evaluations are usually infrequent, typically covering large portions of content or learning activities. As is the case with formative evaluation, summative evaluation can take many forms.

Even with this form of evaluation, personal preferences of teachers may play a part in relation to individuals, for example a teacher may believe that a difficult test may motivate the more able, but depress the less able. On the other hand, he may have some other theory about the relative effect of the difficulty of a test on the various ability levels of the students, for example that anxiety may be related to failure of more able students on a difficult test.

4.3.6.3 Specific Guidelines for the Selection and/or Development of Evaluation Techniques and Instruments.

Formative and summative evaluation techniques and instruments can be selected from a large set of evaluation techniques and instruments

(some of these were described and analysed in section 4.3.3.2 of the present chapter). They can also be developed, when necessary, by each teacher. In this section, specific guidelines for the selection and/or development of evaluation (formative and summative) techniques and instruments are proposed

a) The first guideline suggests that the teacher select and/or develop evaluation techniques in terms of the following criteria:

-Appropriateness to the type of evaluation (formative or summative) undertaken. Some evaluation techniques and instruments are restricted in use to either formative or summative purposes.

-Usefulness in providing information or evidence needed for evaluation purposes. There is no place in an individualized learning programme for collecting piles of data that will not be used.

-Appropriateness in terms of what is really being learned by the students in the programme.

-Appropriateness in terms of the level of development of the students involved in the programme.

-Availability and ease of administration and correction.

-Validity (measure what they purport to measure) and reliability (consistency and accuracy of measurement) of available techniques and instruments.

b) The second guideline suggests that the teacher occasionally select and/or develop evaluation instruments which can be administered, corrected and even interpreted by the students themselves so that they can grow in the ability to make self-appraisals.

c) The third and last guideline suggests that the teacher select and/or develop a variety of evaluation techniques and instruments in order to match the students' individual differences.

As a conclusion to the practical application of the new general model which has been presented as a decision-making process, it is important to mention that although there is an obvious logical progression with respect to the decisions that are made from one stage to another, it is always possible that some of the decisions made in the later stages of the general model could influence in a retroactive way some of those made in earlier stages. This suggests that there is a constant interaction among the six stages included in the new model for individualizing instruction and above all, a difference between teachers in their manner of adaptation to the demands of individuals for whom they wish to offer maximum benefit in their interpretation of the teaching task.

CHAPTER 5

THE EXPERIMENT

In Chapter 4, the new general model for individualizing instruction was introduced and shown to emphasize flexibility by means of alternatives. The model suggests that such flexibility would allow teachers to design individualized learning programmes according to their individual requirements, and above all according to the particular situations in which they are placed.

By implementing the new general model and by assessing some of its effects, both cognitive and affective, it should be possible to gather information giving relevant indications as to its relative effectiveness.

5.1 Hypotheses and Variables.

The choice of variables to be measured to assess the effectiveness of the new general model for individualizing instruction should be related to theory. In section 4.1 of Chapter 4, six basic assumptions were presented and shown to underlie the need for a general model of individualization of instruction. In section 4.2, those same assumptions were then used as a basis for the formulation of a model of instructional congruence like that used in the new general model proposed in the present study. Finally, following formulation of the model of instructional congruence, certain deductions were made, some of them pointing out possible effects of such a model. These deductions are: equilibrium in the individualized instruction system generates success in achievement for the learner, and success in teaching for the teacher; equilibrium in the individualized instruction system leads to motivation and satisfaction in the learner, and motivation and satisfaction in the teacher. Hence, in an assessment of the effectiveness of the new general model, the variables should be chosen as to give indications of the achievement of some of these effects.

The present study will be concerned only with the assessment of effects of the new general model on students' academic achievement, students' attitudes towards a subject and teachers' attitudes towards students. As regards effectiveness of the new model at generating success in teaching, it will be inferred from the assessment of effects of the new model on students' academic achievement and students' attitudes towards a

subject. This is consonant with the largely accepted premise that measures of student growth or progress (cognitive and affective) are the ultimate criteria for research on teaching effects (Rosenshine and Furst, 1973).

5.1.1 Effects on Students' Academic Achievement.

Hypothesis I: The academic achievement of students who have been involved in individualized learning programmes of Mathematics designed according to the new general model proposed in this study, is higher than that of students involved in traditional programmes of Mathematics.

The new general model for individualizing instruction emphasizes the importance for the teachers to design individualized learning programmes, that is programmes adapted to the requirements of each individual student. This emphasis on individualized learning is justified by the assumption that each student is more likely to achieve and be successful when permitted to learn at a pace and in a way commensurate with his abilities and interests. This assumption is supported by the findings of research studies (those were reviewed in Chapter 2) indicating that, to date, most procedures for individualizing learning are as good as or better than more traditional procedures at producing learning.

The main reason justifying the selection of academic achievement as the dependent variable in hypothesis I is the general concern of educators for academic achievement. This general concern is usually heightened in individualized learning situations because of the very nature of individualized learning, which is unfamiliar to most educators, and indeed to most adults in terms of their own school experience.

One would expect hypothesis I to hold true for every area of academic achievement performed by students in individualized learning programmes. However, for the purpose of this study, only one area has been chosen; it is Mathematics. It was decided to limit this study to only one area of academic achievement in an effort to narrow the scope of the study,

thus introducing maximum efficiency by increasing sample sizes for statistical comparisons. Mathematics was selected at random between two subjects, French and Mathematics. These two subjects were previously chosen as being the two most basic subjects taught in French-Canadian Schools.

5.1.2 Effects on Students' Attitudes towards a Subject.

Hypothesis II: The students who have been involved in individualized learning programmes of Mathematics designed according to the new general model proposed in this study, have more positive attitudes towards Mathematics than the students involved in traditional programmes of Mathematics.

As previously mentioned, the new general model for individualizing instruction emphasizes the importance for the teachers to design learning programmes that are adapted to the requirements of each individual student. This emphasis on individualized learning is justified by still another basic assumption which is that each student is more likely to become highly motivated toward learning when permitted to learn at a pace and in a way commensurate with his abilities and interests. This assumption is also supported by the findings of research studies (these were reviewed in Chapter 2) indicating that procedures for individualizing learning can generally foster the development of students' positive attitudes toward learning.

The main reason for selecting the more specific variable of students' attitudes towards a subject as the dependent variable in hypothesis II is based on the assumption that the attitude of the students towards a subject is a valid indicator of a more general attitude toward learning.

5.1.3 Effects on Teachers' Attitudes towards Students.

Hypothesis III: The teachers who have been involved in individualized learning programmes of Mathematics designed according to the new general model proposed in this study, have more positive attitudes towards students than the teachers involved in traditional programmes of Mathematics.

The new general model for individualizing instruction emphasizes the importance for the teachers to design individualized learning programmes according to their own individual requirements and above all, according to the particular situations in which they are placed. This emphasis on individualized teaching (i.e. fitting the teaching method to the teacher) is justified by the assumption that each teacher is more likely to be motivated toward teaching when permitted to teach in a way commensurate with his abilities and interests. As previously admitted (see section 4.1 of Chapter 4), there has been no direct attempt at studying the effects of congruence between the teaching method and the teacher's characteristics; therefore, this assumption is not directly supported by the findings of research studies. One believes however, that on the basis of the findings of research studies indicating that congruence between the learning strategy and the learning characteristics of the learner can foster the development of students' positive attitudes toward learning it is reasonable to assume that congruence between the teaching method and the teacher's characteristics can foster the development of teachers' positive attitudes toward teaching.

The main reason for selecting the more specific variable of teachers' attitudes towards students as the dependent variable in hypothesis III is based on the assumption that the attitude of the teachers towards students is a valid indicator of a more general attitude toward teaching.

5.1.4 Summary of the Three Research Hypotheses.

Hypothesis I will permit verification if the experimental treatment (individualized learning programmes designed according to the new general model proposed in this study) is more successful in enhancing students' academic achievement than the control treatment (traditional instruction programmes). Hypothesis II will permit verification if the experimental treatment is more successful in fostering the development of students' positive attitudes towards a subject than the control treatment. Hypothesis III will permit verification if the experimental treatment is more successful in fostering the development of teachers' positive attitudes towards students than the control treatment. The three hypotheses should offer a basis to reach a conclusion regarding the relative effectiveness of the new model for individualizing instruction.

5.1.5 Independent Variables.

For the purpose of the present study, the independent variable "experimental treatment" refers to those individualized learning programmes designed and administered by the teachers in the experimental group according to the new model for individualizing instruction proposed in the study. These programmes are characterized by the following common features:

- a) They are designed by teachers to accommodate some of their own individual requirements.
- b) Special interest is shown in each student as a unique person.
- c) Some students' individual differences are accommodated by means of the organization of the curriculum, and/or the organization of instruction, and/or the organization of students' evaluation.
- d) Learning is individually paced, that is each student is allowed the necessary amount of time to progress along the curriculum.

e) Each student is allowed to learn in ways commensurate with his abilities and interests.

f) Each student is encouraged to participate in or even to make some decisions relative to what, how and when to learn.

g) Students' evaluation is used not only as a means of assessing each student's achievement of the educational goals of the programme but also as a means for assessing and guiding the progress of each individual student in the programme.

h) Students are given opportunities to make self-evaluations.

The independent variable "control treatment" refers to those traditional programmes of instruction designed and administered by the teachers in the control group. It was recognized that care must be taken to avoid the Hawthorne effect. These programmes are characterized by the following common features, which, it will be noted, will tend to help to make this group feel that it is appreciated, thus obviating the Hawthorne effect as far as possible:

a) They are designed by teachers to accommodate their own school requirements.

b) Special interest is shown in students as a group.

c) The curriculum, the instruction and the students' evaluation are organized in terms of the common needs and interests of the students in the group.

d) Learning is group-paced, that is every student progresses at a common rate along the curriculum.

e) Students have to learn in ways commensurate with the common abilities and interests of the students in the group.

f) Students are not encouraged to participate in nor to make decisions relative to what, how and when to learn.

g) Students' evaluation is used mainly as a means for assessing students' achievement of the educational goals of the programme.

h) Students are not given opportunities to make self-evaluations.

5.2 Research Design.

Studies and experiments comparing teaching methods usually rely, for sampling purposes, either on equivalent randomized-formed groups, or on non-equivalent naturally-formed groups. This study makes use of non-equivalent naturally-formed groups, which are nevertheless likely to be similar in relation to the characteristics which could be confounded with the experimental treatments.

As was the case with the pilot study, the basic research design used in the present study is the quasi-experimental "Non-equivalent Control Group Design" proposed by Campbell and Stanley (1963). The main characteristic of the design is that the experimental and control groups do not have known pre-experimental sampling equivalence. A detailed description of this classic research design was provided in section 3.2.2 of Chapter 3.

The main reason for choosing and using the non-equivalent control group design in the present study is its effectiveness in controlling the major factors jeopardizing the internal validity of such studies, thus allowing the experimenter to be surer of his conclusions about the main effects of the experimental treatment. The main threats to internal validity are controlled in the following manner: the control group insures against effects of history, maturation, testing and instrumentation; the pretest scores insure control against differential selection of subjects; and mortality effects are controlled by checking pretest and posttest records. Moreover, the effects of random initial differences in pretest scores can be controlled by the use of covariance methods.

It is important to reiterate at this time that this basic design does not control factors jeopardizing the external validity of the research. Therefore, the conclusions of the present experiment will be applicable only to the conditions of the present study.

The non-equivalent control group design proposed by Campbell and Stanley will be used to test the three research hypotheses stated in section 5.1 of the present chapter.

5.3 Samples.

The first sampling objective of the present study was to find classes where the new general model for individualizing instruction could be implemented. The second sampling objective was to find classes that could serve as control groups for the testing of the three research hypotheses.

All the fifth-grade teachers in School District Number Thirteen, Moncton, New Brunswick, Canada, except those who had participated in the pilot study, were invited to participate in the experiment on a voluntary basis. Principals of schools which were on the list were approached and they conveyed the invitation to teachers who might take part in the experiment. A detailed description of School District Thirteen was given in section 3.2.3 of Chapter 3.

It was decided to limit the invitation to participate in the experiment only to teachers in the fifth grade in an effort to constitute the largest homogeneous sample possible for statistical comparisons. The results of the pilot study suggested that either grade four or grade five would be more useful than grade six (see end of Chapter 3). The fifth grade was ultimately selected on the basis that students at this level had sufficiently mastered the necessary skills (reading and writing) permitting them to respond to the tests and questionnaires used to collect the data for this experiment.

Eight teachers distributed in three different schools manifested their desire to participate in the experiment on a voluntary basis. These teachers were then invited by the experimenter to attend an information session. At the end of the session, each teacher was assigned to a group, experimental or control.

One must note at this point that before assigning each teacher to a group, it was decided that for each of the three schools represented in the sample there would be an equivalent number of experimental and control groups. The natural distribution of volunteer teachers within the three schools (four teachers in one school and two teachers in each of the other two schools) made this arrangement possible. It was believed that such an arrangement could insure a minimal experimental control of the possible interaction effects of the variable "schools" with the main effects of the experimental treatment (individualized learning programmes designed according to the new general model) on the dependent variables of the present study.

The assignment of each teacher to a group was then made at random and in the following order: at first, two of the four teachers in school number one were selected to represent the experimental group and the other two to represent the control group; then, one of the two teachers in school number two was selected to represent the experimental group and the other one to represent the control group; finally, one of the two teachers in school number three was selected to represent the experimental group and the other one to represent the control group.

The final distribution of the sample for the experiment is shown in Table 5.1.

Table 5.1: Distribution of the Sample for the Final Experiment.

School	Experimental group	Control group
1-	A - 26 students	E - 25 students
	B - 27 students	F - 26 students
2-	C - 24 students	G - 24 students
3-	D - 17 students	H - 18 students

5.4 Implementation of the New General Model.

The new general model for individualizing instruction was presented and explained to the teachers of the experimental group over a period of ten weeks extending from the beginning of October to mid-December, 1975.

The main purpose of the implementation was to provide the teachers of the experimental group with appropriate training in the design and administration of an individualized instruction programme according to the new general model proposed in this study.

The implementation of the new general model conducted by the experimenter consisted mainly of lectures, discussions, practical assignments and answers to questions asked. Briefly, the teachers in the experimental group had to attend a two-hour meeting each week for ten consecutive weeks; they also had to work on the design of their own individualized learning programmes. It is important to note that, at this time, each teacher was given a typewritten transcript of the new model rather than a handwritten transcript as was the case in the implementation of the pilot general model. This arrangement was made in an effort to avoid a possible negative effect (confusion) on the comprehension and interpretation of the model by the teachers.

Specifically, the implementation of the new model was conducted in the following manner:

a) **First meeting:** The first meeting was devoted to the presentation of the new general model for individualizing instruction. Specifically, the teachers were presented with the theoretical foundations and conceptual framework of the new model. At the end of the meeting, teachers were asked to read sections 4.1 and 4.2 of the new general model.

b) **Second and third meetings:** During the second and third meetings, the teachers were asked to answer the following question: "How will you create and maintain a favourable climate for individualization?". In order to guide them in making the necessary and relevant decisions, the teachers were presented with what the author believes to be the necessary conditions and basic attitudes for creating and maintaining a favourable climate for individualization. As a complement to these two meetings, teachers were asked to read section 4.3.1 of the new model as well as the article "The Interpersonal Relationship in the Facilitation of Learning" written by Carl Rogers (1966).

c) **Fourth meeting:** During the fourth meeting, the teachers were told that usually, the next step in the new model would be for them to state the philosophy of their individualized learning programme, that is, specifically, they would be asked to answer the following question: "What will be the educational goals of your individualized learning programme?" However, following the request of School District Number Thirteen, they were told by the experimenter that they would still have to abide by the educational goals mandated by the School District. Those goals can be summarized as follows: to enhance competency, mastery and attainment of learning standards; and to promote motivation to learn. During this meeting, teachers were nevertheless asked to read section 4.3.2 of the new model.

d) **Fifth meeting:** During the fifth meeting, the teachers were asked to answer the following questions: "What type(s) or category(ies) of students' individual differences will be accommodated in your individualized instruction programme?"; and "How will you identify those individual

differences among your students?". In order to guide them in making the necessary and relevant decisions, the teachers were presented with a classification of students' individual differences as well as with a variety of techniques for identifying individual differences among students. As a complement to this meeting, the teachers were asked to read section 4.3.3 of the new general model.

e) Sixth and seventh meetings: During the sixth and seventh meetings, the teachers were asked to organize the curricula of their individualized instruction programmes. Specifically, the teachers were asked to answer the following questions: "What content will you include in the curriculum of your individualized programme?"; and "How will you organize the curriculum content?". In order to guide them in making the necessary and relevant decisions, the teachers were presented with major orientations for curriculum organization, criteria for the selection of content and a variety of procedures for organizing curriculum content. As a complement to these two meetings, the teachers were asked to read section 4.3.4 of the new model.

f) Eighth and ninth meetings: During the eighth and ninth meetings, the teachers were asked to answer the following questions: "What teaching methods will you use?""; "What instructional materials will you use?""; and "What instructional media will you use?". In order to guide them in making the necessary and relevant decisions, the teachers were presented with general guidelines for the selection of teaching methods, instructional materials and instructional media and with a variety of teaching methods, instructional materials and instructional media. General guidelines for the organization of the classroom were also presented to the teachers. As a complement to these two meetings, the teachers were asked to read section 4.3.5 of the new model.

g) Tenth meeting: During the tenth meeting, the teachers were asked to organize the evaluation of their students. Specifically, the teachers were asked to answer the following questions: "What type(s) of students' evaluation will you do in your individualized instruction programme?""; and "What evaluation techniques and instruments will you use?". In order to guide them in making the necessary and relevant

decisions, the teachers were presented with general guidelines for the organization of students' evaluation as well as with two types of students' evaluation. Specific guidelines for the selection and/or development of evaluation techniques and instruments were also presented. As a complement to this meeting, the teachers were asked to read section 4.3.6 of the new model.

As a conclusion to the implementation of the new general model, one must mention that for the duration of the implementation period the component "creation and maintenance of a favorable climate for individualization" was given continuous and special attention, that is the teachers were invited to refer constantly to it while designing their own individualized learning programmes. Such action was required considering that there are essential educational conditions for an effective individualized instruction programme and that achievement of these conditions is necessary to insure the success of the programme.

During the same period of time, the teachers in the control group attended a weekly seminar. It has already been stated that it was necessary to bring a minimal experimental control to the well known "Hawthorne effect" discussed by Isaac and Michael (1971), and this seminar was introduced as one means of achieving such control.

At the first seminar, teachers were given explanations concerning what they were expected to do during the year as volunteer participants in the present study. First, they were told that, during the winter semester, they would be asked, by means of their own programme of instruction, to continue to seek achievement of the educational goals stated by School District Thirteen. These goals are: to enhance competency, mastery and attainment of learning standards; and to promote motivation to learn. Finally, they were told that in preparation for the winter semester, they would have to attend, during the autumn semester, a weekly seminar in which subjects (related to learning and teaching in general) of their choice would be discussed. It will be noted that many issues concerning the evaluation of students were not raised specifically, as teachers in general are equipped with a knowledge of the techniques normally required.

The subjects which were discussed by the experimenter with the teachers in the control group, during these weekly seminars, can be classified under the following categories: intelligence and learning, personality and learning, retention and learning, motivation and learning, transfer of learning, and discipline in the classroom.

At the end of the period of time allocated for the expansion in detail of the new model, the experimenter met again separately with both groups (experimental and control) of teachers in order to remind them of the educational goals they should seek to achieve during the winter session, by means of their respective programmes of instruction: individualized learning programmes for the teachers in the experimental group and traditional instruction programmes for the teachers in the control group.

5.5 Experimental Procedure and Data Collection.

The experiment was carried out between the beginning of January and the end of June, 1976.

Essentially, the experiment consisted of the administration of the two types of instructional programmes respectively by the two groups of teachers: individualized learning programmes by the teachers in the experimental group and traditional instruction programmes by the teachers in the control group.

It will be noted here that according to the regulations of the New Brunswick School System, the teachers were allocated five fifty-minute periods a week for teaching Mathematics. A summary of the content of the Mathematics programme for the fifth grade is presented in Appendix A.

Two experimental controls were initially brought about in the experiment in order to make sure that the teachers in the experimental group had indeed designed and administered individualized learning programmes according to the new model proposed in this study.

The first control consisted of three visits by the experimenter without any advance warning to each experimental classroom. These visits were made during the school day. This first experimental control aimed at verifying (by means of observation) whether the essential conditions for individualization were indeed achieved in the experimental classrooms.

The second control consisted of the administration of a questionnaire, "The Teaching Strategies Inventory", to the teachers in the experimental group at the end of the experiment. This questionnaire aimed at ascertaining in a more systematic manner whether the teachers in the experimental group had really designed and administered individualized learning programmes according to the new model.

It is important to note that the same questionnaire was administered a second time (28 months after the end of the experiment) to the teachers in the experimental group. On the same occasion, the questionnaire was also administered, for the first time, to the teachers in the control group. This additional experimental control was brought about such a long time after the end of the experiment in the hope that it would provide information that might be useful in consolidating the conclusions of the present study. It would probably have been preferable to bring about this additional experimental control (administration of the questionnaire to the teachers in the control group) right at the end of the experiment, but unfortunately the experimenter did not realize the usefulness of doing so until later, while reviewing the various results of the experiment.

In addition to the Teaching Strategies Inventory, three means of data collection were used in the present study: a standardized mathematics achievement test and the Subject Perception Test which were administered to the students; and the Minnesota Teacher Attitude Inventory which was administered to the teachers. These three instruments were administered at the beginning (first week in January) and at the end (third week in June) of the experiment. The same instruments were administered under similar conditions to both the experimental and the control groups. All instruments were administered in groups.

5.6 Instruments.

Four instruments for data collection were used in this study, as described in the following pages.

5.6.1 The Mathematics Achievement Test.

A standardized mathematics achievement test for the fifth grade developed by the Montreal Catholic School Commission was used to test the first research hypothesis in this study. The test is a survey-type objective test composed of 35 questions. For each question a correct answer was assigned a score of one. This is the same test as was used in the pilot study (see section 3.2.6.1 of Chapter 3). The test content was considered a valid measure of achievement in relation to the subject matter of the syllabus appropriate to this particular grade.

5.6.2 The Subject Perception Test.

The Subject Perception Test designed by the author was used to test the second research hypothesis in this study. The Subject Perception Test is a questionnaire measuring the attitude of the students toward the subjects they learn in school. This is the same test as was used in the pilot study (see section 3.2.6.2 of Chapter 3).

5.6.3 The Minnesota Teacher Attitude Inventory.

The Minnesota Teacher Attitude Inventory developed by Cook, Leeds and Callis (1951) was used to test the third research hypothesis in this study. This has also been described in relation to its use in the pilot study (see section 3.2.6.3 in Chapter 3).

5.6.4 The Teaching Strategies Inventory.

The Teaching Strategies Inventory constructed by the author was initially designed and used as an experimental control in order to verify if the teachers in the experimental group had indeed designed and administered individualized learning programmes according to the new general model proposed in this study. Subsequently, the T.S.I. was administered to both groups of teachers (experimental and control) and at the same observation time (28 months after the end of the experiment) in an effort to verify if the two groups of teachers had indeed administered significantly different instructional programmes: individualized learning programmes for the teachers in the experimental group and traditional instruction programmes for the teachers in the control group.

The Teaching Strategies Inventory is a questionnaire composed of 18 general questions concerning the teaching strategies used by the teachers while administering their respective instructional programmes. Nine (questions 1, 3, 4, 8, 9, 10, 13, 14, 17) of the 18 general questions are considered salient for the purpose of identifying the type of instructional programme (individualized or traditional) which was administered by each teacher during the experiment. They are identified closely with the distinguishing features of the two types of programme described in section 5.1.5 of the present chapter. The remaining nine questions as well as the various sub-questions are used to collect additional information concerning the type of programme used by each teacher.

The following answers are considered representative of the administration of an individualized learning programme designed according to the new general model for individualizing instruction: 1: yes, 3: yes, 4: yes, 8: no, 9: yes, 10: no, 13: no, 17: yes. The following answers are considered representative of the administration of a more traditional instruction programme like those usually administered in the New Brunswick educational system: 1: no, 3: no, 4: no, 8: yes, 9: no, 10: yes, 13: yes, 14: yes, 17: no.

There were no systematic studies as to the validity of the T.S.I.. However, we assume that it is a valid instrument insofar as the items were

selected and constructed from the common features previously identified as characterizing each of the two types of instructional programme used in this study.

5.6.4.1 Reliability of the Teaching Strategy Inventory.

One form of reliability, the stability of the T.S.I., was determined by measuring agreement between the answers of the teachers in the experimental group on the T.S.I. at first observation time (June 1976) and the answers of the same teachers on the T.S.I. at second observation time (November, 1978). The formula used for this was Fleiss's (1975) intra-class correlation coefficient.

$$\text{The formula is: } r^* = \frac{4 \times (AD - BC) - (B - C)^2}{(P1 + P2)(Q1 + Q2)}$$

According to Fleiss, the use of this formula is valid only when observations (frequencies) are independent. It was conjectured that responses to items of the questionnaire were independent even when answered by the same person, and hence the formula is treated as giving a useful descriptive statistic.

Table 5.2 shows that the reliability coefficient obtained is $r^* = .83$. This stability estimate is interpreted as satisfactory considering the extremely long interval between the two observation times (28 months).

A copy of the Teaching Strategies Inventory is given in Appendix E.

5.6.4.2 Summary of the Answers of the Teachers in the Experimental Group on the Teaching Strategies Inventory.

The Teaching Strategies Inventory was initially designed to be used as an experimental control in order to verify if the teachers in the

experimental group had indeed designed and administered individualized learning programmes according to the new general model for individualizing instruction proposed in this study. An essential feature of the new model is that individual teachers may differ in their teaching strategies (individualized teaching) while remaining dedicated to the general principles of individualization of learning. Hence the replies of the four "experimental" teachers were further inspected for differences of approach as well as similarities.

Table 5.2: Agreement between the Answers of the Teachers in the Experimental Group (N = 4) on nine questions of the Teaching Strategies Inventory at First Observation Time (June, 1976) and the Answers of the Same Teachers on the Same Test at Second Observation Time (November, 1978).

N. Subjects = 4	N. Answers = 9															
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;"></td> <td style="width: 10%; text-align: center;">YES</td> <td style="width: 10%; text-align: center;">NO</td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 50%;"></td> </tr> <tr> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">YES</td> <td style="border: 1px solid black; text-align: center;">A</td> <td style="border: 1px solid black; text-align: center;">B</td> <td style="border-right: 1px solid black;">A+B = P1</td> <td rowspan="2" style="vertical-align: middle; padding-left: 20px;"> $r^* = \frac{4 \times (AD-BC) - (B-C)^2}{(P1+P2)(Q1+Q2)}$ </td> </tr> <tr> <td style="border-right: 1px solid black;">NO</td> <td style="border: 1px solid black; text-align: center;">C</td> <td style="border: 1px solid black; text-align: center;">D</td> <td style="border-right: 1px solid black;">C+D = Q1</td> </tr> </table>		YES	NO				YES	A	B	A+B = P1	$r^* = \frac{4 \times (AD-BC) - (B-C)^2}{(P1+P2)(Q1+Q2)}$	NO	C	D	C+D = Q1	
	YES	NO														
YES	A	B	A+B = P1	$r^* = \frac{4 \times (AD-BC) - (B-C)^2}{(P1+P2)(Q1+Q2)}$												
NO	C	D	C+D = Q1													
A + C = P2																
B + D = Q2																
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;"></td> <td style="width: 10%; text-align: center;">YES</td> <td style="width: 10%; text-align: center;">NO</td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 50%;"></td> </tr> <tr> <td style="border-right: 1px solid black; border-bottom: 1px solid black;">YES</td> <td style="border: 1px solid black; text-align: center;">16</td> <td style="border: 1px solid black; text-align: center;">1</td> <td style="border-right: 1px solid black;">P1 = 17</td> <td rowspan="2" style="vertical-align: middle; padding-left: 20px;"> $r^* = \frac{4 \times [(16 \times 17) - (1 \times 2)] - (1-2)^2}{(17+18)(19+18)}$ </td> </tr> <tr> <td style="border-right: 1px solid black;">NO</td> <td style="border: 1px solid black; text-align: center;">2</td> <td style="border: 1px solid black; text-align: center;">17</td> <td style="border-right: 1px solid black;">Q1 = 19</td> </tr> </table>		YES	NO				YES	16	1	P1 = 17	$r^* = \frac{4 \times [(16 \times 17) - (1 \times 2)] - (1-2)^2}{(17+18)(19+18)}$	NO	2	17	Q1 = 19	
	YES	NO														
YES	16	1	P1 = 17	$r^* = \frac{4 \times [(16 \times 17) - (1 \times 2)] - (1-2)^2}{(17+18)(19+18)}$												
NO	2	17	Q1 = 19													
P2=18, Q2=18																
r* = .83																

Some of the differences were as follows:

- Question 1.1 Two teachers mentioned only needs and motivation of their pupils, while the other two also mentioned learning style.

- Question 1.2 Two quoted discussions with parents, and one was prepared to obtain more information about her pupils through discussion with them, while the other two relied on observation and testing.

- Question 2.1 Two of the four teachers were prepared to build ancillary course content in relation to pupils' personal experiences, one quoted calculators; the other gave a general response.

- Question 4.1 Teachers differed in regard to the extent to which they were prepared to encourage pupil participation in determining deviations of content from the syllabus available. Only one teacher was prepared to deviate as much as this.

- Question 5.1 Two teachers thought about behavioural objectives, the other two did not. Regarding 5.2 one of these invited pupil participation in stating objectives, while the other did not.

- Question 6.1 While all agreed they would modify the order of presentation, one based such changes on a logical sequence of subject matter, another on children's wishes, another on aptitude, and the remaining teacher stressed building on existing knowledge and interests.

- Questions 11-12 These questions regarding the use and the type of materials and media elicited a variety of responses. Two teachers used objects available in the classroom, while two others were prepared to use materials brought in by pupils or brought in things themselves.

-Question 14.1 This question elicited mention of a variety of evaluation techniques.

-Question 15. This final question brought out very clearly that the four teachers concerned varied a great deal in the frequency with which they used evaluation. One said "almost every day" and the least frequent suggested that evaluative methods were used only five times during the experimental period.

Some of the similarities were as follows:

-Question 1 All the teachers in the experimental group had given special attention to the identification of students' individual requirements.

-Question 2 All the teachers in the experimental group had done something concrete in relation to the organization of the curriculum. All the teachers, in addition to the mathematics reference book, had used other sources in the design of the curriculum.

-Question 6 The four teachers in the experimental group had modified the order of presentation of the contents which was suggested in the mathematics reference book.

-Question 8 All the teachers had permitted the students to study different contents at different times so long as they were related closely to the proposed curriculum.

-Question 9 All the teachers in the experimental group had done something concrete in relation to the organization of instruction. The four teachers had permitted their students to achieve at different rates according to their individual capacities.

- Question 10 All the teachers had used a variety of teaching techniques including lectures, small-group instruction and individual study.

- Question 13 All the teachers had also permitted their students to work with different educational facilities at different times.

- Question 14 All the teachers in the experimental group had evaluated more than one aspect of their students' progress.

- Question 17 All students were given opportunities to learn and practise self-evaluation, mainly by comparing their work with others, by discussing their work with the teacher, or by correcting their answers to problems with scoring keys they were provided with.

From this brief analysis of similarities and differences in the answers given by the teachers in the experimental group on the Teaching Strategies Inventory, two essential points stand out:

-The four teachers in the experimental group had done something concrete in the design and administration of their learning programmes, in order to accommodate some of their students' individual requirements (see similarities in answers to questions 1, 2, 6, 8, 9, 10, 13, 14, 17).

-The four teachers in the experimental group had also done something concrete in the design and administration of their programmes, in order to accommodate some of their own individual requirements (see differences in answers to questions 1.1, 1.2, 2.1, 4.1, 5.1, 6.1, 11, 12, 14.1, 15).

Hence, it may be assumed that the teachers in the experimental group had indeed designed and administered individualized learning programmes according to the new model for individualizing instruction proposed in this study.

5.6.4.3 Differences in Teaching Strategies between the Teachers in the Experimental and Control Groups.

It was mentioned earlier that the Teaching Strategies Inventory was subsequently administered to both groups of teachers (experimental and control) and at the same observation time (28 months after the end of the experiment) in an effort to verify whether the two groups of teachers had indeed administered significantly different programmes: individualized learning programmes for the teachers in the experimental group and traditional instruction programme for the teachers in the control group.

Consequently, a Mann-Whitney U Test of differences was computed between the scores of the teachers in the experimental and control groups on the Teaching Strategies Inventory at second observation time. As shown in Table 5.3, the differences were found to be significant and hence it may be assumed that the teaching strategies of the experimental and control groups differed.

5.7 Plan of the Statistical Analysis.

Various data analysis procedures were used in this study. These procedures are presented here for the three hypotheses to be tested which, it will be noted, have already been stated in this chapter, in sections 5.1.1, 5.1.2 and 5.1.3 respectively.

5.7.1 Hypotheses I and II.

a) The results of testing the first two hypotheses of the present study were analysed by means of covariance analysis using the pretest scores as the covariate. The computer programme ANCV32 (Division of Educational Research Services of the University of Alberta, 1969) was used to perform the analyses.

Table 5.3: Mann-Whitney U Test of Differences between the Scores of the Teachers in the Experimental and Control Groups on the Teaching Strategies Inventory (Second Observation Time).

Group	Score	Rank
Experimental		
A	8	6.5
B	8	6.5
C	9	8
D	6	5
Control		
E	1	1.5
F	2	3
G	1	1.5
H	4	4
$N_1 = 4$	1 1 2 4 6 8 8 9	
$N_2 = 4$	C C C C E E E E	
$U = 0+0+0+0 = 0$		
$P = .014^*$		

*Significant at the .05 level

As previously stated (see section 3.2.7 of Chapter 3), the techniques of analysis of variance and covariance are now regarded as the best means by which to evaluate the results of "methods" experiments. In this study, a covariance approach was used on the basis that, according to Gourlay (1953), it is better than simple analysis of variance at controlling variability due to experimental error. It will be noted that in this study, it was not possible to control variability due to experimental error by the more

direct method of matching the groups of students (experimental and control) equally.

In brief, covariance analysis was used to increase the precision of the present study by controlling variability due to experimental error.

Essentially, the method of covariance analysis consists of taking initial readings of a measure of any property which the experimenter estimates may affect the results and making an adjustment on the final readings to allow for the differences in the initial ones.

b) Post-hoc one-way analyses of covariance were also performed, with reservations about the validity of the tests used, in order to verify whether:

-the experimental treatment had a different effect on the dependent variable (academic achievement in Mathematics for hypothesis I, and attitudes towards Mathematics for hypothesis II) for the "weak" students (pretest scores below the median) and for the "strong" students (pretest scores above the median).

-the control treatment had a different effect on the dependent variable (academic achievement in Mathematics for hypothesis I, and attitudes towards Mathematics for hypothesis II) for the "weak" students (pretest scores below the median) and for the "strong" students (pretest scores above the median).

-there were significant differences between the effect of the experimental treatment and the effect of the control treatment on the dependent variable (academic achievement in Mathematics for hypothesis I, and attitudes towards Mathematics for hypothesis II) for the "weak" students.

-there were significant differences between the effect of the experimental treatment and the effect of the control treatment on the dependent variable (academic achievement in Mathematics for hypothesis I, and attitudes towards Mathematics for hypothesis II) for the "strong" students.

5.7.2 Hypothesis III.

a) The results of testing the third hypothesis in the present study were analysed by means of a Mann-Whitney U test. This procedure was used as an alternative to the parametric T test. The Man-Whitney U test is described by Siegel (1956).

b) For interest, a covariance analysis of these results was also computed.

In conclusion, it will be noted that the level of significance for all the tests used in this study was fixed at 0.05.

CHAPTER 6

PRESENTATION AND ANALYSIS OF RESULTS

The main purpose of this chapter is to present and analyse the results obtained in testing each of the three hypotheses of the final experiment. Each research hypothesis is rephrased in null form for the purposes of statistical testing.

6.1 Effects on Students' Academic Achievement.

Hypothesis I: The academic achievement of students who have been involved in individualized learning programmes of Mathematics designed according to the new model is not different from that of students involved in more traditional programmes.

As mentioned in Chapter 5 (see section 5.6.1), a standardized Mathematics achievement test developed by the Montreal Catholic School Commission was used to test the first research hypothesis. Table 6.1 reports the means and standard deviations of the achievement test scores obtained by the students in the experimental and control groups.

6.1.1 Analysis of Results for Hypothesis I.

The results obtained in testing the first hypothesis were analysed by means of a two-way analysis of covariance using the pretest scores as the covariate. The two factors studied were the teaching methods and the schools.

The F tests for the main effects as well as for the interaction effects are presented in table 6.2. A study of this table indicated that the differences obtained between the scores of the students in the experimental group and those of the students in the control group on the Mathematics achievement test are significant and that there is sufficient evidence to reject the null hypothesis at a .001 level of significance. The results of the

analysis are in the direction of the first stated hypothesis since the scores obtained by the students in the experimental group on the Mathematics achievement test are higher than those obtained by the students in the control group.

Table 6.1: Means and Standard Deviations of the Mathematics Achievement Test Scores Obtained by the Students in the Experimental and Control Groups.

Group	Pretest			Posttest		
	N	M	SD	N	M	SD
Experimental						
A	26	17.31	4.81	26	23.77	5.19
B	27	16.33	5.05	27	23.33	6.26
C	24	16.33	4.74	24	21.88	6.07
D	17	16.12	5.56	17	22.41	6.07
TOTAL	94	16.56	4.97	94	22.91	5.56
Control						
E	25	16.68	5.47	25	19.04	7.89
F	26	16.08	5.49	26	18.54	6.96
G	24	15.17	5.39	24	17.25	6.23
H	18	13.94	5.77	18	17.28	6.87
TOTAL	93	15.59	5.51	93	18.31	6.73

Table 6.2: Two-Way Analysis of Covariance for the Students in the Experimental and Control Groups on the Mathematics Achievement Test.

Source	SS	df	MS	F
Teaching Methods	641.99	1	641.99	40.89*
Schools	38.47	2	19.23	1.22
Interaction	2.98	2	1.49	0.09
Error Within	2827.51	180	15.70	
Totals	3510.95	185		

*significant at the .001 level

Table 6.2 also indicates that there is no significant difference between schools and no significant interaction between the two factors of the design.

6.1.2 "Post Hoc" Analyses of Results for Hypothesis I.

As mentioned in section 5.7.1 of Chapter 5, "post hoc" analyses of results were performed for hypothesis I, in order to verify whether:

-the superiority of the students in the experimental group over the students in the control group on the Mathematics achievement test (see Table 6.2) is confirmed for both the "weak" and the "strong" students.

-the experimental treatment is more effective at enhancing academic achievement for the "weak" students or for the "strong" students.

In order to perform these analyses, the students in both the experimental and control groups were classified as being "weak" (pretest scores below the median) or "strong" (pretest scores above the median). Thus, as is suggested by Winer (1970, p. 594), the covariate (pretest scores) was used as a classification factor. It will be noted however, that unlike Winer, the experimenter in the present study has also used the ^{PRETEST} ~~covariate~~ as a covariate while analysing the results.

The means and standard deviations of the Mathematics achievement test scores obtained by the "weak" and "strong" students in the experimental and control groups are presented in Table 6.3. While studying this table, it is to be noted that the means of the pretest scores in the experimental and control groups for both the "weak" and "strong" categories are close together, while the means of the post-test scores have widened. Regression effects may have contributed to this widening; moreover, the normality of distribution in either tail group is questionable. Despite the possible invalidity of the covariance test in the circumstances, it is included for interest.

Table 6.3: Means and Standard Deviations of the Mathematics Achievement Test Scores Obtained by the Weak Students (Pretest Scores below the Median) and the Strong Students (Pretest Scores above the Median) in the Experimental and Control Groups.

Group	Median	Pretest			Posttest		
		N	M	SD	N	M	SD
Experimental	16.66						
Weak		45	12.28	2.32	45	19.04	3.86
Strong		49	20.49	3.08	49	26.46	4.39
Control	14.86						
Weak		45	11.04	2.18	45	14.02	4.79
Strong		48	19.83	4.09	48	22.33	5.74

a) Comparison between the experimental and control groups ("weak" and "strong" students).

A study of Table 6.4 indicates that the differences obtained between the Mathematics achievement test scores of the "weak" students in the experimental group and those of the "weak" students in the control group are significant. These results, as shown by the multiple classification analysis (see Table 1, Appendix I), are in favour of the experimental group.

Table 6.4: One-Way Analysis of Covariance for the Weak Students (Pretest Scores below the Median) in the Experimental Group and the Weak Students (Pretest Scores below the Median) in the Control Group on the Mathematics Achievement Test.

Source	SS	df	MS	F
Between Groups	567.51	1	567.51	33.59*
Covariates	199.10	1	199.10	11.78*
Explained	766.61	2	383.30	22.68*
Error Within	1469.78	87	16.89	
Total	2236.40	89		

*significant at the .001 level

A study of Table 6.5 also indicates that the differences obtained between the Mathematics achievement test scores of the "strong" students in the experimental group and those of the "strong" students in the control group are significant. These results, as shown by the multiple classification analysis (see Table 2, Appendix I), are also in favour of the experimental group.

Table 6.5: One-Way Analysis of Covariance for the Strong Students (Pretest Scores above the Median) in the Experimental Group and the Strong Students (Pretest Scores above the Median) in the Control Group on the Mathematics Achievement Test.

Source	SS	df	MS	F
Between Groups	414.79	1	414.79	28.63*
Covariates	1117.23	1	1117.23	77.12*
Explained	1532.03	2	766.01	52.88*
Error Within	1361.63	94	14.48	
Total	2893.67	96		

*significant at the .001 level

On the basis of these findings (see Tables 6.4 and 6.5), it seems reasonable to conclude as to the superiority of the students in the experimental group over the students in the control group on the Mathematics achievement test, and this for both the "weak" and "strong" categories.

b) Comparison between the "weak" and "strong" categories in both the experimental and control groups.

A study of Table 6.6 indicates that the differences obtained between the Mathematics achievement test scores of the "weak" students and those of the "strong" students in the experimental group are significant. These results are in favour of the "strong" students, as thereby shown by the multiple classification analysis (see Table 3, Appendix I), suggesting that the experimental treatment is more effective at enhancing academic achievement for the "strong" students. However, if one studies Table 6.7, one realizes that the differences obtained between the Mathema-

tics achievement test scores of the "weak" students and those of the "strong" students in the control group are also significant and, as shown by the multiple classification analysis (see Table 4, Appendix I), they also are in favour of the "strong" students.

Therefore, one cannot reasonably conclude that the experimental treatment is more effective at enhancing academic achievement for the "strong" category.

Table 6.6: One-Way Analysis of Covariance for the Weak Students (Pretest Scores below the Median) and the Strong Students (Pretest Scores above the Median) in the Experimental Group on the Mathematics Achievement Test.

Source	SS	df	MS	F
Individualized Instruction	1293.20	1	1293.20	103.25*
Covariates	444.41	1	444.41	35.48*
Explained	1737.62	2	868.81	69.37*
Error Within	1139.69	91	12.52	
Total	2877.31	93		

*significant at the .001 level

Table 6.7: One-Way Analysis of Covariance for the Weak Students (Pretest Scores below the Median) and the Strong Students (Pretest Scores above the Median) in the Control Group on the Mathematics Achievement Test.

Source	SS	df	MS	F
Traditional Instruction	1604.31	1	1604.31	84.37*
Covariates	852.30	1	852.30	44.82*
Explained	2456.61	2	1228.30	64.59*
Error Within	1711.34	90	19.01	
Total	4167.95	92		

*significant at the .001 level

6.1.3 Hypothesis I: Summary.

The data of the present study show that the academic achievement of students who have been involved in individualized learning programmes designed according to the new general model is higher than that of students involved in more traditional programmes, and this for both the "weak" and "strong" categories. However, the data do not show that the experimental treatment is more effective at enhancing academic achievement for one category or the other of students ("weak" or "strong").

6.2 Effects on Students' Attitudes towards a Subject.

Hypothesis II: The students who have been involved in individualized learning programmes of Mathematics designed according to the new model do not have attitudes towards Mathematics different from those of the students involved in more traditional programmes.

As mentioned in Chapter 5 (see section 5.6.2), a Subject Perception Test developed by the author was used to test the second research hypothesis. Table 6.8 reports the means and standard deviations of the numerical values assigned by the students in the experimental and control groups on the Subject Perception Test.

Table 6.8: Means and Standard Deviations of the Numerical Values Assigned by the Students in the Experimental and Control Groups on the Subject Perception Test.

Group	Pretest			Posttest		
	N	M	SD	N	M	SD
Experimental						
A	26	4.73	2.81	26	5.04	2.79
B	27	5.30	2.64	27	7.04	1.97
C	24	6.75	1.87	24	7.92	0.41
D	17	6.29	2.23	17	6.71	1.26
TOTAL	94	5.69	2.54	94	6.64	2.16
Control						
E	25	6.64	1.80	25	5.40	2.14
F	26	5.15	2.27	26	5.38	2.53
G	24	6.42	2.10	24	5.88	1.98
H	18	6.56	2.06	18	5.44	1.95
TOTAL	93	6.15	2.13	93	5.53	2.16

6.2.1 Analysis of Results for Hypothesis II.

The results obtained in testing the second hypothesis were analysed by means of a two-way analysis of covariance using the pretest scores as the covariate. The two factors studied were the teaching methods and the schools.

The F tests for the main effects as well as for the interaction effects are presented in Table 6.9. A study of this table indicates that the differences obtained between the numerical values assigned by the students in the experimental group and those assigned by the students in the control group on the Subject (Mathematics) Perception Test are significant and that there is sufficient evidence to reject the null hypothesis at the .001 level of significance. The results of the analysis are in the direction of the stated hypothesis since the numerical values assigned by the students in the experimental group on the Subject (Mathematics) Perception Test are higher than those assigned by the students in the control group.

Table 6.9: Two-Way Analysis of Covariance for the Students in the Experimental and Control Groups on the Subject Perception Test.

Source	SS	df	MS	F
Teaching Methods	79.81	1	79.81	22.54*
Schools	17.79	2	8.89	2.51
Interaction	6.40	2	3.20	0.90
Error Within	637.90	180	3.54	
Total	741.90	185		

*significant at the .001 level

Table 6.9 also indicates that there is no significant difference between schools and no significant interaction between the two factors of the design.

6.2.2 "Post Hoc" Analyses of Results for Hypothesis II.

As mentioned in section 5.7.2 of Chapter 5, "post hoc" analyses of results were performed for hypothesis II, in order to verify whether:

-the superiority of the students in the experimental group over the students in the control group on the Subject Perception Test (see Table 6.9) is confirmed for both the "weak" and the "strong" students.

-the experimental treatment is more effective at producing positive attitudes towards a subject for the "weak" or for the "strong" students.

In order to perform these analyses, the students in both the experimental and control groups were classified as being "weak" (pretest scores below the median) or "strong" (pretest scores above the median). Thus, as was the case earlier (see section 6.1.2), the covariate (pretest scores) was used as a classification factor and as a control in the statistical analyses (covariance analyses).

The means and standard deviations of the numerical values assigned by the "weak" and the "strong" students in the experimental and control groups on the Subject Perception Test are presented in Table 6.10. While studying this table, it is to be noted that the means of the pretest numerical values in the experimental and control groups for both the "weak" and "strong" categories are close together, while the means of the posttest numerical values have widened. Regression effects may have contributed to this widening; moreover, the normality of distribution in either tail group is questionable. Despite the possible invalidity of the covariance test in the circumstances, it is included for interest.

Table 6.10: Means and Standard Deviations of the Numerical Values Assigned by the Weak Students (Pretest Numerical Values below the Median) and the Strong Students (Pretest Numerical Values above the Median) in the Experimental and Control Groups on the Subject Perception Test.

Group	Median	Pretest			Posttest		
		N	M	SD	N	M	SD
Experimental	6.51						
Weak		43	3.37	1.96	43	5.74	2.59
Strong		51	7.64	.48	51	7.41	1.32
Control	6.74						
Weak		40	4.12	1.74	40	4.87	2.16
Strong		53	7.67	.47	53	6.01	2.04

a) Comparison between the experimental and control groups ("weak" and "strong" students).

A study of Table 6.11 indicates that the differences obtained between the numerical values assigned by the "weak" students in the experimental group and those assigned by the "weak" students in the control group on the Subject Perception Test are significant. These results, as shown by the multiple classification analysis (see Table 5, Appendix I), are in favour of the experimental group.

Table 6.11: One-Way Analysis of Covariance for the Weak Students (Pretest Numerical Values below the Median) in the Experimental Group and the Weak Students (Pretest Numerical Values below the Median) in the Control Group on the Subject Perception Test.

Source	SS	df	MS	F
Between Groups	15.65	1	15.65	3.46*
Covariates	102.71	1	102.71	22.71**
Explained	118.37	2	59.18	13.08**
Error Within	361.84	80	4.52	
Total	480.21	82		

* significant at the .066 level

** significant at the .001 level

A study of Table 6.12 also indicates that the differences between the numerical values assigned by the "strong" students in the experimental group and those assigned by the "strong" students in the control group on the Subject Perception Test are significant. These results, as shown by the multiple classification analysis (see Table 6, Appendix I), are also in favour of the experimental group.

On the basis of these findings (see Tables 6.11 and 6.12), it seems reasonable to conclude as to the superiority of the students in the experimental group over the students in the control group on the Subject Perception Test, and this for both the "weak" and "strong" categories.

Table 6.12: One-Way Analysis of Covariance for the Strong Students (Pretest Numerical Values above the Median) in the Experimental Group and the Strong Students (Pretest Numerical Values above the Median) in the Control Group on the Subject Perception Test.

Source	SS	df	MS	F
Between groups	50.42	1	50.42	18.40*
Covariates	28.54	1	28.54	10.41**
Explained	78.97	2	39.48	14.40*
Error Within	276.78	101	2.74	
Total	355.76	103		

* significant at the .001 level

** significant at the .002 level

b) Comparison between the "weak" and "strong" categories in both the experimental and control groups.

A study of Table 6.13 indicates that the differences obtained between the numerical values assigned by the "weak" students and those assigned by the "strong" students in the experimental group on the Subject Perception Test, are significant. These results, as shown by the multiple classification analysis (see Table 7, Appendix I), are in favour of the "weak" students, thereby suggesting that the experimental treatment is more effective at producing positive attitudes towards a subject for the "weak" students. However, if one studies Table 6.14, one realizes that the differences obtained between the numerical values assigned by the "weak" students and those assigned by the "strong" students in the control group on the Subject Perception Test are also significant and, as shown by the multiple classification analysis (see Table 8, Appendix I), in favour of the "weak" students.

Table 6.13: One-Way Analysis of Covariance for the Weak Students (Pretest Numerical Values below the Median) and the Strong Students (Pretest Numerical Values above the Median) in the Experimental Group on the Subject Perception Test.

Source	SS	df	MS	F
Individualized Instruction	64.87	1	64.87	20.19*
Covariates	78.14	1	78.14	24.32*
Explained	143.02	2	71.51	22.25*
Error Within	292.39	91	3.21	
Total	435.41	93		

* significant at the .001 level

Table 6.14: One-Way Analysis of Covariance for the Weak Students (Pretest Numerical Values below the Median) and the Strong Students (Pretest Numerical Values above the Median) in the Control Group on the Subject Perception Test.

Source	SS	df	MS	F
Traditional Instruction	29.82	1	29.82	7.63*
Covariates	47.97	1	47.97	12.28**
Explained	77.79	2	38.89	9.96**
Error Within	351.38	90	3.90	
Total	429.18	92		

* significant at the .007 level

** significant at the .001 level

Therefore, one cannot reasonably conclude that the experimental treatment is more effective at producing positive attitudes towards a subject for the "weak" students. It will be noted that the differences obtained between the "weak" and the "strong" students (in favour of the "weak" category) may be explained by the phenomenon of regression towards the mean.

6.2.3 Hypothesis II: Summary.

The data of the present study show that the students who have been involved in individualized learning programmes designed according to the new general model have more positive attitudes towards Mathematics than the students involved in more traditional programmes, and this for both the "weak" and "strong" categories. However, the data do not show that the experimental treatment is more effective at producing positive attitudes towards a subject for one category or the other of students ("weak" or "strong").

6.3 Effects on Teachers' Attitudes towards Students.

As mentioned in Chapter 5 (see section 5.6.3), the Minnesota Teacher Attitude Inventory developed by Cook, Leeds and Callis (1951) was used to test the third research hypothesis. Table 6.15 reports the means and standard deviations of the Minnesota Teacher Attitude Inventory scores obtained by the teachers in both the experimental and control groups. While studying this table, it is interesting to note that there is a large difference between the mean of the pretest scores in the experimental group and that of the pretest scores in the control group. As shown in Table 6.16, this difference is significant and in favour of the experimental group.

Since The Minnesota Teacher Attitude Inventory was administered for the first time (pretest) after the implementation (training) of the new general model and since the assignment of teachers to groups (experimental and control) was made at random and before the implementation of the model, it may be assumed that the training in the new model has produced a change in the attitudes of the teachers (experimental group) towards their students.

One must therefore consider the possibility that this change in teachers' attitudes towards students is partly responsible with the use of the new model itself, for the changes observed after the experimentation in students' academic achievement (see section 6.1) and students' attitudes towards a subject (see section 6.2).

6.3.1 Analysis of Results for Hypothesis III.

The results obtained in testing the third hypothesis were analysed by means of the Mann-Whitney U Test.

The U test of differences between the pretest-posttest gain scores of the teachers in both the experimental and control groups is presented in Table 6.17.

A study of this table indicates that the differences obtained between the pretest-posttest gain scores of the teachers in the experimental group and those obtained by the teachers in the control group on the Minnesota Teacher Attitude Inventory are significant and that there is sufficient evidence to reject the null hypothesis at the .05 level of significance. The results of the analysis are in the direction of the stated hypothesis since the pretest-posttest gain scores obtained by the teachers in the experimental group are higher than those obtained by the teachers in the control group on the Minnesota Teacher Attitudes Inventory.

6.3.2 "Post Hoc" Analysis of Results for Hypothesis III.

As mentioned in section 5.7.3 of Chapter 5, a covariance analysis of results was also performed for interest. The findings are shown in Table 6.18.

A study of this table indicates that the results are not significant at the .05 level of significance. Obviously however, there is not much difference between the findings of the Mann-Whitney U Test shown in Table 6.17 if $F(.10)$ is quoted as a substitute for a one-tailed T test at the .05 level.

Table 6.18: Covariance Analysis of the Minnesota Teacher Attitude Inventory

Source	SS	df	Variance	F	F(.05)	F(.10)
Teaching Methods	115.94	1	115.94	5.86	6.61	4.06
Within Groups	98.82	5	19.76			
Total	214.76	6				

6.3.3 Hypothesis III: Summary.

The data of the present study show that the teachers who have been involved in individualized learning programmes designed according to the new general model, have more positive attitudes towards students than those involved in more traditional programmes. These data also show that the training in the new model has produced a change in the attitudes of the teachers (experimental group) towards their students.

CHAPTER 7

SUMMARY AND CONCLUSIONS

7.1 Summary of the Study.

7.1.1 Objects of the Study.

The main objects of this study were:

a) to review and classify the main procedures commonly used for the purpose of individualizing or helping to individualize instruction, and study their effectiveness in terms of their educational outcomes.

b) to develop a general model for individualizing instruction which emphasizes flexibility by means of alternatives in order to allow each individual teacher to design his own individualized learning programme according to his own individual requirements and above all, according to the particular situation in which he is placed.

c) to implement and assess the effectiveness of the general model in terms of its effects on students' academic achievement, students' attitudes towards a subject and teachers' attitudes towards students.

7.1.2 A Classification and Analysis of Procedures for Individualizing Instruction.

The main procedures commonly used, particularly in the last two decades, for the purpose of individualizing instruction were analysed and classified under five major categories: those centred on organizational patterns; those centred on curriculum development; those centred on the instructional process; those centred on educational facilities; and those student-centred.

Having studied the state-of-the-art in individualized instruction, the conclusion was reached that:

a) all the procedures analysed are directed toward fitting the teaching to the learner (individualized learning) and none is directed toward fitting the teaching method to the teacher (individualized teaching).

b) all the procedures analysed achieve individualization in different respects and in different ways, each of those having its uses and its limitations. Clearly, the most important limitation of the majority of procedures for individualizing learning is encountered in their implementation. Indeed, most procedures have very specific and predetermined requirements which might cause practical problems as regards organization, structure, material, time, space, funds and personnel.

7.1.3 Evidence of Effects of Procedures for Individualizing Instruction.

A review of research findings concerning the effects in terms of educational outcomes of procedures for individualizing instruction (learning) was made in an effort to make observations that could help in the design of a meaningful assessment of the effectiveness of a new general model for individualizing instruction.

The conclusion was that, although research studies concerning the effectiveness of procedures for individualizing instruction are scanty, it does appear that in general these procedures do not result in detrimental effects on educational outcomes. Overall, the research indicates that with respect to the cognitive domain, the majority of procedures for individualizing instruction are at least as good as, and sometimes better than more traditional procedures in producing Learning. In relation to the affective domain, research results are less conclusive. Nevertheless, it seems reasonable to assume that procedures for individualizing instruction generally can produce positive attitudes among both students and teachers.

7.1.4 The Pilot Study.

A pilot study was done in an effort to justify the theoretical and practical elements proposed in the new general model for individualizing instruction, and to perfect the experimental plan used to test the new model.

7.1.4.1 The Pilot General Model for Individualizing Instruction.

The pilot general model for individualizing instruction was made up of four distinct sections: the first introduced the main competences required of a teacher in the design and administration of an individualized learning programme; the second proposed three steps for the design of an individualized learning programme; the third proposed six steps for the administration of an individualized learning programme; and finally, the fourth section summarized the necessary components for an effective individualized learning programme.

7.1.4.2 The Pilot Experiment.

A pilot experiment was carried out for the purpose of assessing the effectiveness of the proposed general model for individualizing instruction.

7.1.4.2.1 Hypotheses.

There were three research hypotheses:

I. Effects on students' academic achievement: the academic achievement of students who have been involved in individualized learning programmes is higher than that of students involved in more traditional programmes.

II. Effects on students' attitudes towards a subject: the students who have been involved in individualized learning programmes have more positive attitudes towards a subject than the students involved in more traditional programmes.

III. Effects on teachers' attitudes towards students: the teachers who have been involved in individualized learning programmes have more positive attitudes towards students than the teachers involved in more traditional programmes.

7.1.4.2.2 Research Design.

The basic research design employed in the pilot study is the quasi-experimental "Non-equivalent Control Group Design" proposed by Campbell and Stanley (1963).

This particular research design was selected on the basis of its recognized efficiency in controlling the major factors jeopardizing the internal validity of such studies.

7.1.4.2.3 Samples.

The samples for the pilot study consisted of 274 students in the fourth, fifth and sixth grades, and 12 teachers distributed in four different schools in School District Number Thirteen, Moncton, New Brunswick, Canada.

Six classes (two in each of the three grades) composed of 137 students were chosen to represent the experimental group. The remaining six classes (two in each of the three grades) also composed of a total of 137 students represented the control group. In both groups, experimental and control, one classroom in each of the three grades was assigned to French, and one class also in each of the three grades was assigned to Mathematics.

7.1.4.2.4 Implementation of the Pilot General Model.

The main purpose of the implementation was to provide the teachers in the experimental group with appropriate training in the design and administration of an individualized learning programme according to the proposed pilot general model.

The implementation of the pilot general model was carried out by the experimenter over a period of ten weeks by means of lectures, discussions, practical assignments and answers to questions asked. The content of the implementation included the four general sections of the pilot general model.

During the same period of time, the teachers in the control group were provided with a weekly seminar dealing mainly with subjects related to the teaching-learning process. The main reason for providing the teachers in the control group with such an activity was to bring a minimal experimental control to the well known "Hawthorne effect".

7.1.4.2.5 Experimental Procedure and Data Collection.

The main purpose of the pilot experiment which was carried out over a period of four months, was to assess the effectiveness in terms of educational outcomes of the proposed pilot general model for individualizing instruction. It consisted of the administration of instructional programmes by both groups of teachers: individualized learning programmes by the teachers in the experimental group and traditional instruction programmes by the teachers in the control group.

Measuring instruments used to collect the data in the pilot study were administered twice, at the beginning and at the end of the pilot experiment. All the instruments were administered in groups.

7.1.4.2.6 Instruments.

Three major instruments were used to collect data for the pilot study: standardized achievement tests in French and Mathematics developed by the Montreal Catholic School Commission; the Subject Perception Test developed by the author; and the Minnesota Teacher Attitude Inventory developed by Cook, Leed and Callis (1951).

The standardized achievement tests in French and Mathematics were administered to the students to test the first hypothesis. The Subject Perception Test was also administered to the students to test the second hypothesis. The Minnesota Teacher Attitude Inventory was administered to the teachers to test the third hypothesis.

7.1.4.2.7. Analysis of Data.

The results of testing the three hypotheses of the pilot study were all analysed by means of one-way covariance analyses using the pretest scores as the covariate. The computer program used to perform the analyses is the BMD on program edited by W.S. Dixon (1974).

The level of significance for all the analyses performed in the pilot study was fixed at .05.

7.1.4.2.8 The Findings.

The main findings of the pilot study based on the testing of the three research hypotheses were:

a) That the academic achievement (French and Mathematics) of the students who have been involved in individualized learning programmes is not higher than that of students involved in more traditional

programmes. But there was some evidence that the experimental method was more efficient in this respect for younger students.

b) That the students who have been involved in individualized learning programmes do not have more positive attitudes towards a subject (French and Mathematics) than the students involved in more traditional programmes. There was a disturbing finding that all mean attitudes of groups deteriorated.

c) That the teachers who have been involved in individualized learning programmes do not have more positive attitudes towards students than the teachers involved in more traditional programmes, though an improvement was recorded for the first group while a fall was measured for the second.

7.1.4.2.8 Conclusions.

In the pilot study, a general model for individualizing instruction was introduced and some of its educational outcomes were tested.

On the basis of the main findings, the conclusion was reached that the pilot general model for individualizing instruction introduced in the pilot study had not proved effective in guiding teachers to design and administer individualized learning programmes producing more positive educational outcomes than those produced by more traditional instruction programmes.

A review of the main limitations and weaknesses of the pilot study (pilot general model and pilot experiment) was also made in an effort to identify some of the major elements that served in the elaboration of a new general model for individualizing instruction and in the establishment of the new experimental plan which was used to assess the effectiveness of the new general model.

7.1.5 The New General Model for Individualizing Instruction.

The new general model for individualizing instruction was then introduced.

7.1.5.1 Theoretical Foundations.

7.1.5.1.1 An Analysis of Current Models.

A brief analysis of current models of individualization was made. From this brief analysis, four essential points stood out, they are:

-All models aim at fitting the teaching to the learner.

-Few models adequately utilize the known social forces in learning.

-Still fewer models adequately consider the role of the teacher in the act of individualization.

-None has yet tackled the basic problem of fitting the teaching method to the teacher.

7.1.5.1.2 Purpose of the General Model.

From the brief analysis of current models of individualization, an urgent need was deduced for a general model aimed at understanding individualized teaching and at the same time catering to individualized learning. The main purpose of the model was to provide teachers with the opportunity to exercise their particular strengths in teaching and a chance to compensate in some way for their individual weaknesses, and this without being prejudicial to the individual learner.

The approach selected to achieve this purpose was to provide teachers with a flexible guide allowing them to design and administer individualized learning programmes according to their individual requirements, and above all according to the particular situations in which they are placed.

7.1.5.1.3 The General Model: Assumptions.

Six basic assumptions underlying the decision to propose a general model for individualizing instruction were also presented and discussed.

7.1.5.2 Conceptual Framework of the Model.

From the six basic assumptions presented in the previous sections, a model of instructional congruence was spelt out. By this is meant the optimal classroom conditions are attained when there is congruence between the four elements in the individualized instruction system. These are the teacher's characteristics, the teaching method, the learning strategy and the learners' characteristics.

Following formulation of the model of instructional congruence, certain deductions were made, some of them pointing out possible effects of such a model.

Finally, the six inviolable principles included in the new model were presented. These are, the creation and maintenance of a favourable climate for individualization, a statement of the philosophy of the educational programme, the identification of students' individual differences, the organization of the curriculum, the organization of instruction and the students' evaluation.

7.1.5.3 Practical Application of the New Model.

The six principles included in the conceptual framework of the new model were translated into operational elements and presented in the form of a decision-making process involving six different but progressive stages.

In each one of the six stages questions are asked and decisions have to be made in relation to the design and administration of an individualized learning programme. In order to guide the teacher in making the necessary and relevant decisions in each one of the six stages, provision is made for alternatives, general guidelines, specific guidelines and practical suggestions.

7.1.6 The Experiment.

An experiment was carried out for the purpose of assessing the effectiveness of the new general model for individualizing instruction.

7.1.6.1 Hypotheses.

There were three research hypotheses:

I. **Effects on students academic achievement:** the academic achievement of the students who have been involved in individualized learning programmes of Mathematics designed according to the new general model proposed in the present study is higher than that of students involved in traditional programmes of Mathematics.

II. **Effects on students' attitudes towards a subject:** the students who have been involved in individualized learning programmes of Mathematics designed according to the new general model proposed in this study, have more positive attitudes towards Mathematics than the students involved in traditional programmes of Mathematics.

III. Effects on teachers' attitudes towards students: the teachers who have been involved in individualized learning programmes of Mathematics designed according to the new general model proposed in this study, have more positive attitudes towards students than the teachers involved in traditional programmes of Mathematics.

7.1.6.2 Research Design.

As was the case with the pilot study, the basic research design used in the present study is the quasi-experimental "Non-equivalent Control Group Design" proposed by Campbell and Stanley (1963).

7.1.6.3 Samples.

The samples for the study consisted of 187 students and eight (8) teachers in the fifth grade distributed in three different schools in School District Number Thirteen, Moncton, New Brunswick, Canada.

Four classes composed of 94 students were chosen to represent the experimental group. The remaining four classes composed of 93 students represented the control group.

7.1.6.4 Implementation of the New General Model.

The main purpose of the implementation was to provide the teachers in the experimental group with appropriate training in the design and administration of an individualized learning programme according to the new general model proposed in this study.

The implementation of the new model was carried out by the experimenter over a period of ten weeks by means of lectures, discussions, practical assignments and answers to questions asked.

During the same period of time, the teachers in the control group were provided with a weekly seminar dealing with subjects related to the teaching-learning process. This seminar was introduced to bring a minimal experimental control to the well known "Hawthorne effect".

7.1.6.5 Experimental Procedure and Data Collection.

The main purpose of the experiment which was carried out over a period of six months, was to assess the effectiveness of the new general model for individualizing instruction. It consisted of the administration of two types of instructional programme by two groups of teachers: individualized learning programmes by the teachers in the experimental group and traditional instruction programmes by the teachers in the control group.

Measuring instruments used to collect the data in the study were all administered in groups. The same instruments were administered under similar conditions to both the experimental and the control groups.

7.1.6.6 Instruments.

Four major instruments were used to collect data for the present study: a Mathematics achievement test developed by the Montreal Catholic School Commission; the Subject Perception Test developed by the author; the Minnesota Teacher Attitude Inventory developed by Cook, Leed and Callis (1951); and the Teaching Strategies Inventory developed by the author.

The Mathematics achievement test was administered twice to the students in both the experimental and the control groups to test the first hypothesis. The Subject Perception Test was also administered twice to the students in both groups to test the second hypothesis. The Minnesota Teacher Attitude Inventory was administered twice to the teachers in both the experimental and the control groups to test the third hypothesis. The

Teaching Strategies Inventory was initially administered to the teachers in the experimental group in order to verify whether they had indeed designed and administered individualized learning programmes according to the model proposed in this study; it was subsequently administered to both groups of teachers (experimental and control) in an effort to verify whether the two groups of teachers had indeed administered significantly different programmes.

7.1.6.7 Analysis of Data.

Hypothesis I: The results of testing the first hypothesis were analysed by means of a two-way analysis of covariance using the pretest scores as the covariate. The two factors studied were the teaching methods and the schools. "Post hoc" one-way covariance analyses were also performed, with reservations about the validity of the test used.

Hypothesis II: The results of testing the second hypothesis were analysed by means of a two-way analysis of covariance using the pretest scores as the covariate. The two factors studied were the teaching methods and the schools. "Post hoc" one-way covariance analyses were also performed, with reservations about the validity of the test used.

Hypothesis III: The results of testing the third hypothesis were analysed by means of a Mann-Whitney U test. A covariance analysis of the results was also performed for interest.

The level of significance for all the tests used in this study was fixed at .05.

7.1.6.8 The Findings.

The main findings of the present study based on the testing of the three research hypotheses were:

a) That the academic achievement (Mathematics) of students who have been involved in individualized learning programmes designed according to the new general model proposed in this study is higher than that of students involved in more traditional programmes, and this for both the "weak" and "strong" categories. However, the data did not show that the experimental treatment is more effective at enhancing academic achievement for one category or the other of students ("weak" or "strong").

b) That the students who have been involved in individualized learning programmes designed according to the new general model, have more positive attitudes towards Mathematics than the students involved in more traditional programmes, and this for both the "weak" and "strong" categories. However, the data did not show that the experimental treatment is more effective at producing positive attitudes towards a subject for one category or the other of students ("weak" or "strong").

c) That the teachers who have been involved in individualized learning programmes designed according to the new general model have more positive attitudes towards students than the teachers involved in more traditional programmes.

From the data of the present study, it was also assumed:

-that the teachers in both the experimental and control groups have indeed designed and administered different instructional programmes.

-that the teachers in the experimental group have designed and administered individualized learning programmes according to the new general model for individualizing instruction proposed in this study.

-that the training in the new general model has produced a change (positive) in the attitudes of the teachers (in the experimental group) towards their students.

7.2 Conclusions.

In the present study, a new general model for individualizing instruction was developed and implemented and some of its effects were tested. This model is different from most models of individualization as regards its purpose and the approach selected to achieve this purpose.

Indeed, while the exclusive purpose of most models is to fit the teaching to the learner, the main purpose of the present general model is to understand individualized teaching and at the same time to cater to individualized learning. The approach selected to achieve the purpose of the new model also differs from all others since its main characteristic is flexibility by means of alternatives. This flexibility permits each teacher to design and administer his own individualized learning programme according to his own requirements and above all according to the situations in which he is placed. It has already been mentioned that most approaches cannot be applied by the majority of teachers because they were designed to be used under very specific and predetermined conditions.

On the basis of the findings, one can conclude that the new general model for individualizing instruction proposed in this study has proved effective in guiding teachers to design and administer individualized learning programmes which led to:

- success in achievement for the students
- motivation and satisfaction for the students
- motivation and satisfaction for the teachers.

If one relies on the previously mentioned premise (see Chapter 5) that measures of student growth or progress are the ultimate criteria for research on teaching effectiveness, one can conclude that the new general model has also proved effective in guiding teachers to design and administer individualized learning programmes which led to success in teaching for the teachers.

Not surprisingly, these conclusions confirm some of the deductions which were made concerning the possible effects of a model of instructional congruence such as the one used in the general model proposed in this study. Indeed, it may be assumed that by providing the teachers with a flexible guide for the design and administration of an individualized learning programme, one has accommodated at the same time both the teachers' individual differences in teaching (individualized teaching) and the students' individual differences in learning (individualized learning), thereby creating equilibrium in the individualized instruction system.

Students' individual differences were accommodated by means of the six inviolable principles to which each teacher had to conform during the design and administration of his individualized learning programme. It must be remembered that in the new general model, the six principles of individualization are the essence of the technique without which teaching cannot be considered as individualized instruction.

On the other hand, teachers' individual differences were accommodated by means of the alternatives with which they were presented during the design of their own individualized learning programmes, and this in accordance with the new general model.

The conclusions of the present study also confirm the basic assumptions underlying the general model for individualizing instruction which was developed in the present study. It will be noted that some of these assumptions, those concerning the effects of congruence between the learning strategy and the learner's characteristics, were supported by the findings of research studies. Other assumptions, those concerning the effects of congruence between the teaching method and the teachers' characteristics, were inferred from the aforementioned research studies.

One could not conclude the present study without reiterating a most interesting finding which points out the possibility that the change in teachers' attitudes towards the students, produced by the training in the new general model, is partly responsible for the changes observed in the students' academic achievement and their attitudes towards Mathematics.

What is interesting about this finding is that it suggests that the attitudes of the teachers towards their students might play an important role in reference to success in teaching.

Unfortunately, the research design of the present study does not permit an exact assessment of the relative value of changes in teacher attitudes after training as opposed to the value of the subsequent use of the model itself on the overall effects of the general model as measured in this study.

One believes however, that there is enough evidence to suggest that, in teacher training, more importance should be given to the development of positive teacher attitudes towards students rather than the present concentration on teaching techniques.

7.2.1 Limitations of the Study.

The limitations of the present study have been noted throughout, but a review of the main limitations could help to prevent excessive generalization from the findings.

The major limitation hampering the generalizability of the present research findings is very closely related to the fact that the subjects involved in the experiment were selected on a voluntary basis and as such may not be representative of teachers, classrooms and schools in general.

Other factors which also limit the generalizability of the research findings are the small number of schools which were involved in the experiment together with the fact that the experiment was carried out with only one academic subject and in only one grade at the elementary level. One must also mention that the period of time allowed for the experiment was probably too short.

It is also very important when discussing the external validity of the present research to be aware that the well known "Hawthorne effect" may have introduced an experimental bias in the experiment as a result of the awareness of the subjects in the experimental group that they were participating in an experiment, even though a minimal experimental control was brought about in the experiment in order to minimize its effects.

7.2.2 Suggestions for Further Research.

The major limitations of the study suggest further areas of research.

This project should be replicated with larger samples at the elementary and secondary levels using a variety of academic subjects. Such replications would definitely increase the generalizability of the findings.

It would also be most useful in relation to the evaluation of the effectiveness of the general model to plan studies comparing it with other existing models or programmes of individualized instruction. In the present research the proposed general model has been compared only with traditional instruction programmes. A direct comparison with other individualized instruction models or programmes would allow for the evaluation of the relative effects of a flexible model versus more rigid models of individualized instruction.

One might also suggest follow-up studies which would allow the measurement of the long-term effects of the proposed general model. This would also provide for a better control of experimental bias such as the "Hawthorne effect". In other words, it would make it possible to examine whether the main effects of the general model are due to short-term enthusiasm or to more inherent properties of the model.

One would also like to mention the importance of introducing in any of the above suggested studies as many as possible of the following dependent variables: responsibility, independence, creativity and social

climate. There is no doubt that measures of such variables could allow for the collection of very significant information in relation to the effectiveness of the proposed general model.

One would finally suggest that future studies make allowance for the specific effects of teacher training in the model and the use of the model itself.

If further research should prove the general model to be effective, this might indicate the need for a more flexible approach in teacher training programmes in general. One of the main features of the proposed general model is that it provides teachers with a considerable amount of freedom and responsibility in the design and administration of individualized learning programmes. Teachers can profit from this responsibility and freedom mainly because they are presented with a variety of alternatives. It might also prove effective to introduce all student-teachers to such alternatives while in training instead of introducing them to exclusive methods or programmes, which seems to be the present trend.

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APPENDIX A

SUMMARY OF THE MATHEMATICS AND FRENCH PROGRAMMES IN THE FOURTH, FIFTH AND SIXTH GRADES

MATHEMATICS
FOURTH GRADE

A la suite d'un apprentissage et d'un enseignement adéquats, l'enfant est habilité à:

Écrire les symboles numériques d'une suite, située entre 1000 et 99 999, donnée dans un ordre croissant ou donnée dans un ordre décroissant.

Écrire le symbole numérique représenté par un ensemble donné (inférieur à 100 000).

Écrire le nombre de dizaine(s) de mille, le nombre d'unité(s) de mille, le nombre de centaine(s), le nombre de dizaine(s), le nombre d'unité(s) représentées dans un symbole numérique.

Identifier le chiffre qui tient la place de
l'ordre des dizaines de mille,

l'ordre des unités de mille,

l'ordre des centaines,

l'ordre des dizaines,

l'ordre des unités dans un symbole numérique donné.

Utiliser correctement les symboles " $>$ ", " $<$ ", pour désigner la relation d'ordre entre deux nombres donnés situés entre 1000 et 100 000.

Écrire les symboles numériques d'une suite, située entre 1 et 100, donnée dans un ordre croissant ou donnée dans un ordre décroissant dont le code est "compter par cinq", "compter par deux".

Identifier, dans un ensemble de nombre donnés, les nombres pairs ou les nombres impairs.

Identifier les symboles de l'addition (+), de la soustraction (-), de la multiplication (\times), de la division (\div), de l'égalité (=), d'infériorité (\lt), de supériorité (\gt).

Trouver la somme (addition sans ou avec regroupements) de deux nombres de cinq chiffres ou moins posés verticalement (somme 100 000).

Trouver la différence (soustraction sans ou avec regroupements) de deux nombres inférieurs à 100 000 posés verticalement.

Reconnaître la commutativité de l'addition dans une expression donnée.

Reconnaître l'associativité de l'addition dans une expression donnée.

Donner l'élément qui manque (la donnée, la règle de fonction ou le résultat) dans une situation d'addition ou de soustraction présentée à l'aide d'une machine à fonction.

Résoudre un problème qui nécessite l'utilisation de deux opérations (addition ou soustraction inférieure à 100 000).

Représenter sous forme d'équation de multiplication une situation représentée à l'aide d'ensembles, de bords sur une droite numérique ou d'une addition répétée. (ex.: 5×3).

Écrire de mémoire, le produit de deux facteurs dont l'un est inférieur à 11 et l'autre est inférieur à 6.

Écrire le produit de deux facteurs dont l'un est un nombre de deux chiffres et l'autre est un multiple de 10 ou de 100.

Reconnaître la commutativité de la multiplication.

Reconnaître l'associativité de la multiplication.

Reconnaître l'élément neutre de la multiplication.

Représenter sous forme d'une équation de division une situation représentée à l'aide de partition d'ensemble, de bonds, sur une droite numérique ou d'une soustraction répétée.

Trouver la variable d'une équation de multiplication ou d'une équation de division associée à la multiplication, sans l'aide de matériel concret ou semi-concret, dont le résultat est retrouvé dans la table de multiplication de 2, 3, 4 ou 5. (Pas plus loin que $n \times 10$).

Résoudre un problème qui nécessite l'utilisation d'une opération (multiplication ou division en respectant les limites déjà précisées).

Identifier le symbole numérique qui représente l'un des éléments suivants dans un ensemble d'expression donné: un terme, un facteur, une somme, une différence, un produit, un quotient.

Choisir la bonne représentation de figures ou d'objets simples d'une fraction donnée sous la forme $x/2$, $x/3$, $x/4$, $x/8$ et en colorier la région correspondante.

Estimer en centimètre(s) la longueur d'un chemin polygonal.

Déterminer au centimètre(s) près, à l'aide d'une règle, le périmètre d'un carré, d'un rectangle ou d'un triangle.

Identifier dans un ensemble de formes géométriques les formes qui sont des quadrilatères.

Identifier dans un ensemble de quadrilatères, les quadrilatères qui sont des carrés ou des rectangles.

Tracer, sur une grille pointée, un segment congru et parallèle à un segment donné.

Tracer, sur une grille pointée, une figure congrue à une figure géométrique donnée (polygone).

Identifier une représentation qui évoque l'idée d'un segment, d'une demi-droite, d'une droite ou d'un plan.

Identifier les sommets, les faces et les arêtes dans une figure à trois dimensions.

Identifier le nombre de sommets, de faces et d'arêtes dans une figure à trois dimensions.

MATHEMATICS
FIFTH GRADE

A la suite d'un apprentissage et d'un enseignement adéquats, l'enfant est habileté à:

- 1- Écrire les symboles numériques d'une suite située entre 100 000 et 1 000 000, donnée dans un ordre croissant ou donnée dans un ordre décroissant.
- 2- Écrire le symbole numérique représenté par un ensemble donné ou par une notation développée (inférieur à 1 000 000).
- 3- Écrire le nombre de centaine(s) de mille, le nombre de dizaine(s) de mille, le nombre d'unité(s) de mille, le nombre de centaine(s), le nombre de dizaine(s), le nombre d'unité(s) représentées dans un symbole numérique.
- 4- Identifier le chiffre qui tient la place de:
L'ordre des centaines de mille,
L'ordre des dizaines de mille,
L'ordre des unités de mille,
L'ordre des centaines,
L'ordre des dizaines,
L'ordre des unités, d'un symbole numérique donné.
- 5- Représenter un symbole numérique sous la forme d'une notation développée.
- 6- Utiliser correctement les symboles " $>$ ", " $<$ " pour désigner la relation d'ordre entre deux nombres donnés situés entre 100 000 et 1 000 000.
- 7- Arrondir un symbole numérique de 2 ou 3 chiffres aux dizaines près, aux centaines près.

- 8- Identifier, dans un ensemble de nombres donnés, les nombres pairs ou les nombres impairs.
- 9- Identifier, dans un ensemble de nombres donnés, les nombres premiers ou les nombres composés, (nombres 100).
- 10- Trouver tous les facteurs d'un nombre donné inférieur à 100.
- 11- Décomposer un nombre naturel donné en un produit de trois ou de deux facteurs (nombre inférieur à 1 000).
- 12- Reconnaître si un nombre donné possède le caractère de divisibilité de 2, de 5, ou de 10.
- 13- Identifier les symboles suivants:
 - de l'addition (+)
 - de la soustraction (-)
 - de la multiplication (x)
 - de la division (\div)
 - de l'égalité (=)
 - de l'infériorité (<)
 - de la supériorité (>)
- 14- Trouver la somme (addition sans ou avec regroupements) de plus de deux nombres de six chiffres ou moins posés verticalement ou posés horizontalement (somme inférieur à 1 000 000).
- 15- Trouver la différence (soustraction sans ou avec regroupements) de deux nombres inférieurs à 1 000 000 posés verticalement ou posés horizontalement.
- 16- Reconnaître la commutativité de l'addition dans une expression donnée.
- 17- Reconnaître l'associativité de l'addition dans une expression donnée.

- 18- Reconnaître l'élément neutre "0" de l'addition dans une expression donnée.
- 19- Donner l'élément qui manque (la donnée, la règle de fonction ou le résultat) dans une situation d'addition ou de soustraction présentée à l'aide d'une machine à fonction.
- 20- Résoudre un problème qui nécessite l'utilisation de deux opérations (addition ou soustraction inférieure à 1 000 000).
- 21- Représenter, sous forme d'équation de multiplication, une situation représentée à l'aide d'ensembles, de bonds sur une droite numérique ou d'une addition répétée (ex: 5×8).
- 22- Écrire de mémoire, le produit de deux facteurs (facteurs inférieurs à 11).
- 23- Trouver le produit de deux facteurs dont l'un a un chiffre et l'autre 3 ou 4 chiffres (multiplication posée verticalement ou posée horizontalement).
- 24- Trouver le produit de deux facteurs de 2, 3 ou 4 chiffres dont l'un est multiple de 10, 100 ou 1 000 (multiplication posée horizontalement).
- 25- Trouver le produit de deux facteurs de deux chiffres (multiplication posée verticalement).
- 26- Reconnaître la commutativité de la multiplication.
- 27- Reconnaître l'associativité de la multiplication.
- 28- Reconnaître l'élément neutre de la multiplication.
- 29- Reconnaître l'élément absorbant de la multiplication.
- 30- Reconnaître la distributivité de la multiplication sur l'addition.

- 31- Représenter, sous forme d'une équation de division, une situation représentée à l'aide de partition d'ensemble, de bonds sur une droite numérique ou d'une soustraction répétée.
- 32- Trouver la variable d'une équation de multiplication ou de division associée à la multiplication, sans l'aide de matériel concret ou semi-concret dont le résultat est inférieur à 101.
- 33- Trouver le quotient d'une division où le dividende est un nombre de deux ou trois chiffres et où le diviseur est un nombre d'un chiffre. (Le reste est exprimé sous la forme simple ex: $748 - 8 = 93, R4$).
- 34- Identifier, dans un ensemble d'expression donné le symbole numérique qui représente l'un des éléments suivants:
- un terme
 - une somme
 - une différence
 - un produit
 - un facteur
 - un multiplicande
 - un multiplicateur
 - un dividende
 - un diviseur
 - un quotient
- 35- Résoudre un problème qui nécessite l'utilisation de deux opérations (multiplication ou division en respectant les limites déjà précisées).
- 36- Représenter sous forme de couple (a,b) ou sous forme de fraction (a/b) , la partie fractionnaire d'une région ou d'un ensemble donné.
- 37- Identifier le numérateur et le dénominateur d'une fraction donnée.
- 38- Identifier une fraction équivalente à une fraction donnée (" $x/2, x/3, x/4, x/8$ ").

- 39- Identifier dans un ensemble de formes géométriques, les formes qui sont des quadrilatères.
- 40- Identifier, dans un ensemble de quadrilatères, les quadrilatères qui sont des carrés ou des rectangles.
- 41- Identifier, dans un ensemble de quadrilatères les quadrilatères qui sont des parallélogrammes.
- 42- Identifier, dans un ensemble donné, deux droites ou deux segments parallèles.
- 43- Identifier une représentation qui évoque l'idée d'un segment, d'une demi-droite, d'une droite, d'un angle, d'un angle droit ou d'un plan.
- 44- Identifier quelle figure a une surface plane ou une surface courbe.
- 45- Identifier les sommets, les faces et les arêtes d'une figure à trois dimensions.
- 46- Identifier le nombre de sommets, de faces et d'arêtes dans un polyèdre donné.
- 47- Identifier à l'aide de représentations, les courbes ouvertes, les courbes fermées, les courbes simples, courbes non-simples, les courbes ouvertes simples, les courbes fermées simples.
- 48- Identifier, quel(s) point(s) est(sont) à l'intérieur ou à l'extérieur d'une région donnée (courbe simple ou fermée).
- 49- Identifier, dans un ensemble de figures, les figures qui sont symétriques.
- 50- Identifier, dans un ensemble de figures, les figures qui sont congrues.

- 51- Identifier, dans un ensemble de figures à trois dimensions, les figures qui sont de forme cylindrique ou de forme conique.
- 52- Identifier, le rayon, le diamètre, le point centre d'un cercle.
- 53- Estimer en cm la longueur d'un chemin polygonal ou d'une courbe.
- 54- Déterminer au cm près, à l'aide d'une règle, le périmètre d'un polygone.
- 55- Identifier, sous forme de couple (x, y) , les coordonnées d'un point donné dans le plan cartésien (premier quadrant seulement).
- 56- Situer, sur une grille, un point dont on lui donne les coordonnées sous forme de couple (premier quadrant seulement).

MATHEMATICS
SIXTH GRADE

A la suite d'un apprentissage et d'un enseignement adéquats, l'enfant est habileté à:

- 1- Découvrir, à partir d'un ensemble donné, la ou les caractéristiques communes à certains éléments.
- 2- Identifier, à partir d'un ensemble donné, les éléments possédant la ou les caractéristiques communes données.
- 3- Classer, à partir d'un ensemble de figures, les figures d'après certaines propriétés et relations communes.
- 4- Identifier, à partir de deux figures données, les similitudes et les différences en termes de tailles, couleurs et formes.
- 5- Écrire le symbole numérique représenté par un ensemble donné ou par une notation développée ou par une notation exponentielle (nombre /1 000 000).
- 6- Représenter un symbole numérique sous la forme d'une notation développée ou sous la forme d'une notation exponentielle.
- 7- Déterminer la valeur positionnelle que prend un chiffre selon l'ordre dans lequel il apparaît dans un symbole numérique donné.
- 8- Déterminer la valeur de chaque ordre un par rapport à l'autre dans un symbole numérique donné.
- 9- Utiliser correctement les symboles ">" ou "<" pour désigner la relation d'ordre entre deux nombres donnés (nombres 1 000 000).
- 10- Arrondir un symbole numérique de 6 ou 5 chiffres aux dizaines près, aux centaines près, aux unités de mille près, aux dizaines de mille près et aux centaines de mille près.

- 11- Écrire le nouveau symbole numérique après avoir ajouté et/ou enlevé des éléments.
- 12- Écrire, sous la forme d'une notation exponentielle, le produit d'une multiplication de mêmes facteurs.
- 13- Identifier, dans une notation exponentielle donnée, les symboles "puissance", "base" et "exposant".
- 14- Identifier, dans un ensemble de nombres, les nombres pairs ou les nombres impairs.
- 15- Identifier, dans un ensemble de nombres, les nombres premiers ou les nombres composés (nombres 1 000).
- 16- Reconnaître si un symbole numérique donné possède le caractère de divisibilité de 2, 3, 4, 5, 9 et 20.
- 17- Décomposer un nombre naturel donné, inférieur à 1 000, en un produit de facteurs premiers (ordre de facteurs).
- 18- Décomposer un nombre en un produit de facteurs premiers en utilisant la notation exponentielle.
- 19- Trouver tous les facteurs d'un nombre donné (nombre 100).
- 20- Trouver le PGFC de deux ou trois nombres donnés (nombres 100).
- 21- Trouver tous les multiples d'un nombre donné (nombre 100).
- 22- Trouver le PPMC de deux ou trois nombres donnés (nombres 100).
- 23- Trouver la somme de deux nombres entiers ou plus, (somme 1 000 000) posés horizontalement ou posés verticalement.
- 24- Reconnaître les différentes propriétés de l'addition: commutativité, associativité, élément neutre.

- 25- Écrire de mémoire le produit de deux facteurs (facteurs 11).
- 26- Trouver le produit de deux facteurs de deux ou trois chiffres (multiplication posée verticalement).
- 27- Trouver le produit de deux facteurs de deux, trois, quatre ou cinq chiffres dont l'un et/ou l'autre est multiple de 10, 100, 1 000 (multiplication posée verticalement).
- 28- Reconnaître les propriétés de la multiplication: commutativité, associativité, élément neutre, élément absorbant, distributivité de la \times sur $+$.
- 29- Trouver le quotient d'une division où le dividende est un nombre de trois ou quatre chiffres et où le diviseur est un nombre de deux chiffres (le reste est exprimé sous la forme simple: ex: $287 : 16 = 17, R15$).
- 30- Identifier, dans un ensemble d'expressions donné, le symbole numérique qui représente l'un des éléments suivants:
- un terme
 - une somme
 - une différence
 - un facteur
 - un multiplicande
 - un multiplicateur
 - un produit
 - un dividende
 - un diviseur
 - un quotient.
- 31- Donner l'élément qui manque: la donnée (n), la règle de fonction, ou le résultat (f(n)) dans une situation donnée.
- 32- Résoudre un problème qui nécessite l'utilisation de deux ou trois opérations (+, -, \times , \div), tout en respectant les limites déjà précisées).

- 33- Trouver la moyenne arithmétique à partir d'un ensemble de nombres donnée.
- 34- Résoudre un problème qui nécessite l'utilisation du concept de la moyenne.
- 35- Exprimer, sous forme de couple (a,b) ou sous forme de fraction (a/b) , une partie comparée à une totalité d'une région ou d'un ensemble.
- 36- Identifier le numérateur et le dénominateur d'une fraction donnée.
- 37- Construire la classe de fractions équivalentes à une fraction donnée.
- 38- Reconnaître si deux fractions données sont équivalentes.
- 39- Trouver la fraction équivalente irréductible à une fraction donnée.
- 40- Utiliser correctement les symboles " $>$ " ou " $<$ " pour désigner la relation d'ordre entre deux fractions données.
- 41- Trouver la somme de deux ou trois fractions données dont les dénominateurs ne sont pas communs (dénominateur commun 100).
- 42- Trouver la différence de deux fractions données dont les dénominateurs ne sont pas communs (dénominateur commun 100).
- 43- Identifier, sur une droite numérique, le point correspondant à un nombre rationnel donné.
- 44- Exprimer, sous la forme d'une expression fractionnaire, un nombre rationnel.
- 45- Exprimer, sous la forme d'un nombre rationnel, une expression fractionnaire.

- 46- Trouver la somme de deux nombres rationnels donnés (dénominateur commun 50).
- 47- Trouver la différence de deux nombres rationnels donnés (dénominateur commun 50).
- 48- Trouver le produit de deux fractions données (fractions unitaires: $1/3 \times 1/4$).
- 49- Trouver le produit d'une fraction unitaire et d'un nombre naturel ($1/3 \times 10$).
- 50- Trouver le produit de deux fractions données ($2/3 \times 4/7$).
- 51- Trouver le quotient de deux nombres rationnels donnés exprimés sous la forme a/b .
- 52- Reconnaître les différentes propriétés de l'addition dans les nombres rationnels: commutativité, associativité, élément neutre.
- 53- Reconnaître les différentes propriétés de la multiplication dans les nombres rationnels: commutativité, associativité, élément neutre, élément absorbant.
- 54- Résoudre un problème qui nécessite l'utilisation d'une opération (+, -, \times , \div) de nombres rationnels (respecter les limites déjà précisées).
- 55- Écrire une fraction décimale donnée sous la forme d'un nombre décimal (dénominateur 10, 100 ou 1 000).
- 56- Écrire un nombre décimal donné sous la forme d'une fraction décimale (nombre décimal ayant un, deux ou trois chiffres dans la partie fractionnaire).
- 57- Utiliser correctement le symbole " $>$ " ou " $<$ " pour désigner la relation d'ordre entre deux nombres décimaux donnés.

- 58- Trouver la somme de deux ou trois nombres décimaux donnés.
- 59- Trouver la différence de deux nombres décimaux donnés.
- 60- Trouver le produit de deux nombres décimaux donnés (réponse: partie fractionnaire $n/1\ 000$).
- 61- Trouver le quotient d'une division où le dividende est un nombre décimal et d'où le diviseur est un nombre naturel (réponse partie fractionnaire $n/1\ 000$).
- 62- Résoudre un problème qui nécessite l'utilisation d'une multiplication ou d'une division de nombres décimaux (selon les limites déjà précisées).
- 63- Résoudre un problème qui nécessite l'utilisation d'une opération (+, -, \times , \div), dans une situation monétaire.
- 64- Écrire, sous forme de rapport, une comparaison quantitative entre deux ensembles donnés.
- 65- Identifier les termes d'une proportion.
- 66- Donner la loi de la proportion.
- 67- Trouver le terme qui manque dans la proportion donnée.
- 68- Résoudre un problème qui nécessite l'utilisation du concept de proportion.
- 69- Identifier, dans un ensemble de quadrilatère donnés, les formes qui sont:
- des trapèzes
 - des parallélogrammes
 - des rectangles
 - des losanges
 - des carrés.

- 70- Identifier une représentation qui évoque l'idée d'un segment, d'une demi-droite, d'une droite, d'un angle ou d'un plan.
- 71- Identifier, dans un ensemble de segments, les segments congrus, les segments parallèles, les segments perpendiculaires ou les segments concourants.
- 72- Identifier, dans un ensemble de segments, les segments horizontaux, les segments verticaux et les segments obliques.
- 73- Identifier, dans un ensemble d'angles, les angles congrus, les angles droits, les angles aigus ou les angles obtus.
- 74- Identifier, dans un ensemble de triangles, les triangles rectangles, les triangles aigus, les triangles obtus, les triangles isocèles, les triangles scalènes ou les triangles équilatéraux.
- 75- Identifier le rayon, le diamètre, le point centre d'un cercle.
- 76- Identifier quelle figure a une surface plane ou une surface courbe.
- 77- Identifier, dans un ensemble d'objets les objets évoquant les formes géométriques suivantes:
- prisme rectangulaire
 - cylindre
 - sphère
 - pyramide
 - cône
- 78- Identifier les sommets, les faces et les arêtes d'une figure à trois dimensions.
- 79- Identifier le nombre de sommets, de faces et d'arêtes dans un polyèdre donné.
- 80- Identifier, à l'aide de représentations, les courbes ouvertes, les courbes fermées, les courbes simples, les courbes non-simples, les courbes ouvertes-simples, les courbes fermées-simples.

- 81- Identifier, quel(s) point(s) est(sont) à l'intérieur ou à l'extérieur d'une région donnée (courbes fermées-simples).
- 82- Trouver le périmètre d'un polygone donné.
- 83- Trouver, à l'aide d'une grille centimétrique, l'aire d'une surface irrégulière ou l'aire d'une surface régulière.
- 84- Trouver le volume d'un solide dont l'unité cube est donnée.
- 85- Identifier, sous forme de couple, les coordonnées d'un point donné dans le plan cartésien (premier quadrant seulement).
- 86- Situer, dans un plan cartésien, un point dont on lui donne les coordonnées sous forme de couple (premier quadrant seulement).

FRENCH
FOURTH GRADE

Perfectionner son habileté à s'exprimer oralement de façon claire et compréhensible.

Développer son expression par le vécu de situations de communication orale et/ou des variantes.

- la conversation
- le poème, la chanson
- le message
- la présentation
- la causerie
- le jeu dramatique
- la narration (conte, fable, dialogue, récit)
- la description
- l'audition d'une émission de radio et/ou télévision
- l'audition de disques
- le visionnement d'un film ou diaporama...
- la causerie-information
- l'interview

Développer ses habiletés d'émetteur:

- concevoir un message intéressant accessible et compréhensible par le récepteur
- connaître les besoins et les capacités d'un interlocuteur choisir les meilleurs moyens pour transmettre un message
- prononcer distinctement
- faire les liaisons les plus courantes
- s'exercer à la bonne diction.

Extensionner le champ de performance de l'enfant dans le sens d'une certaine accommodation au français dit standard.

- rendre l'enfant capable de revenir sur sa propre production verbale
- rendre l'enfant capable de revenir sur la production verbale d'un autre enfant et/ou d'un adulte
- rendre l'enfant capable de comparer sa propre production verbale avec celle d'un autre enfant et/ou d'un adulte
- rendre l'enfant capable de manipuler des productions verbales au moyen d'opérations structurales diverses qui lui sont proposées et/ou qu'il a lui-même élaborées
- rendre l'enfant capable de diverses productions verbales et d'identifier celles qui sont de la langue écrite (e), celles qui sont de la langue orale (p), celles qui sont de son dialecte (n), celles qui sont d'un autre dialecte (o).

Développer son habileté à s'exprimer par écrit de façon claire et compréhensible.

Développer son expression par le vécu de situations de communication écrite et/ou des variantes

- la poésie
- le journal d'actualité
- le message (invitation, remerciement...)
- la narration (conte, récit, fable, dialogue)
- l'affiche
- la recherche
- la bande dessinée
- à chaque texte son titre
- la correspondance (scolaire, outre-mer...)

Développer chez l'enfant l'acquisition de techniques particulières à l'expression écrite.

- présenter un travail propre
- bien former ses lettres
- aérer un texte
- faire un brouillon préparatoire à la composition
- établir des listes de synonymes et d'antonymes
- composer des mots nouveaux à l'aide de préfixe et/ou de suffixe
- employer des verbes précis au lieu de "il y a", "être", "se trouve", "faire"
- élaborer un plan préparatoire à une composition
- respecter un ordre chronologique dans son expression

Développer chez l'élève des habiletés d'écoute selon différents processus mentaux.

Rendre l'enfant capable de choisir certains éléments, qui lui sont significatifs, à l'intérieur d'un ensemble de possibilités suggérées

Rendre l'enfant capable de créer spontanément des solutions nouvelles à un problème ou une situation donnée (une conclusion différente ...)

Rendre l'enfant capable d'apprécier une audition (lecture, disque...)

Rendre l'enfant capable d'être attentif (se concentrer) lors d'une audition quelconque (conte, visionnement d'un film)

Rendre l'enfant capable d'analyser une audition donnée

Rendre l'enfant capable de résumer une audition donnée

Rendre l'enfant capable d'évaluer cognitivement et/ou affectivement une audition donnée

Développer chez l'élève l'habitude et le goût de lire en assurant une bonne compréhension.

Développer chez l'élève l'habitude de lire

- rendre l'élève capable de lire cent cinquante (150) mots à la minute
- rendre l'élève capable de lire différents textes sous différentes formes d'écriture

Développer chez l'élève la compréhension de sa lecture à l'aide de techniques de base.

Développer chez l'élève le goût de lire.

- créer un environnement riche, varié et stimulant à l'intérieur duquel le livre est en évidence
- assurez une exploitation vivante de la lecture

Donner à l'enfant les outils nécessaires afin qu'il puisse maîtriser la morphologie et la syntaxe de la grammaire à l'écrit.

Amener l'élève à étudier le fonctionnement de la phrase par des exercices appropriés sur les éléments suivants:

- les types de phrases
 - .déclarative affirmative
 - .déclarative négative
 - .interrogative
 - .exclamative
- intériorisation des groupes (couleurs)
- intériorisation de notions de base
- intériorisation du genre et du nombre
- intériorisation de certains types de pronoms

Développer sa pratique des formes verbales.

Développer sa pratique des schèmes grammaticaux par des exercices structuraux appropriés.

Amener l'élève à respecter la ponctuation.

- révision des signes
 - .la virgule
 - .le point, le point d'exclamation, le point d'interrogation
 - .les deux points

- découverte des signes suivants:
 - .le trait d'union
 - .le point virgule

Développer chez l'élève un vocabulaire juste et enrichi par l'entremise de l'album de "coupures" dont les principaux objectifs spécifiques sont:

Choisir des textes, des documents suivant un objet très restreint

S'aider d'un contexte visuel

Comprendre la signification de mots nouveaux

Reconnaître certaines catégories de mots

Assurer une orthographe correcte des mots de son langage usuel:

Manipuler les mots de son langage usuel par

- la classification de ceux-ci de la façon suivante: phonème=graphies (alphabet phonétique international)
- le jeu d'ensembles et de sous-ensembles
- le dictionnaire personnel

Développer l'orthographe grammaticale

- accord du verbe avec son sujet
- accord du verbe avec ses sujets
- féminin de certains mots (animaux, en eur, en teur, en er, en en, en on)
- le pluriel des mots en au et en eu

Contrôler périodiquement ces apprentissages orthographiques par la dictée et/ou des variantes.

FRENCH
FIFTH GRADE

Perfectionner son habileté à communiquer oralement.

Développer son expression orale par le vécu de situations de communication.

- développer la communication
- développer l'esprit d'observation et l'esprit critique
- développer l'imagination et la sensibilité

Développer sa capacité de communiquer par le vécu d'un projet d'une certaine envergure en petit ou en grand groupe.

Extensionner le champ de performance de l'enfant en le faisant participer à l'étude et à l'analyse de sa langue.

Perfectionner son habileté à communiquer par écrit.

Développer son expression écrite par le vécu de situations de communication

- développer la communication
- développer l'esprit d'observation
- développer l'imagination et l'expression créatrice écrite

Développer chez l'enfant la maîtrise de certaines techniques particulières de l'expression écrite.

- présenter un travail propre
- bien former ses lettres
- aérer un texte
- faire un plan préparatoire à la composition
- employer des verbes précis au lieu de "il y a", "être", "se trouve", "faire"
- respecter un ordre logique dans ses récits ou ses observations.

Permettre à l'enfant d'apprendre à comprendre à l'intérieur du contexte naturel de la communication.

Permettre à l'enfant d'utiliser sa langue dans des situations contraignantes de demandes communicatives.

Développer l'écoute par l'exploitation de textes sonores (enfants, adultes, autres régions...)

- discuter à fond du contenu du texte pour savoir s'il est clair, logiquement ordonné, bien expliqué, bref, aussi compréhensible que possible
- enregistrer sur une autre cassette destinée à l'équipe productrice leur appréciation du texte sonore pour aider l'autre équipe à produire à l'avenir d'autres textes plus compréhensibles.

Développer chez l'élève l'habitude et le goût de lire en assurant une bonne compréhension.

Développer chez l'élève l'habitude de lire

- rendre l'élève capable de lire cent soixante-quinze (175) mots à la minute
- rendre l'élève capable de lire différentes écritures, sous différents styles.

Développer chez l'élève la compréhension de sa lecture à l'aide de techniques de base.

- rendre l'élève capable de:

- .indiquer la racine d'un mot auquel on a ajouté un préfixe ou un suffixe
- .identifier le préfixe ou le suffixe d'un mot et en préciser le sens
- .déterminer le sens d'un mot par sa forme
- .trouver le sens d'un mot à l'aide du contexte
- .identifier les mots - charnières et en expliquer le sens
- .trouver un antonyme, un synonyme de certains adjectifs ou verbes fréquemment employés
- .identifier les mots se rapportant à un sujet donné
- .indiquer les principaux personnages, événements et lieux d'un récit
- .trouver l'idée principale d'un texte
- .trouver les idées secondaires d'un récit
- .trouver des informations précises dans un texte
- .indiquer les principaux éléments d'un message
- .rétablir l'ordre logique ou chronologique d'une série d'événements
- .observer des indications données
- .expliquer les caractéristiques et l'idée principale d'un poème
- .expliquer une bande dessinée
- .expliquer l'utilisation des différentes grosseurs de caractères imprimés
- .identifier le genre de texte qu'on lit
- .distinguer les détails importants de ceux qui le sont moins
- .identifier les différents types d'articles qu'on trouve dans un journal
- .distinguer un fait d'une opinion

- .placer des mots par ordre alphabétique
- .trouver de plus en plus rapidement un mot dans le dictionnaire
- .consulter un index afin d'y trouver le tome et la page du sujet qui nous intéresse
- .consulter une table des matières ou un sommaire afin d'y trouver la page du sujet qui nous intéresse
- .indiquer le titre, l'auteur, la collection et l'éditeur d'un livre
- .imaginer la suite ou la conclusion logique d'un récit
- .porter un jugement sur ce qu'on lit
- .distinguer la réalité de la fiction dans un récit
- .consulter des fiches de la bibliothèque

Développer chez l'élève le goût de lire:

- aménager un coin de lecture
- animer un coin de lecture
- assurer une promotion du livre
- favoriser l'exploitation du livre par des activités convergentes et divergentes

Donner à l'enfant les outils nécessaires afin qu'il puisse maîtriser la morphologie et la syntaxe de la grammaire à l'écrit.

Amener l'élève à étudier le fonctionnement de la phrase par des exercices structuraux sur les éléments suivants:

- révision des pronoms personnels compléments
- ajouter les pronoms compléments: nous, vous
- les verbes pronominaux
- les pronoms non personnels: généralités
 - .les démonstratifs
 - .les possessifs
- les groupes permutable et non permutable
(ex: les circonstanciels sont permutable donc peuvent changer de place)
- la structure GN - V - GN
- la structure GN - V
- la structure GN - V - adj.
- la phrase à verbe être
- les correspondances avoir/être
- la construction indirecte
les prépositions
- groupes indirects. La structure GN - V - GN prép.
- la structure GN - V - GN - GN prép.
- les phrases de base (graphique)

le subjonctif présent

- coordination et subordination
- subordination avec que

Développer sa pratique des formes verbales suivantes:

- verbes in ir, issons au présent
- verbes in ir, issons aux autres temps connus
- verbes venir et tenir
- verbe dire
- verbe faire
- verbe savoir
- verbes pouvoir et vouloir
- l'impératif
- verbes paraître et connaître
- le plus-que-parfait
- le verbe mettre
- verbe lire
- le subjonctif
- le conditionnel
- verbe partir

Développer sa pratique des schèmes grammaticaux par des exercices structuraux sur les éléments suivants:

- quantité et intensité: trop, assez, pas assez
- quantité et intensité: la négation du comparatif
- quantité et intensité: plus... plus, moins... moins, plus... moins, moins... plus
- quantité et intensité: le superlatif

Reviser les règles de ponctuation par des exercices systématiques

Organiser le lexique de l'enfant (vocabulaire)

Préciser la signification des mots que celui-ci connaît plus ou moins bien

Favoriser des associations entre ces mots et ceux qu'il emploie déjà à bon escient, de façon qu'ils conviennent à la formulation précise de sa pensée

Assurer une orthographe correcte des mots de son langage usuel

Manipuler les mots de son langage usuel par:

- la classification de ceux-ci de la façon suivante: phonème=graphies (A.P.I.)
- le jeu d'ensembles et sous-ensembles
- le dictionnaire personnel

Développer l'orthographe grammaticale

- accorder le verbe avec des sujets de personnes différentes
- accorder correctement le participe passé employé avec être
- écrire correctement les mots invariables
- appliquer la règle d'accord du verbe avec le pronom relatif qui
- accorder des adjectifs avec des noms de genres différents
- écrire correctement les adjectifs numéraux (et cardinaux) dans des phrases
- accord des noms et des adjectifs en al
- accord des noms en au
- féminin des adjectifs en c et g final
- féminin des noms en n, t, f, x final
- accord du participe passé avec avoir dans ses formes les plus simples

Contrôler périodiquement ces apprentissages orthographiques par la dictée et/ou des variantes.

FRENCH
SIXTH GRADE

Perfectionner son habileté à communiquer oralement.

Développer son expression orale par le vécu de situations de communication.

- développer la communication
- développer l'esprit d'observation et l'esprit critique
- développer l'imagination et la sensibilité

Développer sa capacité de communiquer par le vécu d'un projet d'une certaine envergure en petit ou en grand groupe.

Extensionner le champ de performance de l'enfant en le faisant participer à l'étude et à l'analyse de sa langue.

Perfectionner son habileté à communiquer par écrit.

Développer son expression écrite par le vécu de situations de communication

- développer la communication
- développer l'esprit d'observation
- développer l'imagination et l'expression créatrice écrite

Développer chez l'enfant la maîtrise de certaines techniques particulières de l'expression écrite.

- présenter un travail propre
- bien former ses lettres
- aérer un texte
- faire un plan préparatoire à la composition
- employer des verbes précis au lieu de "il y a", "être", "se trouve", "faire"
- respecter un ordre logique dans ses récits ou ses observations.

Permettre à l'enfant d'apprendre à comprendre à l'intérieur du contexte naturel de la communication.

Permettre à l'enfant d'utiliser sa langue dans des situations contraignantes de demandes communicatives.

Développer l'écoute par l'exploitation de textes sonores (enfants, adultes, autres régions...)

- discuter à fond du contenu du texte pour savoir s'il est clair, logiquement ordonné, bien expliqué, bref, aussi compréhensible que possible
- enregistrer sur une autre cassette destinée à l'équipe productrice leur appréciation du texte sonore pour aider l'autre équipe à produire à l'avenir d'autres textes plus compréhensibles.

Développer chez l'élève l'habitude et le goût de lire en assurant une bonne compréhension.

Développer chez l'élève l'habitude de lire

- rendre l'élève capable de lire deux cents (200) mots à la minute
- rendre l'élève capable de lire différentes écritures, sous différents styles.

Développer chez l'élève la compréhension de sa lecture à l'aide de techniques de base.

-rendre l'élève capable de:

- .expliquer le sens d'un mot d'après son contexte
- .expliquer le sens d'un mot par sa forme
- .pouvoir expliquer le sens et le rôle des mots charnières
- .pouvoir reconnaître les mots clefs
- .indiquer le raisonnement logique ou l'ordre chronologique que l'auteur a suivi
- .indiquer l'idée principale et les idées secondaires
- .expliquer le sens global d'un texte
- .maîtriser l'ordre alphabétique
- .reconnaître les principales abréviations et les principaux sigles
- .pouvoir utiliser les indications que le dictionnaire donne sur la prononciation des mots (API)
- .interpréter une table des matières
- .indiquer le nom des principaux personnages, lieux, événements et établir des liens qui les unissent
- .exprimer ses réactions face à ce qu'on lit
- .porter un jugement objectif sur ce qu'on lit et expliquer ses réactions
- .établir des comparaisons entre ce qu'on lit et sa vie passée, présente ou future
- .trouver un volume selon le système Dewey
- .expliquer le contenu d'une fiche (bibliothèque)
- .consulter un fichier
- .intégrer l'index d'un livre
- .consulter une encyclopédie
- .expliquer les indications données sur la page de titre d'un volume
- .expliquer le sommaire d'un journal

- .interpréter et compléter un horaire
- .expliquer un schéma
- .expliquer des graphiques

Développer chez l'élève le goût de lire:

- aménager un coin de lecture
- animer un coin de lecture
- assurer une promotion du livre
- favoriser l'exploitation du livre par des activités convergentes et divergentes

Donner à l'enfant les outils nécessaires afin qu'il puisse maîtriser la morphologie et la syntaxe de la grammaire à l'écrit.

Amener l'élève à étudier le fonctionnement de la phrase par des exercices structuraux sur les éléments suivants:

- révision des pronoms personnels compléments
- ajouter les pronoms compléments: nous, vous
- les verbes pronominaux
- les pronoms non personnels: généralités
 - .les démonstratifs
 - .les possessifs
- les groupes permutable et non permutable
(ex: les circonstanciels sont permutable donc peuvent changer de place)
- la structure GN - V - GN
- la structure GN - V
- la structure GN - V - adj.
- la phrase à verbe être
- les correspondances avoir/être
- la construction indirecte
les prépositions
- groupes indirects. La structure GN - V - GN prép.
- la structure GN - V - GN - GN prép.
- les phrases de base (graphique)
le subjonctif présent
- coordination et subordination
- subordination avec que

Développer sa pratique des formes verbales suivantes:

- verbes in ir, issons au présent
- verbes in ir, issons aux autres temps connus
- verbes venir et tenir

- verbe dire
- verbe faire
- verbe savoir
- verbes pouvoir et vouloir
- l'impératif
- verbes paraître et connaître
- le plus-que-parfait
- le verbe mettre
- verbe lire
- le subjonctif
- le conditionnel
- verbe partir

Développer sa pratique des schèmes grammaticaux par des exercices structuraux sur les éléments suivants:

- quantité et intensité: trop, assez, pas assez
- quantité et intensité: la négation du comparatif
- quantité et intensité: plus... plus, moins... moins, plus... moins, moins... plus
- quantité et intensité: le superlatif

Reviser les règles de ponctuation par des exercices systématiques

Organiser le lexique de l'enfant (vocabulaire)

Préciser la signification des mots que celui-ci connaît plus ou moins bien

Favoriser des associations entre ces mots et ceux qu'il emploie déjà à bon escient, de façon qu'ils conviennent à la formulation précise de sa pensée

Assurer une orthographe correcte des mots de son langage usuel

Manipuler les mots de son langage usuel par:

- la classification de ceux-ci de la façon suivante: phonème=graphies (A.P.I.)
- le jeu d'ensembles et sous-ensembles
- le dictionnaire personnel

Développer l'orthographe grammaticale

- accorder le verbe avec des sujets de personnes différentes

- accorder correctement le participe passé employé avec être
- écrire correctement les mots invariables
- appliquer la règle d'accord du verbe avec le pronom relatif qui
- accorder des adjectifs avec des noms de genres différents
- écrire correctement les adjectifs numéraux (et cardinaux) dans des phrases
- accord des noms et des adjectifs en al
- accord des noms en au
- féminin des adjectifs en c et g final
- féminin des noms en n, t, f, x final
- accord du participe passé avec avoir dans ses formes les plus simples

Contrôler périodiquement ces apprentissages orthographiques par la dictée et/ou des variantes.

APPENDIX B
THE ACHIEVEMENT TESTS

DIRECTIVES AUX ELEVES

- 1- Pour chaque question, vous avez un choix de 5 réponses (toujours placées horizontalement). Après avoir lu attentivement une question, vous choisissez la réponse qui vous semble la bonne.
- 2- Pour indiquer votre réponse, vous encerclez la case correspondant à votre choix. Il n'y a qu'une seule bonne réponse par question.
- 3- Si une question vous semble trop difficile, passez-la; vous y reviendrez plus tard.
- 4- Il serait souhaitable d'effacer le moins possible sur votre cahier.
- 5- Suivez bien maintenant au tableau, nous allons faire ensemble les trois exemples.
- 6- Après avoir reproduit le modèle, le professeur fait les exemples un par un avec les élèves et indique les réponses aux bons endroits en encerclant dans chaque cas le numéro de la case appropriée. Ensuite, il s'assure que tous les élèves ont bien compris avant d'entreprendre le test proprement dit.

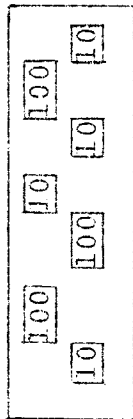
TEST DE RENDEMENT EN MATHÉMATIQUES

4e

Exemples:

Tous les calculs peuvent se faire par écrit.

A- Quel nombre identifie cet ensemble:



- 430
- 340
- 700
- 70
- 610

B- Quelle est la valeur de n dans: $26 + 32 = 32 + n$?

- 58
- 32
- 26
- 90
- 48

C- Si tu fais l'union des deux ensembles: combien y aura-t-il d'éléments dans ton nouvel ensemble?



- 13
- 6
- 7
- 14
- 12

- 1- Ma soeur collectionne les timbres. Son premier album contient 210 timbres, le deuxième 540 et le troisième 249. Combien a-t-elle de timbres dans sa collection?
- | | | | | |
|-----|-----|-----|-----|-----|
| 989 | 899 | 789 | 889 | 999 |
|-----|-----|-----|-----|-----|
- 2- A quel nombre faut-il ajouter 8 pour que la somme devienne 15?
- | | | | | |
|---|---|---|----|---|
| 7 | 9 | 6 | 23 | 5 |
|---|---|---|----|---|
- 3- Quel nombre écrirais-tu à la place du carré noir dans cette série:
- | | | | | |
|----|----|----|----|----|
| 32 | 24 | 43 | 37 | 36 |
|----|----|----|----|----|
- 31 - 33 - 35 - ~~37~~ - 39 - 41 ?
- 4- Laquelle des cases suivantes contient une erreur?
- | | | | | | | | |
|-----|-----|--------------|-----|-----|-----------|-----|-----|
| 672 | 627 | 600+46 = 646 | 987 | 798 | 96 = 60+9 | 676 | 667 |
|-----|-----|--------------|-----|-----|-----------|-----|-----|
- 5- Observe bien cet ensemble: Quel nombre représente cet ensemble?
- | | | | | |
|-----|-----|-----|-----|-----|
| 453 | 345 | 354 | 435 | 543 |
|-----|-----|-----|-----|-----|
- 4 centaines
3 unités 5 dizaines
- 6- Cette année 3 groupes de 50 élèves ont visité le planétarium. Combien d'élèves ont visité cet endroit?
- | | | | | |
|-----|-----|-----|----|----|
| 150 | 120 | 180 | 80 | 53 |
|-----|-----|-----|----|----|

7- Si au nombre 3417 j'ajoute 1 centaine, 5 dizaines et 1 unité, lequel de ces nombres vais-je obtenir?

3308	3266	3568	2366	3468
------	------	------	------	------

8- Si de cet ensemble

10	10	1	10	1
10	1	10	1	10

j'enlève 4 dizaines et 3 unités, combien me restera-t-il?

2 dizaines 2 unités	5 dizaines 2 unités	3 dizaines 1 unité	4 dizaines 2 unités	3 dizaines 4 unités
------------------------	------------------------	-----------------------	------------------------	------------------------

9- On doit couvrir un plancher avec 657 tuiles. Si 288 sont déjà posées, combien en reste-t-il à poser?

368	365	369	445	379
-----	-----	-----	-----	-----

10- Lequel des nombres suivants est plus grand que 6999 mais plus petit que 7001?

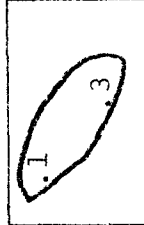
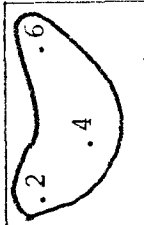
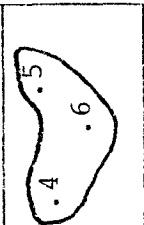
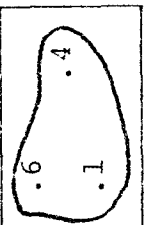

6998	6899	6000	7000	7002
------	------	------	------	------

11- Voici les chiffres que mon professeur me donne:

.9	.6	.7	.8
----	----	----	----

Il me demande de composer le plus grand nombre de 4 chiffres avec ces éléments. Quel sera ce nombre?

9786	9865	9876	9768	9678
------	------	------	------	------

- 12- J'ai acheté 3 boîtes de 18 crayons chacune. Combien de crayons ai-je achetés
- | | | | | |
|----|----|----|----|----|
| 24 | 56 | 57 | 54 | 64 |
|----|----|----|----|----|
- 13- Lequel des nombres suivants contient le plus de dizaines en tout?
- | | | | | |
|----|-----|-----|-----|-----|
| 90 | 100 | 210 | 142 | 190 |
|----|-----|-----|-----|-----|
- 14- Je te donne 4 bâtonnets d'égale longueur pour construire une figure et je veux que tu les utilises tous. Quelle figure bâtiras-tu?
- | | | | | |
|-----------|--------------|----------|-------------|----------|
| un cercle | un rectangle | un carré | un triangle | un angle |
|-----------|--------------|----------|-------------|----------|
- 15- Quel ensemble contient des nombres pairs seulement?
- | | | | | |
|---|---|---|---|---|
|  |  |  |  |  |
|---|---|---|---|---|
- 16- Quelle est la longueur du segment CD, si tu te sers du segment AB comme unité de mesure (sans te servir de ta règle)?
- | | | | | |
|----------|-----------|-----------|-----------|----------|
| 8 unités | 10 unités | 14 unités | 12 unités | 9 unités |
|----------|-----------|-----------|-----------|----------|



- 17- J'ai 35 bonbons. J'en garde 10 pour moi. Je distribue tout le reste à mes amis et chacun en reçoit 5. Combien ai-je d'amis?
- | | | | | |
|---|----|---|---|---|
| 7 | 15 | 9 | 4 | 5 |
|---|----|---|---|---|
- 18- J'ai 35¢. Combien me manque-t-il de pièces de 5¢ pour m'acheter un stylo de 50¢?
- | | | | | |
|----|----|---|---|---|
| 15 | 25 | 3 | 7 | 5 |
|----|----|---|---|---|
- 19- Le principal d'une école a reçu 180 crayons. Combien de dizaines de crayons a-t-il reçues?
- | | | | | |
|---|---|----|----|----|
| 1 | 8 | 18 | 80 | 10 |
|---|---|----|----|----|
- 20- Si j'avais gagné 9 points de plus j'en aurais gagné 18. Combien de points ai-je gagnés?
- | | | | | |
|----|---|----|---|----|
| 27 | 9 | 25 | 8 | 26 |
|----|---|----|---|----|
- 21- Lequel des nombres suivants se trouve entre 760 et 960 lorsque tu fais des bonds de 100?
- | | | | | |
|-----|-----|------|-----|-----|
| 800 | 660 | 1060 | 860 | 770 |
|-----|-----|------|-----|-----|
- 22- Pour former une équipe de ballon-volant nous avons besoin de 6 personnes. Si 36 personnes se sont présentées, combien pouvons-nous former d'équipes?
- | | | | | |
|---|-----|---|---|---|
| 6 | 216 | 7 | 8 | 5 |
|---|-----|---|---|---|

23- A quel nombre faut-il ajouter 315 pour qu'il devienne 999?

614	1314	1214	584	684
-----	------	------	-----	-----

24- Observe bien la droite numérique ci-dessous. Quelle équation y est illustrée?

$3 \times 5 = 15$	$5 \times 3 = 15$	$3 + 12 = 15$	$6 + 9 = 15$	$12 + 3 = 15$
-------------------	-------------------	---------------	--------------	---------------



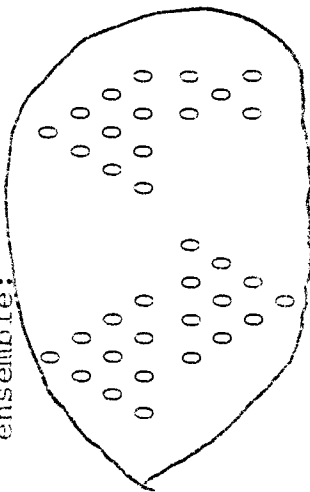
25- Lequel des nombres suivants est équivalent à 28 dizaines?

2800	280	28	2810	38
------	-----	----	------	----

26- Dans le nombre 1000, combien comptes-tu de centaines?

1	10	90	1000	100
---	----	----	------	-----

27- A l'intérieur de cet ensemble:



il te faut former 7 sous-ensembles équipotents (équivalents). Combien y aura-t-il d'éléments dans chacun de ces sous-ensembles?

35	7	42	28	5
----	---	----	----	---

28- Mon professeur me demande d'ajouter 1 millier au nombre 5392. Lequel des chiffres qui le composent changera?


6	2	3	9	5
---	---	---	---	---

29- Combien auras-tu de pièces de 10 cents en échange de 4 pièces de 5 cents?

20	2	40	8	10
----	---	----	---	----

30- Trouve la valeur de n dans: $(n+69) + 67 = 48 + (29+67)$.

29	67	48	144	96
----	----	----	-----	----

31- Pour faire un problème mon professeur nous montre cet ensemble de bâtonnets:  Il nous demande de bâtir 6 ensembles équipotents (équivalents). Combien aurons-nous besoin de bâtonnets pour faire le travail?

8	48	54	40	56
---	----	----	----	----

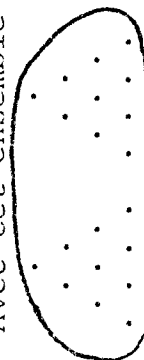
32- Choisis le nombre qui contient 13 dizaines de plus que 367?

380	497	1667	397	1490
-----	-----	------	-----	------






33- Je dois partager également une certaine somme d'argent entre 4 personnes. Quelle opération dois-je faire pour savoir combien chaque personne recevra?

une addition	une soustraction	une multiplication	une division	un ensemble vide
--------------	------------------	--------------------	--------------	------------------

34- Avec cet ensemble



il me fallait former des ensembles équipotents (équivalents). Dans quelle case ai-je commis une erreur?

				
---	---	---	---	---

35- A la loto du Québec mon père a gagné 10 centaines de dollars. Combien d'argent a-t-il gagné?

\$10.00	\$100.00	\$10,000	\$1,000.00	\$100,000.00
---------	----------	----------	------------	--------------

FIN DU TEST

Exemples

L'usage du dictionnaire est interdit.

A- Quel mot doit se terminer par la lettre "O"

un mart__ un lavab__ un bat__ un cout__ un gât__

B- Trouve le nom d'une fleur.

une cerise une épINETTE une chèvre une serre une tulipe

Remplace le mot souligné par un autre plus joli.

C- Faire un discours.

écouter terminer prononcer corriger allonger

I ORTHOGAPHE

1	une souri__	un bari__	une fourmi__	une loteri__	un bandi__
2	une __raise	du __romage	une __rase	un __rère	la __ranchise
3	une __abitude	un __aveugle	une __adresse	un __arbre	une __allumette
4	un corn__	un bal__	un poul__	un gil__	un robin__
5	une __alade	un __ervice	une __olution	une __erise	un __ignal

II	COMPREHENSION D'UN TEXTE ORAL
----	-------------------------------

6	l'admiration	la dignité	la faiblesse	le calme	la gentillesse
7	la collaboration	la rivalité	l'affection	la finesse	l'honneur
8	l'envie	l'orgueil	la prudence	la gentillesse	le doute
9	la résignation	l'héroïsme	la finesse	l'ambition	la peur
10	l'orgueil	l'inquiétude	la droiture	la responsabilité	la peine

III PHRASES A COMPLETER

11

On trouve comment s'écrit
un mot...

dans un dictionnaire
dans une grammaire
dans un catalogue
dans une encyclopédie
dans une revue

12

Une haie est une clôture...

faite de planches de bois
faite de broche en métal
faite de roches plates
faite d'arbustes
faite de blocs de ciment

15

Les abeilles fabriquent
le miel...

dans leur iglou
dans leur niche
dans leur hutte
dans leur terrier
dans leur ruche

14

Le ski nautique se pratique...

sur la neige
à travers les champs
sur l'eau
dans les vallées
sur les côtes

15

Chaque année, l'école
recommence...

au début du mois de janvier
au début du mois de septembre
au début du mois de mars
au début du mois de juin
au début du mois de novembre

IV VOCABULAIRE

- 16- Comment appelle-tu la roue qui permet de conduire une voiture?
- | | | | | |
|---------|-----------|-------------|----------|-----------|
| le pneu | le klaxon | le cylindre | le frein | le volant |
|---------|-----------|-------------|----------|-----------|
- 17- Comment appelle-tu l'enveloppe qui couvre un oeuf?
- | | | | | |
|--------------|--------------|--------------|---------------|--------------|
| une coquille | une douzaine | une omelette | une jonquille | une poulette |
|--------------|--------------|--------------|---------------|--------------|
- 18- Trouve le nom d'un des points cardinaux.
- | | | | | |
|------|-----|-------|--------|-----|
| juin | sud | mardi | minute | été |
|------|-----|-------|--------|-----|
- 19- Qu'est-ce qui n'est pas le nom d'un arbre?
- | | | | | |
|------------|----------|-----------|----------|-------------|
| un bouleau | un sapin | un érable | un chêne | un bûcheron |
|------------|----------|-----------|----------|-------------|
- 20- Qu'est-ce qui n'est pas le nom d'une embarcation?
- | | | | | |
|-------------|--------------|----------|--------------|-----------|
| un paquebot | une chaloupe | un canot | une remorque | un radeau |
|-------------|--------------|----------|--------------|-----------|

V | STYLISTIQUE

Change le mot souligné pour un autre plus joli.

21- Faire un problème.

lire	résoudre	diviser	écrire	copier
------	----------	---------	--------	--------

22- La politesse est une chose qui est remarquée.

une espèce	un défaut	une habitude	un service	une qualité
------------	-----------	--------------	------------	-------------

23- Dans ce magasin, on vend des affaires de sport.

articles	centres	outils	joutes	billets
----------	---------	--------	--------	---------

24- Si Jean continue à grandir il aura six pieds.

pèsera	lèvera	mesurera	montera	marchera
--------	--------	----------	---------	----------

25- Tout le monde veut avoir le premier prix de la loterie.

dépenser	donner	annoncer	gagner	emprunter
----------	--------	----------	--------	-----------

VI ANTONYMES

Trouve le contraire de chacun des mots soulignés.

26- Le propriétaire ouvre son magasin à huit heures.

ferme	décore	annonce	nettoie	éclairé
-------	--------	---------	---------	---------

27- Aline donnera un cadeau.

attachera	achètera	enveloppera	recevra	cachera
-----------	----------	-------------	---------	---------

VII SYNONYMES

Trouve un mot qui veut dire à peu près la même chose que le mot souligné.

28- Le chasseur s'enfonce dans le bois.

le sable	la forêt	la boue	la rivière	l'avenue
----------	----------	---------	------------	----------

29- Durant notre voyage nous avons admiré des paysages magnifiques.

encadré	dessiné	dépassé	cueilli	contemplé
---------	---------	---------	---------	-----------

30- Luc s'est blessé en tombant sur une pierre.

lançant	montant	trébuchant	jouant	passant
---------	---------	------------	--------	---------

VIII CONJUGAISON

31- Trouve un verbe au présent.

il ira à
la campagne

je regardais la
télévision

nous chanterons
ensemble

tu finis
ton devoir

vous aviez
hâte

32- Trouve un verbe au
passé.

vous avez
joué du
piano

tu viendras
demain

nous serons
à l'heure

je termine
mon travail

vous tirez
trop fort

33- Trouve un verbe au
futur.

la pluie
tombait du
ciel

le chien
rongera son
os

la rivière
coule len-
tement

les nuages
cachaient
le soleil

Luc fait
une commis-
sion

IX GRAMMAIRE

- 34- Trouve un nom d'animal.
- 35- Trouve un nom au féminin singulier.
- 36- Trouve un nom au masculin pluriel.
- 37- Trouve un adjectif (mot de qualité).
- 38- Trouve un mot qui dit à qui appartient la chose.
- 39- Trouve un nom au féminin pluriel.
- 40- Trouve un verbe au pluriel.

une niche	un perchoir	une chanson	un aquarium	un ourson
un travail	deux parties	L'hirondelle	un orage	des oranges
des cartes	un aigle	les vacances	les signaux	une course
délicieuse	celui	pâtisserie	terminer	toujours
mardi	des	elle	sur	tes
une souris	des nuages	deux jumelles	un rêve	trois sous
tu auras	vous parlez	je suis	il est venu	tu écris

FIN DU TEST

TEST DE RENDEMENT EN MATHÉMATIQUES

5e

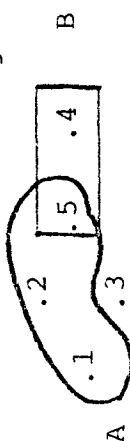
Tous les calculs peuvent se faire par écrit.

Exemples

A- Combien te faut-il d'éléments pour former un ensemble contenant 19 dizaines d'éléments?

19	190	10	228	1900
----	-----	----	-----	------

B- Observe bien ce diagramme:



Quel élément se trouve dans l'intersection des ensembles A et B?

1	2	3	4	5
---	---	---	---	---

C- Lequel des nombres suivants écrirais-tu à la place de \underline{n} dans:

8	56	3	4	32
---	----	---	---	----

$$(7 \times 8) = (4 \times 8) + (n \times 8)?$$

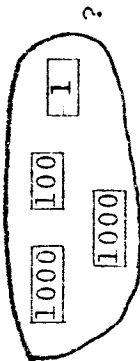
1- J'ai décomposé un nombre et j'ai obtenu:

$$(7 \times 1000) + (6 \times 100) + (5 \times 10) + 4$$

Quel était ce nombre?

7,654	76,654	76,054	76,504	7,650
-------	--------	--------	--------	-------

2- Quel nombre illustre cet ensemble:



- 301
- 2011
- 2110
- 2101
- 2111

3- Quelle est la valeur de \bar{n} dans: $1973 - 1887 = n$?

- 76
- 96
- 156
- 114
- 86

4- Quelle est la valeur de n dans: $(226+333) + 7 = 7 + (226+n)$?

- 226
- 233
- 333
- 566
- 433

5- Voici comment se distribuent les élèves à l'intérieur d'une école:

nombre d'élèves	100	90	210	120	150	90
degré	1re	2e	3e	4e	5e	6e

Combien y a-t-il d'élèves dans cette école?

- 750
- 660
- 650
- 760
- 560

6- Quelle est la valeur de \bar{n} dans:

- 0
- 25
- 20
- 4
- 5

$(5 \times n) - 5 = 20$?

7- J'ai \$20.00. Je dépense \$7.00 et mon père me donne \$12.00. Quelle expression représente l'argent que j'ai maintenant?

$(20+7) - 12$	$(20-7) + 12$	$20 - (7+12)$	$(7+12) + 20$	$(20-12) + 7$
---------------	---------------	---------------	---------------	---------------

8- Quelle est la valeur de n dans: $(8 \times 4) - n = 32$?

0	64	32	4	8
---	----	----	---	---

9- Observe bien les cinq ensembles suivants:

<p>A</p> <pre> * * * * </pre>	<p>B</p> <pre> * * * * * * * * * </pre>	<p>C</p> <pre> : : : : : : : : : </pre>
<p>D</p> <pre> </pre>	<p>E</p> <pre> [] </pre>	

Quels sont les deux ensembles que je dois réunir pour obtenir le plus grand nombre d'éléments?

D et E	C et B	B et D	C et E	C et D
--------	--------	--------	--------	--------

10- Quelle est la règle de fonction appliquée dans ce tableau:

opérateur	nombre donné	nombre résultat
	.1	.1
	.3	.5
	.5	.9
	.7	.13
		+5-1
		x2+1
		+2
		x2-1
		+0

11- Le segment AB est plus petit que le segment CD et le segment EF est plus grand que CD. Quelle figure illustre cette donnée?

--	--	--	--	--	--

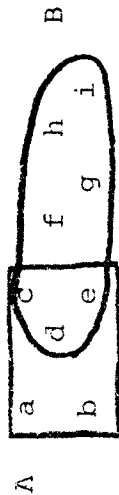
12- J'avais 6 équipes de 12 joueurs. J'ai décidé de former 12 équipes de 6 joueurs. Combien de joueurs ai-je renvoyés?

72	6	0	18	36
----	---	---	----	----

13- Combien me manque-t-il d'argent pour acheter une lampe de poche de \$1.98 si je ne dispose que de \$0.99?

\$1.01	\$0.99	\$1.09	\$0.87	\$0.89
--------	--------	--------	--------	--------

14- Dans le diagramme suivant, quel est l'ensemble des lettres qui appartiennent à la fois à l'ensemble A et à l'ensemble B?

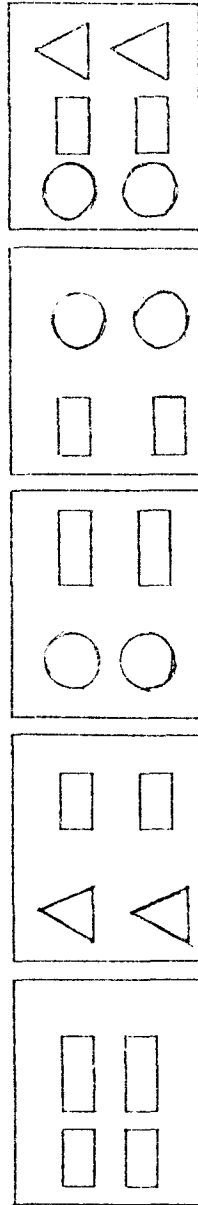


- (a,b,c,d,e,
f,g,h,i)
- (f,g,h,i)
- (c,d,e)
- (a,b)
- ()

15- En observant le code suivant:

= 1000, = 100,

= 10, = 1, quelle case contient le nombre 2002?



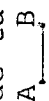
16- Lequel des nombres suivants contient 143 dizaines?

- 14300
- 1430
- 14
- 30
- $\frac{143}{10}$

17- Lequel des ensembles suivants ne représente pas deux facteurs du nombre 24?

- (2,12)
- (6,4)
- (8,3)
- (0,24)
- (24,1)

- 18- On m'a demandé de décomposer le nombre 73,000 de cinq façons différentes. Trouve mon erreur.
- | | | | | |
|---------|---------|---------|------------|--------------|
| 73x1000 | 730x100 | 7300x10 | 72,000-100 | 72,000-1,000 |
|---------|---------|---------|------------|--------------|
- 19- Quelle est la valeur de n dans: $(8x25) - (2x25) = n \times 25$?
- | | | | | |
|-----|---|-----|----|----|
| 200 | 2 | 250 | 50 | 10 |
|-----|---|-----|----|----|
- 20- Combien aurez-vous de pièces de 5¢ en échange de 10 pièces de 10¢?
- | | | | | |
|----|---|-----|---|----|
| 20 | 2 | 100 | 4 | 25 |
|----|---|-----|---|----|
- 21- La règle de fonction étant $(nx2)-6$, quel est le résultat si $n = 6$?
- | | | | | |
|----|---|---|----|---|
| 12 | 2 | 6 | 18 | 0 |
|----|---|---|----|---|
- 22- Si je veux calculer le temps que tu prends pour te rendre à l'école, de quelle unité de mesure vais-je me servir?
- | | | | | |
|------------|---------|----------|-----------|------------|
| la seconde | le pied | le mille | le gallon | le segment |
|------------|---------|----------|-----------|------------|
- 23- Combien y a-t-il de dizaines en tout dans 12386?
- | | | | | |
|---|----|------|-----|-------|
| 8 | 86 | 1238 | 123 | 12380 |
|---|----|------|-----|-------|
- 24- En prenant le segment AB comme unité de mesure, quelle est la longueur du segment CD (sans te servir de ta règle)
- | | | | | |
|----------|----------|----------|----------|----------|
| 6 unités | 8 unités | 7 unités | 9 unités | 5 unités |
|----------|----------|----------|----------|----------|

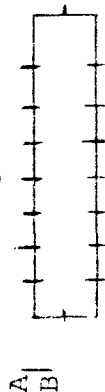


25- Jeanne a reçu \$14.00 et Pierre \$20.00. Combien de dollars Pierre doit-il donner à Jeanne pour que Pierre et Jeanne aient le même montant?

\$6.00	\$34.00	\$3.00	\$17.00	\$7.00
--------	---------	--------	---------	--------

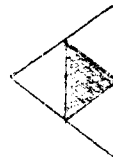
26- En te servant du segment AB comme unité de mesure, quelle est le périmètre de cette figure?

20	2	16	10	18
----	---	----	----	----



27- Observe bien la figure ci-contre. La partie ombragée représente quelle fraction de la figure entière?

$\frac{3}{4}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{5}$	$1\frac{1}{3}$
---------------	---------------	---------------	---------------	----------------



28- Josée veut construire l'ensemble des diviseurs de 30. Voici son ensemble: (2, 3, 5, 6, 10, 15, 30). Quel diviseur a-t-elle oublié?

1	60	0	18	9
---	----	---	----	---

29- Mon père travaille de 8h. à 17h. Combien d'heures travaille-t-il par jour s'il prend 1 heure pour dîner?

13	8	3	10	9
----	---	---	----	---

30- Si j'ai un certain nombre entier à multiplier par 1000, laquelle des réponses suivantes peut être acceptée?

2500	1010	2400	15000	1001
------	------	------	-------	------

31- Si $21 \times 64 = 1344$, on peut conclure que $22 \times 64 = 1344 - n$. Quelle sera alors la valeur de n?

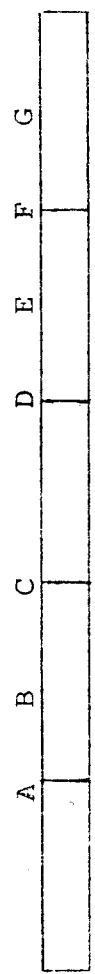
64	21	85	1344	1408
----	----	----	------	------

32- Deux camions partent en même temps du même endroit et suivent le même trajet. Le premier roule à 50 milles à l'heure et le second à 40 milles à l'heure. Après 4 heures de route, quelle distance sépare les deux camions?

200 milles	160 milles	90 milles	40 milles	360 milles
------------	------------	-----------	-----------	------------

33- Le segment ci-dessous est gradué en pouces. Quelle lettre est située à $3\frac{1}{2}$ pouces du début du segment:

E	D	G	B	AUCUNE
---	---	---	---	--------



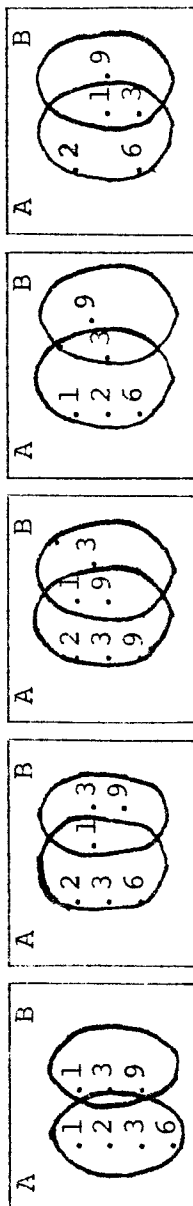
34- Laquelle des fractions suivantes représente la plus grande partie d'un même objet?

$\frac{3}{9}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{2}{6}$	$\frac{1}{2}$
---------------	---------------	---------------	---------------	---------------

35- L'ensemble $A = 1.2.3.6$
représente tous les
facteurs de 6.

L'ensemble $B = 1.3.9$
représente tous les
facteurs de 9.

Trouve le diagramme qui
représente l'intersection
de ces ensembles.



Exemples

L'usage du dictionnaire est interdit

A- Quel mot doit se compléter par la lettre "O"?

un lavab__	un cout__	un mart__	un gât__	un bat__
------------	-----------	-----------	----------	----------

Remplace le mot souligné de la phrase ci-dessous par UN AUTRE PLUS JOLI.

B- Faire une erreur.

trouver	corriger	oublier	commettre	effacer
---------	----------	---------	-----------	---------

Conjuge le verbe souligné de la phrase ci-dessous au TEMPS DEMANDE

C- Pierre écouter (présent)
un disque.

écoutait	écouterà	écoute	écouterait	a écouté
----------	----------	--------	------------	----------

1- Quel mot se complète par les lettres AM?

une gr__ge	une l__terne	un ourag__	une __poule	un m__teau
------------	--------------	------------	-------------	------------

2- Quel mot se complète par la lettre S?

une tribu__	un débu__	un menu__	une avenu__	un refu__
-------------	-----------	-----------	-------------	-----------

3- Dans quel mot le son È s'écrit-il AI?

une sem__ne	la n__ge	un p__gne	une r__ne	une p__ne
-------------	----------	-----------	-----------	-----------

- 4- Dans quel mot ER se prononce-t-il différemment des autres?

cuiller	amer	hier	acier	enfer
---------	------	------	-------	-------
- 5- Dans quel mot UM se prononce-t-il différemment des autres?

forum	sérum	parfum	album	aquarium
-------	-------	--------	-------	----------
- 6- Dans quel mot SON se prononce-t-il différemment des autres?

raison	ourson	maison	saison	prison
--------	--------	--------	--------	--------
- 7- Dans quel mot CH se prononce-t-il différemment des autres?

chemin	chopine	charade	chorale	chute
--------	---------	---------	---------	-------

Dans chacune des phrases ci-dessous, remplace le mot souligné par UN AUTRE PLUS JOLI.

- 8- Faire un discours intéressant.

allonger	écouter	prononcer	applaudir	reproduire
----------	---------	-----------	-----------	------------
- 9- Le savant utilise avec précaution ses affaires scientifiques.

instruments	émissions	congrès	conférences	structures
-------------	-----------	---------	-------------	------------
- 10- Dans la salle, il y avait un grand silence.

montait	régnait	circulait	éclatait	couvrait
---------	---------	-----------	----------	----------
- 11- Dans ce magasin, on peut acheter toutes sortes de choses.

menus	achats	articles	annonces	services
-------	--------	----------	----------	----------

Complète chacune des phrases ci-dessous par LE MOT QUI CONVIENT.

12- La chasse aux phoques est permise ? elle est limitée.

alors	mais	selon	sinon	sans
-------	------	-------	-------	------

13- La grève a retardé les travaux, ? ils seront terminés à temps.

néanmoins	malgré	comme	donc	durant
-----------	--------	-------	------	--------

14- Les bateaux de pêche n'ont pu quitter le quai ? la mer était en furie.

pour	vers	avec	mais	car
------	------	------	------	-----

15- L'ours fait une provision de graisse et ? ils s'endort pour l'hiver.

avant	ensuite	quand	durant	dont
-------	---------	-------	--------	------

Lis chacune des phrases ci-dessous et trouve le sens du mot souligné.

- 16- Avant d'atteindre Vancouver, la vérification d'un des moteurs de notre avion nous a forcés à faire une escale de deux heures à Toronto.
- | | | | | |
|-----------|--------|-------------|----------|---------|
| un départ | un vol | un aéroport | un arrêt | un saut |
|-----------|--------|-------------|----------|---------|
- 17- Les bombardements ayant dévasté les champs, ce pays connaîtra une grande pénurie de céréales.
- | | | | | |
|-------------|-------------|-----------|---------------|-------------|
| une disette | une récolte | une vente | une abondance | une culture |
|-------------|-------------|-----------|---------------|-------------|
- 18- Grâce à son flair, ce chien policier, après avoir senti un des souliers du garçonnet disparu, retrouva ce dernier au milieu de la forêt.
- | | | | | |
|------------|-------------|----------------|-------------|------------|
| son maître | sa bravoure | son expérience | sa fidélité | son odorat |
|------------|-------------|----------------|-------------|------------|
- 19- Au lieu de déposer son argent à la banque, ce vieil ermite l'avait dissimulé sous une pierre près de sa maison.
- | | | | | |
|-------|-------|--------|-------|-------|
| gagné | perdu | retiré | prêté | caché |
|-------|-------|--------|-------|-------|
- 20- Il faut reconnaître les champignons qui sont comestibles et ceux qui peuvent nous empoisonner.
- | | | | | |
|------------------------|------------------------|--------------------|----------------------|------------------------|
| qui poussent à l'ombre | que l'on peut congeler | qui sont déjà mûrs | que l'on peut manger | qui sont assez tendres |
|------------------------|------------------------|--------------------|----------------------|------------------------|

Les phrases ci-dessous sont en désordre. Dans ta tête replace-les dans un ordre logique et trouve celle qui serait la ...

... la première.

Sa convalescence a été longue.

Il a subi une opération délicate

Il a passé des radiographies.

Jean avait des douleurs à l'estomac.

Maintenant, il est parfaitement guéri.

21

22

... la deuxième.

La fermière prépare la terre de son jardin.

Les plantes profitent bien.

Elle récoltera beaucoup de légumes.

Elle arrose son jardin tous les jours.

Elle sème différentes graines.

... la troisième.

Au retour un campeur manque à l'appel.

Des campeurs partent en excursion.

L'excursion se déroule selon le plan prévu.

Le disparu est retrouvé au pied d'un arbre.

Des recherches sont entreprises pour le retrouver.

23

24

... la dernière.

Dès son arrivée, il se met à pêcher.

Il revient fier de ses prises.

Pierre prépare un voyage de pêche.

Il attrape cinq poissons.

Il part de bon matin.

Trouve la deuxième partie (le reste) de chacune des phrases ci-dessous.

25

Les personnes obèses doivent...
Suivre un itinéraire précis.
Suivre un guide expérimenté.
Suivre une émission éducative.
Suivre un horaire stricte.
Suivre un régime sévère.

26

La dernière tempête a causé...
Une agréable surprise aux campeurs.
Une longue panne d'électricité.
Une augmentation des récoltes.
Un orage de vives protestations.
Une baisse dans la vente des parapluies.

27

A cause des travaux de voirie, les automobilistes doivent...
Accélérer leur vitesse.
Faire vérifier leur moteur.
Porter des verres fumés.
Faire des détours.
Allumer leurs phares.

28

Durant une joute de hockey, les joueurs...
Suivent les instructions de leur entraîneur.
Observent les réactions de la foule.
Se détendent dans leur chambre.
Se réchauffent pour être en forme.
Ont les yeux rivés sur l'écran de télévision.

29

Le rôle de l'infirmière consiste à...
Aider le médecin dans sa comptabilité.
Préparer les repas des malades.
Porter un uniforme blanc et propre.
Dispenser les soins prescrits par le médecin.
Inscrire les rendez-vous chez le médecin.

Conjugué les verbes ci-dessous aux TEMPS DEMANDES.

30- N'oublie pas ton rendez-vous et être (impératif présent, 2e pers. du sing.) à l'heure.

soit	soie	soi	soies	sois
------	------	-----	-------	------

31- Si elle s'y mettait, elle finir (conditionnel présent) son tricot demain.

finirais	finissait	finirait	finira	finiraient
----------	-----------	----------	--------	------------

Trouve la nature (sorte de mots) de chacun des mots soulignés.

32- Ce lours camion a défoncé la chaussée.

pronom	adverbe	nom	verbe	article
--------	---------	-----	-------	---------

33- Le verglas alourdit les branches des arbres.

adverbe	verbe	adjectif	pronom	article
---------	-------	----------	--------	---------

34- Le prochain combat dira qui est le plus fort des deux.

article	verbe	nom	adjectif	adverbe
---------	-------	-----	----------	---------

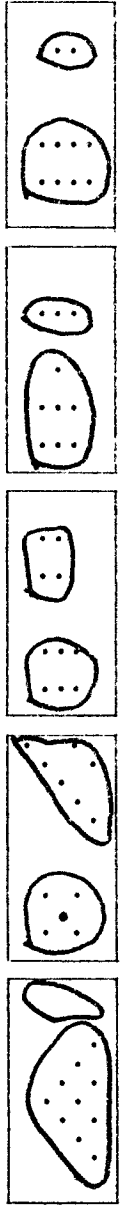
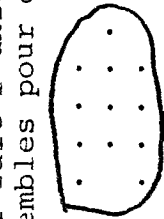
35- Les pluies ont lourdement endommagé les récoltes.

adverbe	nom	article	adjectif	verbe
---------	-----	---------	----------	-------

FIN DU TEST

Exemples: Les calculs peuvent se faire par écrit.

A- J'ai fait l'union de deux ensembles pour obtenir:



Quels étaient ces ensembles?

B- Quel nombre faut-il ajouter à 12 pour avoir 17?

29	2	3	4	5
----	---	---	---	---

C- Trouve la valeur de n dans:
 $(31+6) + 24 = 31 + (6+n)$.

37	61	24	30	55
----	----	----	----	----

1- Si $12 \times 12 = 144$, je peux conclure que...

$144 \div 12 = 12$	$144 \div 24 = 6$	$144 - 21 = 120$	$144 - 12 = 136$	$12 = 144 - 12$
--------------------	-------------------	------------------	------------------	-----------------

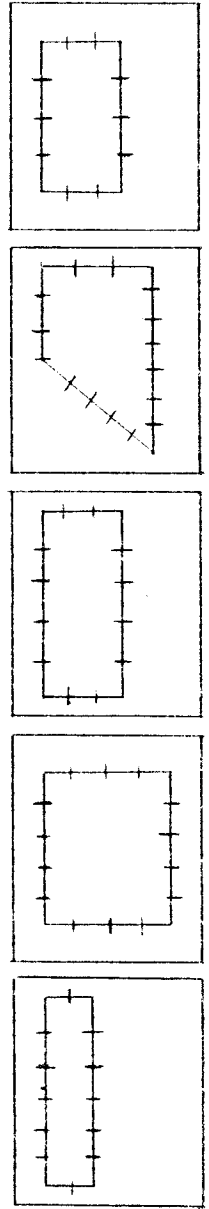
2- Trouve la valeur de n dans:
 $87 + (n+93) = (87+93) + 34$

180	34	214	87	6
-----	----	-----	----	---

3- Trouve la valeur de n dans: $1272 \div 6 = n$

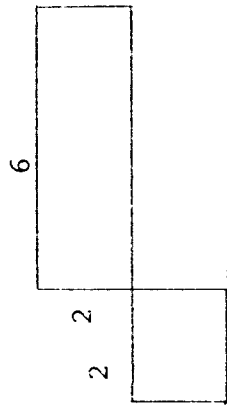
2012	213	217	209	212
------	-----	-----	-----	-----

4- La distance entre deux petites marques étant toujours la même, laquelle des figures suivantes possède le plus grand périmètre?



5- Trouve le périmètre de la figure ci-dessous.

12	24	10	14	22
----	----	----	----	----



6- Par l'illustration ci-dessous, je veux prouver que

$4 \times 3 = 3 \times 4$	$8 - 4 = 12$	$9 - 3 = 12$	$6 - 6 = 12$	$12 - 12 = 24$
---------------------------	--------------	--------------	--------------	----------------



7- Quel est le plus grand facteur commun à 12 et à 30?

12	2	3	4	6
----	---	---	---	---

8- Trouve la valeur de n dans: $7 \times 9 = (n \times 9) - (1 \times 9)$

9	63	8	6	54
---	----	---	---	----

9- Retrouve le nombre composé de:

6784	6840	8467	8764	8460
------	------	------	------	------

$(6 \times 10) - 7 - (8 \times 10 \times 10 \times 10) - (4 \times 10 \times 10)$

10- Sur ta feuille de calculs, prends la longueur de ce segment: . Maintenant, trouve un segment qui lui est congru.

--	--	--	--	--

11- $3060 \div 17 =$

180	151r3	294r2	18	280
-----	-------	-------	----	-----

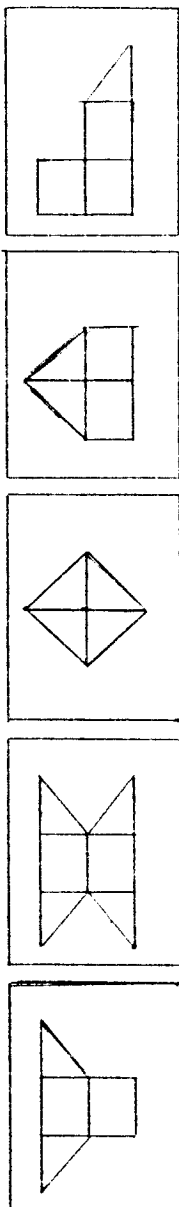
12- L'ensemble suivant contient des multiples de 6. Lequel des nombres fait partie du même ensemble?

.12	.24	.30	.18
-----	-----	-----	-----

42	2	3	46	58
----	---	---	----	----

13- En te servant de cette unité de mesure: ,

trouve la figure dont l'aire égale 4 unités.



14- Quelle équation de multiplication peux-tu écrire à la place de l'illustration suivante:



- $1 \times 12 = 12$
- $6 \times 2 = 12$
- $6 - 6 = 12$
- $4 \times 3 = 12$
- $3 - 3 - 3 - 3 = 12$

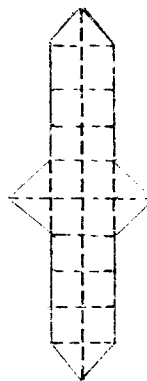
15- Lequel des nombres suivants n'est pas un facteur de 54?

- 18
- 27
- 3
- 4
- 54

16- Combien d'unités de ce genre seront nécessaires

pour couvrir cette figure?

- 20
- 24
- 22
- 18
- 19




17- Trouve tous les facteurs premiers du nombre 12.

2x2x3	3x4	6x2	12x1	12
-------	-----	-----	------	----

18- La règle de fonction étant $(nx2)-2$, quel nombre irait à la place du carré noir dans:

12	16	10	14	8
----	----	----	----	---

n	2	3	5	7
F (n)	2	4	8	

?

19- Quelle équation décrit la situation suivante: Sachant que 8 fois un nombre plus 9 égale 49, quel est ce nombre?

$(8+n)+9 = 49$	$(49-n)+9 = 8$	$(49-n) = 9+8$	$(8xn)+9 = 49$	$(8x9)-n = 49$
----------------	----------------	----------------	----------------	----------------

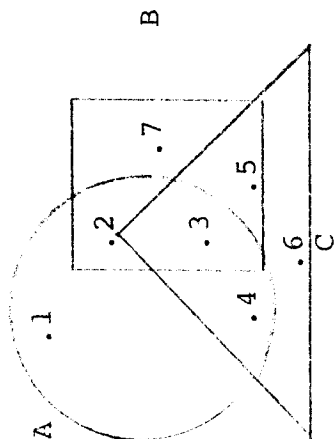
20- J'ai ajouté 3 zéros à la droite d'un nombre naturel. J'ai donc multiplié ce nombre par ...

0x0x0	10	1000	100	30
-------	----	------	-----	----

21- Une porte mesure 90 pouces de hauteur. Quelle est sa hauteur en pieds?

$7\frac{1}{2}$ pieds	$7\frac{3}{4}$ pieds	$7\frac{2}{3}$ pieds	$7\frac{1}{3}$ pieds	$7\frac{1}{4}$ pieds
----------------------	----------------------	----------------------	----------------------	----------------------

22-- Observe bien ce diagramme ci-dessous:



Lequel des ensembles suivants est formé de B et C?

- 2, 3, 5, 4, 6, 7
- 1, 2, 3, 4, 5, 6
- 3, 4, 5
- 2, 3, 4
- 2, 3, 5

23-- En te servant du diagramme du numéro 22, lequel des ensembles suivants serait formé par l'intersection des ensembles A et C?

- 2, 3, 4, 5
- 3, 5
- 3, 4, 5
- 3, 4
- 1, 2, 3, 4, 6

24-- Pour quelle équation n a-t-il la valeur de 4?

- $n(2+1) = 9$
- $n + (3+1) = 4$
- $(5-n) + 6 = 7$
- $n = (5-1) + 4$
- $4x(n) = 4$

25-- Si je veux expliquer la distributivité de la multiplication sur l'addition j'écrirai que: $7 \times (3+4) =$

- $(7 \times 3) + 4$
- $(7 \times 3) + (7 \times 4)$
- $(7 \times 4) + 3$
- $(7+4) \times 3$
- $(7+3) \times 4$

26- Lucie a dépensé \$2.50 et Sylvie \$1.50 de plus que Lucie. Combien ont-elles dépensé ensemble?

\$5.50	\$7.50	\$3.00	\$4.00	\$6.50
--------	--------	--------	--------	--------

27- Observe bien l'équation ci-dessous:

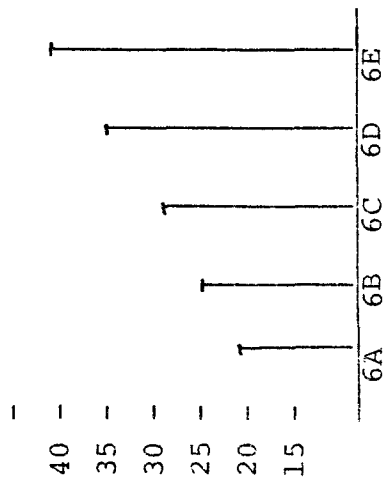
$$\triangle \times \square = \triangle$$

Quel nombre écrirais-tu à la place du

1	2	3	0	10
---	---	---	---	----

de façon à vérifier l'équation.
 (le \triangle est un nombre plus grand que 0).

28- Observe bien le graphique ci-dessous.



Le principal décide de former 5 classes ayant un nombre égal d'élèves. Quelle classe ne changera pas de nombre d'élèves?

6A	6B	6C	6D	6E
----	----	----	----	----

29- Retrouve le nombre composé de:

65432	650.32	654-32	654.32	6543.2
-------	--------	--------	--------	--------

$$(6 \times 10 \times 10) + (5 \times 10) + 4 + (3 \times \frac{1}{10}) + (2 \times \frac{1}{100})$$

30- Lundi j'ai travaillé $2\frac{1}{4}$ heures dans l'avant-midi et $3\frac{3}{4}$ heures dans l'après-

$13\frac{1}{4}$ heures	$5\frac{1}{2}$ heures	$7\frac{1}{4}$ heures	$6\frac{1}{4}$ heures	$6\frac{3}{8}$ heures
------------------------	-----------------------	-----------------------	-----------------------	-----------------------

midi. Combien de temps ai-je travaillé?

31- Trouve l'erreur.

$\frac{3}{7} = \frac{21}{49}$	$\frac{3}{4} = \frac{75}{100}$	$\frac{1}{2} < \frac{1}{4}$	$\frac{4}{8} \neq \frac{1}{4}$	$\frac{5}{8} > \frac{1}{4}$
-------------------------------	--------------------------------	-----------------------------	--------------------------------	-----------------------------

32- Lequel des nombres rationnels suivants n'est pas équivalent aux autres?

$\frac{12}{18}$	$\frac{1}{3}$	$\frac{9}{27}$	$\frac{15}{45}$	$\frac{10}{30}$
-----------------	---------------	----------------	-----------------	-----------------

33- Observe bien l'ensemble ci-dessous:

$\frac{1}{3}$ $\frac{3}{9}$
 $\cdot\overline{3}$ $\cdot\overline{9}$
 $\cdot\frac{2}{6}$ $\cdot\frac{5}{15}$
 $\cdot\overline{9}$

Lequel des nombres rationnels suivants fait partie du même ensemble?

$\frac{2}{3}$	$\frac{3}{4}$	$\frac{6}{30}$	$\frac{7}{21}$	$\frac{4}{16}$
---------------	---------------	----------------	----------------	----------------

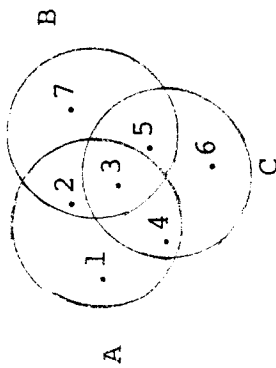
34- Lequel des nombres suivants contient 176 centaines?

1760	160.16	176,000	$\frac{176}{100}$	17,600
------	--------	---------	-------------------	--------

35- Trouve l'erreur.

$\frac{1}{2} = \frac{10}{20}$	$\frac{1}{3} > \frac{1}{4}$	$8.3 < 8.30$	$\frac{6}{10} = \frac{3}{5}$	$\frac{3}{4} > \frac{5}{8}$
-------------------------------	-----------------------------	--------------	------------------------------	-----------------------------

36- Observe bien ce diagramme:



Quel ensemble serait formé par l'intersection des ensembles B et C?

3,4,5,6	3,5	3,4,5	2,3	2,3,4,5,6,7
---------	-----	-------	-----	-------------

37- Si je compte les éléments d'un ensemble en base quatre, la réponse est $12(4)$. Quelle serait ma réponse en base 10?

9	6	3	48	30
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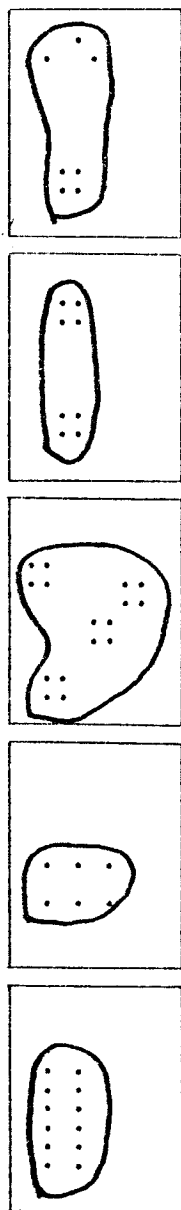
38- Trouve la valeur de $\frac{a}{b}$ dans $a = 1$, si $a = 4$.

$\frac{1}{4}$	0	3	4	5
---------------	---	---	---	---

39- Laquelle des fractions suivantes est réduite à sa plus simple expression?

$\frac{15}{27}$	$\frac{17}{35}$	$\frac{9}{15}$	$\frac{63}{84}$	$\frac{17}{51}$
-----------------	-----------------	----------------	-----------------	-----------------

40- J'ai compté le nombre
d'éléments contenus dans
un ensemble et j'ai
obtenu 12(4). Quel était
cet ensemble?



FIN DU TEST

TEST DE RENDEMENT EN FRANCAIS
6e

L'usage du dictionnaire est interdit.

Exemples

A- Lequel des mots ci-contre doit se compléter par la lettre L?

une souri_ un bari_ une ami_ un habi_ un frui_

B- Parmi les mots ci-contre, lequel est de la même famille que l'adjectif MORTEL?

mortaise morne mortier morsure mort

C- Comment appelle-tu une personne qui a perdu la vue?

un orphelin un sourd un aveugle un infirme un muet

1- Lequel des mots ci-contre doit se compléter par la lettre P?

un sanglo_ un paquebo_ un cano_ un siro_ un escro_

2- Lequel des mots ci-contre doit se compléter par la lettre S?

un cadena_ un contra_ un cinéma_ un avoca_ un opéra_

3- Lequel des mots ci-contre doit se compléter par la lettre T?

un oubli_ un étui_ un profi_ un appui_ un ennui_

- 4- Parmi les noms ci-contre, lequel est de la MÊME FAMILLE que le nom FORCE?
- | | | | | |
|---------|--------|---------|-------|--------|
| fortune | effort | confort | effet | effroi |
|---------|--------|---------|-------|--------|
- 5- Parmi les noms ci-contre, lequel est de la MÊME FAMILLE que l'adjectif SOLIDE?
- | | | | | |
|----------|------------|----------|----------|-------------|
| solution | solidarité | solidité | solitude | sollicitude |
|----------|------------|----------|----------|-------------|
- 6- Parmi les mots ci-contre, quel est celui dont la première syllabe IM a le sens de QUI N'EST PAS?
- | | | | | |
|------------|------------|-------------|-------------|------------|
| importance | imprimerie | importation | impolitesse | impression |
|------------|------------|-------------|-------------|------------|
- 7- Parmi les mots ci-contre, quel est celui dont la première syllabe BI a le sens de DEUX?
- | | | | | |
|-----------|-------|--------------|-------|--------|
| bijoutier | bilan | bibliothèque | biche | bipède |
|-----------|-------|--------------|-------|--------|
- 8- Parmi les mots ci-contre, quel est celui qui a le sens de PLUS PETIT à cause du suffixe ETTE?
- | | | | | |
|-----------|-----------|----------|-----------|----------|
| chaînette | squelette | assiette | serviette | raquette |
|-----------|-----------|----------|-----------|----------|

Pour chacun des numéros ci-dessous, trouve le nom dont la partie soulignée se prononce différemment des autres.

- 9 chopine chômage chocolat chose chorale
- 10 cabane cerise colonie culture calèche
- 11 épouse pelouse bourse jalouse blouse

Laquelle des phrases ci-dessous exprime UN DOUTE?

Pierre poursuit des études en médecine.

Je n'ai pas encore eu l'occasion de voyager en avion.

Officiellement, le printemps commence le 21 mars.

L'exposition se tiendra dans le gymnase de l'école.

Nous nous demandons si ces traitements sont efficaces.

12

Laquelle des phrases ci-dessous exprime UNE CERTITUDE?

Selon moi, ce bijou n'a aucune valeur.

D'après les experts, l'hiver sera rigoureux.

Le rouge est le symbole conventionnel du danger.

Ils espèrent que la pêche sera bonne.

J'ai l'impression que cette coiffure ne me convient pas.

13

Réponds aux questions ci-dessous.

- 14- Comment appelles-tu un jeune garçon qui livre les journaux?
 un kiosque un camelot un agent un journalier un abonné
- 15- Comment appelles-tu celui qui charge et décharge les navires?
 un emballleur un pilote un remorqueur un portier un débardeur
- 16- Trouve un nom qui n'est pas celui d'une personne.
 un magistrat une hôtesse un oculiste un visagiste un classeur
- 17- Qu'est qui n'est pas un ouvrage que l'on peut lire?
 un volume un pamphlet un éditeur un mémoire un document
-
- Lis chacun des textes ci-dessous et réponds à la question qui s'y rapporte.
- 18- Depuis des années un commis de bureau est astreint à la même tâche. Il n'a jamais l'occasion de connaître quelque variété dans son travail. Quel mot ci-dessous définit le sentiment qu'il finit par éprouver?
 la timidité la responsabilité le réalisme la monotonie la collaboration
- 19- Votre famille loue un chalet pour l'été. Craignant la pollution de l'eau, vous la faites bouillir avant de la boire. Quel mot ci-dessous définit votre façon d'agir?
 la stupidité la panique la prudence la confusion la certitude

Complète chacune des phrases ci-dessous.

20

Sur l'ordre du douanier, nous avons dû...

- Payer une amende pour excès de vitesse.
- Remplir une formule de demande d'emploi.
- Réserver nos places sur l'avion.
- Ouvrir nos valises de voyage.
- Visiter la ville à l'aide d'un guide.

21

Le cerisier donne des cerises et le chêne...

- Donne des glands.
- Donne des amandes.
- Donne des cantaloupes.
- Donne des pistaches.
- Donne des courges.

22

Depuis quelques années, le camping...

- Connaît un fléchissement considérable.
- Encombre le centre des villes.
- Se gagne des adeptes de plus en plus nombreux.
- N'est pratiqué que par des gens riches.
- Est déconseillé par les organisations touristiques.

Dans les numéros ci-dessous, on te donne deux phrases.
Quelle est la meilleure façon de les réunir en
UNE SEULE PHRASE?

23-

Nous avons pris des vacances. C'était en juillet.

A cause du mois de juillet, nous avons pris nos vacances.

Nous avons pris nos vacances au mois de juillet.

Nous avons pris nos vacances malgré le mois de juillet.

Nous avons pris au mois de juillet pour nos vacances.

A part du mois de juillet, nous avons pris nos vacances.

24-

Il conduit. Il est prudent.

Pour être prudent, il conduit.

Il conduit par prudence.

Il conduit quand il est prudent.

Il est prudent lorsqu'il est conduit.

Il conduit avec prudence.

Dans chacune des phrases ci-dessous, remplace le mot souligné par un autre plus joli.

- 25- Dans ce magasin de varié-
tés, on peut se procurer
un grand nombre d'affaires.
clients achats articles usages profits
- 26- A cause de son nouveau
poste, cet employé aura
de lourdes responsabilités.
adoptera échangera accueillera poursuivra assumera
- 27- La secrétaire fait de
l'ordre dans son classeur.
entasse impose ajoute classe met
- 28- Ce cycliste a pu faire un
dernier effort et il a
gagné la course.
fournir ajouter retenir ressentir repousser

Complète chacune des phrases ci-dessous par le mot qui convient.

- 29- J'ai fait réparer ma montre
? elle prend encore
du retard.
mais met m'est mes mets
- 30- Désirant être un jour
propriétaire de son propre
magasin, ce commis ?
devenu à force de travail.
laid les lait l'est laie
- 31- De toutes les teintes,
c'est le ? qui convien-
drait le mieux.
verre vers vert vair ver

Dans chacune des phrases ci-dessous, trouve le **CONTRAIRE** du mot souligné.

- 32- Cet événement ancien offre peu d'intérêt.
 politique important imprévu récent national
- 33- Ce pianiste se révèle un interprète ordinaire de la musique de Bach.
 moyen sensible acceptable exceptionnel régulier

Trouve à quel temps est conjugué chacun des verbes soulignés ci-dessous.

- 34- Si le temps le permet, nous partirons tôt demain matin.
 indicatif présent futur simple passé composé conditionnel présent participe présent
- 35- Avant de quitter la classe, fermez bien les fenêtres.
 indicatif présent passé composé impératif présent conditionnel présent
- 36- Il faudrait que vous veniez nous visiter.
 conditionnel présent imparfait de l'indicatif passé composé futur simple subjonctif présent

Pour chacun des numéros ci-dessous, trouve un mot de la NATURE demandée.

37- Un verbe

port	vent	pure	soir	vient
------	------	------	------	-------

38- Un adverbe

retour	sourd	toujours	coure	secours
--------	-------	----------	-------	---------

39- Un nom

prudent	accident	souvent	éloquent	sûrement
---------	----------	---------	----------	----------

Trouve la FONCTION de chacun des mots soulignés des phrases ci-dessous.

40- L'incendie éteint, les pompiers retournent à leur caserne.

complément circons- tancier	complément d'objectif direct	complément du nom	sujet	complément d'objectif indirect
-----------------------------------	------------------------------------	----------------------	-------	--------------------------------------

41- Le client, après avoir lu le menu, commande son repas.

complément d'objectif indirect	sujet	complément circons- tancier	complément d'objectif direct	complément du nom
--------------------------------------	-------	-----------------------------------	------------------------------------	----------------------

42- A l'occasion de son départ, nous offrirons un souvenir à notre patron.

complément d'objectif direct	complément circons- tancier	complément du nom	complément d'objectif indirect	sujet
------------------------------------	-----------------------------------	----------------------	--------------------------------------	-------

Lis attentivement le texte ci-dessous et réponds aux questions qui s'y rapportent.

Mon frère aîné avait vendu l'héritage parternel, et le nouveau propriétaire ne l'habitait pas. J'arrivai au château par la longue avenue des sapins; je traversai à pied les cours désertes; je m'arrêtai à regarder les fenêtres fermées ou demi-brisées.

Couvrant un moment mes yeux de mon mouchoir, j'entrai sous le toit de mes ancêtres. Je parcourus les appartements sonores où l'on n'entendait que le bruit de mes pas. Les chambres étaient à peine éclairées par la faible lumière qui pénétrait entre les volets fermés.

Je sortis précipitamment de ces lieux, je m'en éloignai à grands pas sans oser tourner la tête. Qu'ils sont doux, mais qu'ils sont rapides, les moments que les frères et soeurs passent dans leurs jeunes années, réunis sous l'aile de leurs parents.

Chateaubriand

43- Quelle personne avait vendu le château?

Le garçon le plus âgé de la famille.

L'ancêtre paternel.

Le nouveau propriétaire.

Les frères et soeurs de la famille.

L'auteur lui-même du texte.

- - - - -

44- Pour quelle raison le visiteur quitte-t-il le château sans oser tourner la tête?

Parce qu'il est pris d'une peur soudaine.

Parce que ses frères et soeurs l'attendent.

Parce que l'avenue des pins est longue à traverser.

Pour ne pas rencontrer le nouveau propriétaire.

Pour oublier le plus vite possible ce qu'il vient de voir.

- - - - -

45- Dans la dernière phrase, à quel regret l'auteur fait-il allusion?

Au regret de voir l'ancien château abandonné.

Au regret de ne plus rencontrer son frère aîné.

Au regret de ne pouvoir restaurer le château.

Au regret d'un passé heureux vécu en famille.

Au regret de devoir quitter le château précipitamment.

- - - - -

FIN DU TEST

APPENDIX C
THE SUBJECT PERCEPTION TEST

DIRECTIVES AUX ELEVES

- 1- Nous allons d'abord lire ensemble la liste des huit sujets inscrits sur votre feuille-réponses.
- 2- Maintenant écoutez attentivement. Pensez sérieusement au sujet que vous aimez le plus apprendre actuellement. Placez votre index sur le sujet choisi; suivez la ligne pointillée et au bout de la ligne entre les parenthèses, inscrivez le chiffre huit. (L'expérimentateur s'assure que tous les étudiants ont complété la première étape avant de continuer).
- 3- Pensez maintenant au sujet que vous aimez le plus en deuxième lieu. Placez l'index sur le sujet choisi; suivez la ligne pointillée et au bout de la ligne entre les parenthèses, inscrivez le chiffre sept.
- 4- L'expérimentateur répète la même consigne jusqu'au sujet choisi au huitième rang pour lequel l'étudiant inscrit le chiffre un entre les parenthèses.
- 5- Il sera souhaitable d'effacer le moins possible sur votre feuille-réponses.

No.....

NOM :

ECOLE:

GRADE: (.....)

ANGLAIS ()

ART ()

CATECHESE ()

ETUDES SOCIALES ()

FRANCAIS ()

HYGIENE ()

MATHEMATIQUES ()

SCIENCES NATURELLES ()

APPENDIX D
THE MINNESOTA TEACHER ATTITUDE INVENTORY

NE TOURNEZ PAS LA PAGE AVANT LE SIGNAL

INVENTAIRE MINNESOTA
DES OPINIONS DE L'ENSEIGNANT

Variante A

WALTER W. COOK
Université du
Minnesota

CARROLL H. LEEDS
Université de Furnam

ROBERT CALLIS
Université du
Missouri

Traduit et adapté sous la direction
du Dr Jean-Marc Chevrier

DIRECTIVES

La présente brochure renferme 150 énoncés permettant d'apprécier l'opinion qu'on se fait du rapport entre élève et maître. Il faut dire que les avis sont passablement divisés quant à la relation élève-maître idéale; par conséquent, on ne saurait se tromper en répondant. On s'intéresse d'abord et avant tout à votre façon personnelle de réagir à ces énoncés. Il s'agit de lire chacun des énoncés et d'exprimer votre sentiment personnel à ce sujet. Il ne vous reste plus qu'à noter votre réponse dans les espaces ménagés à cet effet sur la Feuille de réponse. Ne faites aucune marque dans la présente brochure.

Si vous êtes tout à fait d'accord, noircissez le rectangle coiffé des lettres "TA".

Si vous êtes simplement d'accord, noircissez le rectangle coiffé de la lettre "A".

Si vous hésitez, noircissez le rectangle coiffé de la lettre "H".

Si vous n'êtes pas d'accord, noircissez le rectangle que coiffent les lettres "PA".

Si vous êtes d'un avis diamétralement opposé, noircissez le rectangle que coiffent les lettres "DO".

TA	A	H	PA	DO
..
..
TA	A	H	PA	DO
..
..
TA	A	H	PA	DO
..
..
TA	A	H	PA	DO
..
..

Songez plutôt à la règle qu'à l'exception ou au cas d'espèce. Bien qu'il n'y ait pas de temps prescrit, tâchez de travailler le plus rapidement possible. PRIERE DE REpondre A TOUS LES ARTICLES SANS EXCEPTION.

TA - Tout à fait d'accord	H - Hésitant ou incertain	PA - Pas d'accord
A - D'accord		DO - Diamétralement opposé

1. Les enfants sont pour la plupart obéissants.
2. L'élève qui fait le malin est sans doute rempli de lui-même.
3. Il est parfois préférable de régler sur le ton de la plaisanterie les menus accrocs faits à la discipline.
4. Il faut préférer la réserve à la hardiesse.
5. L'enseignement ne tourne jamais à la monotonie.
6. Les élèves ne font pour la plupart aucun cas du mal que le maître se donne pour eux.
7. Devant une situation cocasse, la classe est portée à la dissipation sitôt que le maître s'en amuse avec elle.
8. Il se peut que le choix que l'élève fait de ses camarades fasse l'objet d'une surveillance trop étroite.
9. Il faut engager l'enfant à ne point s'ouvrir de ses goûts.
10. A l'occasion, il est salulaire de réprimander l'élève en présence de ses condisciples.
11. On se gardera d'exiger de l'enfant l'obéissance aveugle.
12. Il faut exiger qu'au retour à la maison, l'enfant consacre plus de temps à l'étude.
13. D'abord et avant tout, l'enfant doit apprendre qu'il lui faut obéir au maître au doigt et à l'oeil.
14. De nos jours, on a du mal à comprendre la jeunesse.
15. On insiste trop sur l'importance de "faire régner l'ordre" dans la classe.
16. Ce n'est qu'exceptionnellement qu'il faudra imputer au maître l'échec de l'élève.

CONTINUEZ A LA PAGE SUIVANTE

TA - Tout à fait d'accord	H - Hésitant ou incertain	PA - Pas d'accord
A - D'accord		DO - Diamétralement opposé

17. Il y a des cas où l'on ne saurait tenir rigueur au maître d'être à bout de patience avec un élève.
18. En tout temps, le maître se gardera de s'entretenir de problèmes sexuels avec ses élèves.
19. A l'école moderne, les élèves ont la vie trop facile.
20. On aurait tort d'exiger du maître qu'il porte le fardeau des problèmes personnels de l'élève.
21. Dans son travail scolaire, l'élève attend beaucoup trop d'aide du maître.
22. On aurait tort d'exiger du maître qu'au lieu de passer la soirée à se détendre, il aille rendre visite à l'élève et à sa famille.
23. Pour la plupart, les élèves ne fournissent pas suffisamment d'effort à la préparation de leurs leçons.
24. De nos jours, il y a trop d'enfants qu'on laisse libres d'agir à leur guise.
25. Les besoins de l'enfant comptent tout autant que ceux de l'adulte.
26. Le plus souvent, c'est au maître qu'il faut imputer l'impuissance de l'élève à suivre des directives.
27. Il faut que l'enfant apprenne à obéir aux adultes aveuglément.
28. D'ordinaire, le jeune vantard ressent une confiance exagérée en ses capacités.
29. L'enfant est naturellement porté à la dissipation.
30. Le maître ne saurait ajouter grande foi aux déclarations de l'élève.
31. Certains enfants posent trop de questions.
32. On se gardera d'exiger de l'élève qu'il se tienne debout pour réciter sa leçon.

CONTINUEZ A LA PAGE SUIVANTE

TA - Tout à fait d'accord	H - Hésitant ou incertain	PA - Pas d'accord
A - D'accord		DO - Diamétralement opposé

33. On ne doit pas s'attendre à ce que le maître maîtrise l'enfant dont les parents eux-mêmes ne viennent pas à bout.
34. Le maître se gardera de reconnaître devant ses élèves qu'il ignore tout de telle ou telle question.
35. A l'école moderne, la discipline n'est pas aussi stricte qu'elle le devrait.
36. Pour la plupart, les élèves manquent d'imagination créatrice.
37. Il faut adapter les exigences scolaires aux possibilités de l'élève.
38. Pour la plupart, les élèves prennent leurs responsabilités au sérieux.
39. Le maître ne saurait tenir sa classe en main à moins d'être un dur à cuire.
40. Le succès est un aiguillon plus puissant que l'échec.
41. Qui forge les explications de toutes pièces mérite la même punition que le menteur.
42. Tout élève de sixième année doit lire aussi couramment que l'exigent les normes de la sixième année.
43. Pour aiguillonner l'élève, il est bon de faire la comparaison critique de son travail avec celui de ses condisciples.
44. Mieux vaut que l'enfant se montre timide au lieu de se laisser tourner la tête par les enfants de l'autre sexe.
45. Il ne faut jamais réduire les notes en guise de punition.
46. De nos jours, il faut "déterrer le fouet" plus souvent.
47. L'enfant doit apprendre que c'est le maître qui est le meilleur juge.

CONTINUEZ A LA PAGE SUIVANTE

TA - Tout à fait d'accord	H - Hésitant ou incertain	PA - Pas d'accord
A - D'accord		DO- Diamétralement opposé

48. Une plus grande liberté en classe engendre le désordre.
49. Il ne faut pas s'attendre à ce que le maître se montre bienveillant à l'égard des élèves qui font l'école buissonnière.
50. Les professeurs doivent faire montre de plus d'autorité en classe.
51. Ce sont les problèmes de discipline qui causent le plus de soucis au maître.
52. Si le rendement de l'élève laisse à désirer, c'est sans doute en raison de son indolence et de son peu d'application.
53. On insiste à l'excès sur le passage d'une classe à une classe supérieure.
54. Pour la plupart, les enfants manquent de la courtoisie la plus élémentaire envers les adultes.
55. Les cas les plus sérieux sont les enfants agressifs.
56. Le maître doit parfois punir toute la classe lorsqu'il n'arrive pas à découvrir le coupable.
57. Bon nombre de maîtres ne se montrent pas assez stricts dans leurs rapports avec les élèves.
58. Il faut qu'ordre et silence règnent en classe.
59. Le maître doit nécessairement faire face à quelques échecs au moins.
60. On a moins de mal à régler les problèmes de discipline qu'à les prévenir.
61. En classe, les enfants se montrent d'ordinaire trop "sociables".
62. Lorsqu'ils sont livrés à leurs propres ressources, les élèves savent pour la plupart se tirer d'affaire.

CONTINUEZ A LA PAGE SUIVANTE

TA - Tout à fait d'accord	H - Hésitant ou incertain	PA - Pas d'accord
A - D'accord		DO - Diamétralement opposé

63. De nos jours, la classe est le théâtre de trop d'enfantillages.
64. Il arrive souvent que l'école soit responsable des cas d'école buissonnière.
65. Les enfants manquent de sérieux.
66. Il faut retenir à l'école et y faire travailler tout élève qui n'étudie pas ses leçons au jour le jour.
67. Les élèves d'origine étrangère rendent la tâche du maître souvent désagréable.
68. Les enfants sont pour la plupart désireux de s'exprimer correctement en français.
69. Il arrive souvent qu'un pensum soit une excellente punition.
70. Sous forme de tricherie, la malhonnêteté est sans doute l'une des plus graves atteintes à la morale.
71. Il faut accorder à l'élève une plus grande latitude dans l'exécution des activités d'apprentissage.
72. Ne fût ce qu'en vertu de ses fonctions, le maître a droit au respect de l'élève.
73. Il n'est pas toujours indispensable que l'enfant comprenne le bien-fondé de la bienséance.
74. D'ordinaire, l'élève n'est pas en mesure de choisir lui-même le sujet d'une narration ou d'un exposé.
75. Nul enfant ne doit se révolter contre l'autorité.
76. De nos jours, on traite les enfants avec trop d'indulgence.
77. Il est rare que les problèmes de discipline graves soient imputables au maître.
78. Les caprices et les désirs irréfléchis des enfants méritent d'ordinaire qu'on s'y arrête.

CONTINUEZ A LA PAGE SUIVANTE

TA - Tout à fait d'accord	H - Hésitant ou incertain	PA - Pas d'accord
A - D'accord		DO - Diamétralement opposé

79. Le plus souvent, l'enfant a beaucoup de mal à se plier aux directives.
80. De nos jours, les enfants jouissent à l'école d'une trop grande liberté.
81. Il faut que tout enfant commence à lire dès l'âge de sept ans.
82. La promotion universelle des élèves ravale souvent les normes de rendement.
83. L'enfant est incapable de raisonner juste.
84. Le maître ne saurait tolérer les expressions argotiques dans la bouche de l'élève.
85. Il faut inspirer à l'enfant qui a des écarts de conduite un sentiment de culpabilité et de honte.
86. Dès que l'élève veut parler ou quitter sa place durant la classe, il lui faut nécessairement en obtenir la permission du maître.
87. L'élève ne doit pas au maître plus de respect qu'à n'importe quel adulte.
88. Il faut châtier tout élève qui se permet de lancer bâtons de craie et gommes à effacer.
89. Le maître qu'on préfère est sans doute celui qui sait le mieux comprendre ses élèves.
90. Les élèves s'efforcent pour la plupart de faciliter la tâche du maître.
91. Les maîtres sont pour la plupart avares d'explications dans leur enseignement.
92. On charge le programme de l'école moderne de trop d'activités qui n'ont rien à voir avec la formation scolaire.
93. Il faut accorder à l'enfant plus de liberté qu'il n'en a d'ordinaire en classe.

CONTINEZ A LA PAGE SUIVANTE

TA - Tout à fait d'accord	H - Hésitant ou incertain	PA - Pas d'accord
A - D'accord		DO - Diamétralement opposé

94. Les enfants font pour la plupart trop peu de cas des désirs du maître.
95. Les enfants ne doivent pas s'attendre à ce qu'on leur cède la parole lorsque les adultes veulent parler.
96. D'ordinaire, l'enfant met du temps à saisir ce qu'il vient tout juste d'aborder.
97. Le maître doit connaître le milieu familial de chacun de ses élèves.
98. Il arrive parfois que les élèves soient particulièrement ennuyants.
99. L'enfant ne doit pas se mêler de poser des questions sur la sexualité.
100. Il faut que l'élève sache exactement à quoi s'en tenir et quant au travail et quant à la méthode à suivre.
101. Les élèves sont pour la plupart pleins d'égards envers le maître.
102. Il faut bannir le chuchotement.
103. On exigera surtout de l'élève timide qu'il se tienne debout pour réciter sa leçon.
104. Il faut que le maître s'occupe encore plus sérieusement des problèmes de comportement.
105. Le maître ne doit en aucun cas donner carte blanche à la classe.
106. On ne peut attendre d'un maître qu'il fournisse plus de travail que celui pour lequel il est payé.
107. Il y a des élèves qui ont le don de faire damner le maître.
108. Les échecs s'expliquent sans doute pour la plupart par le "manque d'application".

CONTINUEZ A LA PAGE SUIVANTE

TA - Tout à fait d'accord	H - Hésitant ou incertain	PA - Pas d'accord
A - D'accord		DO - Diamétralement opposé

109. De nos jours, la jeunesse est trop étourdie.
110. Règle générale, le maître se montre trop indulgent à l'égard de ses élèves.
111. L'élève peu doué met sûrement la patience du maître à l'épreuve.
112. Les notes scolaires ont de la valeur parce qu'elles se basent sur le principe d'émulation.
113. L'élève aime bien importuner le maître.
114. Il est rare que l'enfant pense par lui-même.
115. Il faut qu'en classe, les statuts et règlements passent pour inviolables.
116. Les élèves ont pour la plupart la tâche trop facile de sorte qu'ils n'acquièrent pas l'habitude du travail assidu.
117. L'enfance est si charmante qu'on lui passe le plus souvent ses imperfections.
118. Il faut châtier l'élève qu'on surprend à écrire des obscénités.
119. Il est rare qu'un maître trouve les enfants agréables.
120. Il existe généralement une méthode, meilleure que toute autre, d'accomplir son travail scolaire, et tout élève doit s'astreindre à la suivre.
121. En pratique, on ne saurait axer le travail scolaire sur les intérêts des enfants.
122. On a peine à comprendre que certains enfants préféreraient se rendre à l'école de si bon matin, avant même que celle-ci n'ouvre ses portes.
123. Il faut renvoyer tout élève qui ne satisfait pas aux exigences académiques de l'école.
124. Les enfants sont d'ordinaire trop curieux.

CONTINUEZ A LA PAGE SUIVANTE

TA - Tout à fait d'accord H - Hésitant ou incertain PA - Pas d'accord

A - D'accord DO - Diamétralement opposé

125. On est parfois contraint de manquer aux promesses qu'on fait aux enfants.
126. De nos jours, l'enfant jouit d'une trop grande liberté.
127. Il faut savoir s'entendre avec presque tout enfant.
128. L'enfant n'a pas la maturité qu'il lui faut pour prendre ses décisions personnelles.
129. Il faut piquer l'amour-propre de l'enfant porté à se ronger les ongles.
130. Pourvu qu'on lui en donne l'occasion, l'enfant pensera par lui-même.
131. Chez certains enfants, l'hypersensibilité est inexcusable.
132. Il est tout simplement impossible de se fier aux enfants.
133. Il faut expliquer à l'enfant ce pourquoi on lui impose certaines contraintes.
134. Les élèves pour la plupart ne se soucient pas de s'instruire.
135. Ce sont d'ordinaire les matières les plus arides et les plus ardues qui profitent surtout à l'élève.
136. Il faut qu'à tout moment, l'enfant soit bien conscient de ce qu'on attend de lui.
137. Les activités parascolaires sont l'occasion d'un commerce excessif entre individus des deux sexes.
138. Il faut multiplier les occasions qu'a l'enfant bègue de s'exprimer oralement.
139. Il ne faut pas que le maître prête l'oreille à l'enfant qui passe son temps à se plaindre de maux imaginaires.

CONTINUEZ A LA PAGE SUIVANTE

TA - Tout à fait d'accord	H - Hésitant ou incertain	PA - Pas d'accord
A - D'accord		DO - Diamétralement opposé

140. Sans doute le maître fait-il trop grand cas de l'élève qui se complaît à écrire des obscénités.
141. Le maître ne doit pas compter sur l'estime de l'élève.
142. L'enfant se conduit plus correctement que bien des adultes.
143. Il faut surtout s'occuper des enfants au caractère agressif.
144. Le maître, autant que l'élève, peut se tromper.
145. La jeunesse d'aujourd'hui vaut celle de la génération précédente.
146. Maintenir la discipline n'est pas un problème aussi sérieux que certains maîtres le prétendent.
147. L'élève a le droit de dire ouvertement à ses maîtres qu'il ne partage pas leur opinion.
148. Le plus souvent, l'inconduite de l'élève a pour but d'importuner le maître.
149. Il ne faut pas s'attendre à ce que l'élève aime l'école.
150. Dans l'appréciation du rendement de l'élève, on ne doit pas dissocier le travail fourni du succès obtenu.

APPENDIX E
THE TEACHING STRATEGIES INVENTORY

QUESTIONNAIRE GENERAL
SUR
L'ENSEIGNEMENT INDIVIDUALISE

No:

DIRECTIVES

Ce questionnaire a pour but de recueillir des informations générales sur le programme d'enseignement individualisé des mathématiques que tu as élaboré et administré au deuxième semestre de l'année académique 1975-76.

Tu réponds franchement aux questions posées soit en crochant la (es) case (s) appropriée (s) ou soit en donnant des explications brèves lorsque demandé.

-
1. As-tu porté une attention spéciale à l'identification de certaines différences et/ou demandes individuelles de tes étudiants?

oui non

Si tu as répondu oui:

- 1.1. Enumère par ordre d'importance quelques-unes des différences et/ou demandes individuelles auxquelles tu as porté une attention spéciale:

- 1.2. Enumère par ordre d'importance quelques-unes des méthodes et/ou techniques que tu as utilisées pour ce faire:

2. Le manuel de base mis à ta disposition pour l'enseignement des mathématiques a-t-il été l'unique source d'information que tu as utilisée pour élaborer le contenu de ton programme?

oui non

Si tu as répondu non:

- 2.1. Enumère par ordre d'importance quelques-unes des autres sources que tu as utilisées:

3. As-tu tenu compte de certaines différences et/ou demandes individuelles lorsque tu as élaboré le contenu de ton programme?

oui non

Si tu as répondu oui:

- 3.1. Enumères-en quelques-unes par ordre d'importance:

4. As-tu fait participer tes étudiants d'une façon ou d'une autre, à l'élaboration du contenu de ton programme?

oui non

Si tu as répondu oui:

- 4.1. As-tu donné l'opportunité aux étudiants de choisir des contenus habituellement non prévus au programme?

oui non

5. As-tu élaboré des objectifs de comportement lorsque tu as planifié le contenu de ton programme?

oui non

Si tu as répondu oui:

- 5.1. As-tu fait participer les étudiants à l'élaboration de ces objectifs?

oui non

- 5.2. As-tu donné l'opportunité aux étudiants d'élaborer des objectifs personnels?

oui non

6. As-tu respecté l'ordre de présentation des contenus tel que suggéré dans ton manuel de base?

oui non

Si tu as répondu non:

- 6.1. Enumères par ordre d'importance les critères sur lesquels tu t'es basé pour modifier l'ordre de présentation suggéré:

7. Pendant les périodes de cours consacrées aux mathématiques, les contenus étudiés étaient-ils tous nécessairement étroitement liés aux mathématiques?

oui non

Si tu as répondu non:

- 7.1. Enumère quelques autres contenus qui ont été étudiés:

- 7.2. Indique qui a suggéré l'étude de ces autres contenus:

professeur étudiants les deux

8. Pendant les périodes de cours consacrées aux mathématiques, les étudiants devaient-ils tous s'intéresser aux mêmes contenus, en même temps?

oui non

Si tu as répondu non:

- 8.1. Enumère les principaux critères sur lesquels étaient basées les décisions à ce niveau:

9. Les étudiants pouvaient-ils évoluer à des rythmes individuels dans l'apprentissage des mathématiques?

oui non

Si tu as répondu oui:

- 9.1. Enumère les principaux critères qui ont servis à prendre les décisions à ce niveau:

10. As-tu utilisé une seule méthode et/ou technique d'enseignement pendant les périodes de cours consacrées à l'enseignement des mathématiques?

oui non

Si tu as répondu non:

- 10.1. Enumère par ordre d'importance quelques-unes des autres méthodes et/ou techniques que tu as utilisées:

- 10.2. Enumère les principaux critères qui ont servis à prendre les décisions à ce niveau:

11. Enumère les plus importantes facilités éducationnelles (matériaux et média) qui ont été utilisées pendant les cours de mathématiques:

12. Indique les principales sources d'où étaient puisées ces facilités éducationnelles que tu as utilisées:

13. Les étudiants devaient-ils tous travailler avec les mêmes facilités éducationnelles, en même temps?

oui non

Si tu as répondu non:

- 13.1. Indique les principaux critères qui ont servis à prendre les décisions à ce niveau:

14. Lorsque tu as évalué tes étudiants, as-tu évalué seulement l'aspect rendement académique?

oui non

Si tu as répondu non:

- 14.1. Enumère les autres aspects que tu as évalués:

15. Indique le nombre approximatif de fois que tu as évalué tes étudiants: _____

16. As-tu utilisé une seule méthode et/ou technique d'évaluation?

oui non

Si tu as répondu non:

- 16.1. Enumère les plus importantes méthodes et/ou techniques d'évaluation que tu as utilisées:

17. As-tu fourni l'occasion à tes étudiants de s'auto-évaluer?

oui non

Si tu as répondu oui:

17.1. Explique brièvement comment:

18. Explique en dix lignes ou moins l'atmosphère général qui a régné dans ta classe pendant les périodes de cours consacrées aux mathématiques.

Fin du questionnaire

APPENDIX F

RAW SCORES OBTAINED BY THE STUDENTS IN THE
EXPERIMENTAL GROUP ON THE SUBJECT PERCEPTION
TEST AND ON THE MATHEMATICS ACHIEVEMENT
TEST (PRETEST AND POSTTEST).

Student	Pretest		Posttest	
	Mathematics Perception test	Mathematics Perception test	Mathematics Perception test	Mathematics Perception test
1101	16	1	22	1
1102	19	7	24	7
1103	13	6	14	4
1104	18	3	25	5
1105	21	8	28	8
1106	27	8	30	8
1107	10	7	16	8
1108	20	8	23	8
1109	19	2	26	3
1110	14	8	21	7
1111	26	1	28	1
1112	19	6	31	7
1113	11	5	18	8
1114	17	1	32	1
1115	15	1	21	5
1116	9	7	19	8
1117	19	7	27	7
1118	16	2	25	2
1119	28	1	34	8
1120	14	7	20	2
1121	15	6	22	5
1122	15	1	18	1
1123	12	7	23	8
1124	20	1	30	1
1125	19	6	18	3
1126	18	6	23	5
1201	19	8	28	8
1202	10	1	13	8
1203	13	8	20	8
1204	26	7	33	7
1205	17	7	29	7
1206	12	4	14	8
1207	20	8	26	8
1208	10	1	22	6
1209	13	3	21	8
1210	12	1	22	8
1211	13	5	19	7
1212	19	8	27	8
1213	19	5	26	8
1214	22	8	29	8
1215	24	8	31	8
1216	13	4	20	8
1217	19	3	24	4
1218	17	7	18	1
1219	24	8	30	8
1220	21	3	33	6
1221	18	1	29	1
1222	17	8	16	8

Student	Pretest		Posttest	
	Mathematics Perception test	Mathematics Perception test	Mathematics Perception test	Mathematics Perception test
1223	6	8	11	8
1224	16	2	18	8
1225	20	7	29	7
1226	11	5	25	8
1227	10	5	17	8
1301	14	6	20	8
1302	10	8	17	8
1303	14	8	15	8
1304	12	8	27	8
1305	17	8	22	8
1306	20	6	26	8
1307	16	2	18	8
1308	25	6	24	8
1309	19	5	21	8
1310	12	6	22	8
1311	18	8	21	8
1312	11	8	16	8
1313	12	8	22	8
1314	17	8	20	8
1315	19	8	23	8
1316	16	4	25	8
1317	8	8	14	8
1318	18	6	18	8
1319	22	8	30	8
1320	23	8	29	8
1321	26	8	32	8
1322	13	8	19	8
1323	18	7	27	8
1324	12	2	17	6
1401	24	8	32	8
1402	18	3	24	7
1403	10	8	14	8
1404	24	7	25	6
1405	20	2	25	3
1406	11	8	12	7
1407	12	7	18	8
1408	13	7	19	7
1409	21	7	23	6
1410	20	8	29	7
1411	14	7	19	7
1412	17	3	27	6
1413	11	7	27	7
1414	14	7	22	7
1415	10	8	19	7
1416	26	2	32	5
1417	9	8	14	8

APPENDIX G

**RAW SCORES OBTAINED BY THE STUDENTS IN THE
CONTROL GROUP ON THE SUBJECT PERCEPTION
TEST AND ON THE MATHEMATICS
ACHIEVEMENT TEST (PRETEST
AND POSTTEST).**

Student	Pretest		Posttest	
	Mathematics test	Perception test	Mathematics test	Perception test
2101	13	6	17	8
2102	17	8	24	7
2103	11	6	7	4
2104	19	8	25	7
2105	21	6	24	6
2106	28	8	31	5
2107	9	1	12	1
2108	17	8	15	7
2109	24	7	28	4
2110	19	7	17	8
2111	16	8	20	1
2112	14	6	13	6
2113	23	4	28	3
2114	16	8	26	3
2115	10	4	20	3
2116	16	8	18	5
2117	20	8	20	4
2118	10	4	11	4
2119	12	8	17	7
2120	28	8	33	8
2121	16	7	24	8
2122	11	6	13	5
2123	19	6	21	7
2124	9	8	8	7
2125	19	8	24	7
2201	16	3	14	4
2202	12	4	14	7
2203	12	8	14	4
2204	12	7	28	1
2205	20	4	24	2
2206	9	2	21	5
2207	15	2	14	8
2208	21	3	22	5
2209	12	5	10	1
2210	18	6	22	8
2211	24	7	27	4
2212	23	6	28	8
2213	15	8	7	8
2214	8	3	6	4
2215	14	8	16	8
2216	15	5	17	6
2217	11	8	14	8
2218	24	6	24	6
2219	18	3	16	7
2220	10	7	16	7
2221	22	8	30	8
2222	18	5	21	5

Student	Pretest		Posttest	
	Mathematics test	Perception test	Mathematics test	Perception test
2223	19	5	18	1
2224	29	2	31	6
2225	12	8	19	8
2226	9	1	9	1
2301	12	7	21	2
2302	19	5	17	6
2303	10	8	10	7
2304	22	4	27	4
2305	12	2	15	6
2306	28	8	30	8
2307	12	8	11	6
2308	12	8	17	8
2309	14	7	18	5
2310	21	8	20	7
2311	15	8	20	7
2312	13	7	10	5
2313	11	8	17	7
2314	9	1	7	1
2315	16	7	21	5
2316	27	7	28	8
2317	18	6	26	8
2318	22	2	13	4
2319	13	7	12	6
2320	13	6	11	7
2321	16	8	12	8
2322	11	7	17	8
2323	9	8	21	3
2324	10	7	13	5
2401	15	8	20	8
2402	9	1	8	3
2403	16	8	22	7
2404	10	8	8	6
2405	11	7	19	5
2406	22	3	26	3
2407	12	8	15	8
2408	14	8	13	8
2409	17	5	24	7
2410	14	6	21	5
2411	28	8	32	6
2412	20	8	18	4
2413	13	8	14	2
2414	17	8	23	5
2415	8	7	17	3
2416	14	7	8	8
2417	8	4	15	5
2418	3	6	8	5

APPENDIX H

RAW SCORES OBTAINED BY THE TEACHERS IN
THE EXPERIMENTAL AND CONTROL GROUPS ON
THE MINNESOTA TEACHER ATTITUDE
INVENTORY (PRETEST AND POSTTEST).

Teacher	Pretest	Posttest
Experimental group		
A	+ 21	+ 40
B	00	+ 20
C	+ 06	+ 15
D	+ 70	+ 95
Control group		
E	- 02	+ 03
F	- 46	- 43
G	- 01	+ 01
H	- 16	- 10

APPENDIX I
MULTIPLE CLASSIFICATION ANALYSES

Table 1: Multiple Classification Analysis for the Weak Students in the Experimental Group and the Weak Students in the Control Group on the Mathematics Achievement Test.

GRAND MEAN = 16.53

WEAK		UNADJUSTED	ADJUSTED FOR	ADJUSTED FOR
	N	DEV'N ETA	INDEPENDENTS	INDEPENDENTS
			DEV'N BETA	+ COVARIATES
				DEV'N BETA
EXPERIMENTAL	45	2.51	2.51	2.10
CONTROL	45	-2.51	-2.51	-2.10
		.50	.50	.42
MULTIPLE R SQUARED			.254	.343
MULTIPLE R			.504	.585

Table 2: Multiple Classification Analysis for the Strong Students in the Experimental Group and the Strong Students in the Control Group on the Mathematics Achievement Test.

GRAND MEAN = 24.42

STRONG		UNADJUSTED	ADJUSTED FOR	ADJUSTED FOR
	N	DEV'N ETA	INDEPENDENTS	INDEPENDENTS
			DEV'N BETA	+ COVARIATES
				DEV'N BETA
EXPERIMENTAL	49	2.05	2.05	1.74
CONTROL	48	-2.09	-2.09	-1.77
		.38	.38	.32
MULTIPLE R SQUARED			.143	.529
MULTIPLE R			.379	.728

Table 3: Multiple Classification Analysis for the Weak Students and the Strong Students in the Experimental Group on the Mathematics Achievement Test

GRAND MEAN = 22.91

EXPERIMENTAL	UNADJUSTED	ADJUSTED FOR	ADJUSTED FOR
	N	DEV'N ETA	INDEPENDENTS
			+ COVARIATES
			DEV'N BETA
WEAK	45	-3.87	-3.87
STRONG	49	3.55	3.55
		.67	.67
			.08
MULTIPLE R SQUARED			.449
MULTIPLE R			.670

Table 4: Multiple Classification Analysis for the Weak Students and the Strong Students in the Control Group on the Mathematics Achievement Test.

GRAND MEAN = 18.31

CONTROL	UNADJUSTED	ADJUSTED FOR	ADJUSTED FOR
	N	DEV'N ETA	INDEPENDENTS
			+ COVARIATES
			DEV'N BETA
WEAK	45	-4.29	-4.29
STRONG	48	4.02	4.02
		.62	.62
			.01
MULTIPLE R SQUARED			.385
MULTIPLE R			.620

Table 5: Multiple Classification Analysis for the Weak Students in the Experimental Group and the Weak Students in the Control Group on the Subject Perception Test.

GRAND MEAN = 5.33

WEAK		UNADJUSTED	ADJUSTED FOR	ADJUSTED FOR
	N	DEV'N ETA	INDEPENDENTS	INDEPENDENTS
			DEV'N BETA	+ COVARIATES
				DEV'N BETA
EXPERIMENTAL	43	.42	.42	.64
CONTROL	40	-.45	-.45	-.69
		.18	.18	.28
MULTIPLE R SQUARED			.033	.246
MULTIPLE R			.181	.496

Table 6: Multiple Classification Analysis for the Strong Students in the Experimental Group and the Strong Students in the Control Group on the Subject Perception Test.

GRAND MEAN = 6.70

STRONG		UNADJUSTED	ADJUSTED FOR	ADJUSTED FOR
	N	DEV'N ETA	INDEPENDENTS	INDEPENDENTS
			DEV'N BETA	+ COVARIATES
				DEV'N BETA
EXPERIMENTAL	51	.71	.71	.73
CONTROL	53	-.68	-.68	-.70
		.38	.38	.39
MULTIPLE R SQUARED			.142	.222
MULTIPLE R			.376	.471

Table 7: Multiple Classification Analysis for the Weak Students and the Strong Students in the Experimental Group on the Subject Perception Test.

GRAND MEAN = 6.65

EXPERIMENTAL	UNADJUSTED		ADJUSTED FOR	ADJUSTED FOR
	N	DEV'N ETA	INDEPENDENTS	INDEPENDENTS + COVARIATES
			DEV'N BETA	DEV'N BETA
WEAK	43	-.90	-.90	.65
STRONG	51	.76	.76	-.55
		.39	.39	.28
MULTIPLE R SQUARED			.149	.328
MULTIPLE R			.386	.573

Table 8: Multiple Classification Analysis for the Weak Students and the Strong Students in the Control Group on the Subject Perception Test.

GRAND MEAN = 5.53

CONTROL	UNADJUSTED		ADJUSTED FOR	ADJUSTED FOR
	N	DEV'N ETA	INDEPENDENTS	INDEPENDENTS + COVARIATES
			DEV'N BETA	DEV'N BETA
WEAK	40	-.65	-.65	.58
STRONG	53	.49	.49	-.44
		.26	.26	.23
MULTIPLE R SQUARED			.069	.181
MULTIPLE R			.264	.426
