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**Evaluation of a
Presecondary-level Individualized Mathematics Program
for Inuit Adults in Northern Québec**

Tzippy Corber

**A Thesis Equivalent
in
The Department
of
Educational Technology**

**Presented in Partial Fulfillment of the Requirements
for the Degree of Master of Arts at
Concordia University
Montréal, Québec, Canada**

January 1988

• Tzippy Corber, 1988

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ABSTRACT

Evaluation of A Presecondary-level Individualized Mathematics Program for Inuit Adults in Northern Québec

Tzippy Corber

A formative evaluation was carried out on a ninety-hour presecondary-level individualized mathematics program that was written for Inuit adults in Northern Québec. The purpose of the evaluation was: (1) to determine the accuracy, the effectiveness and the efficiency of the material, and (2) to suggest viable procedures for future evaluations.

Math 204 was pilot/fieldtested from January to May 1987, in eight villages in Northern Quebec. Data were gathered from (1) pretest and posttest scores; (2) student questionnaires; (3) teacher questionnaires; and (4) expert review. *Math 204* was found to be effective in producing student performance that reached the chosen criterion; however, a number of problems germane to the efficiency of the instructional material were revealed. Recommendations are made for procedures to be followed in the design, development and evaluation of future curriculum development projects.

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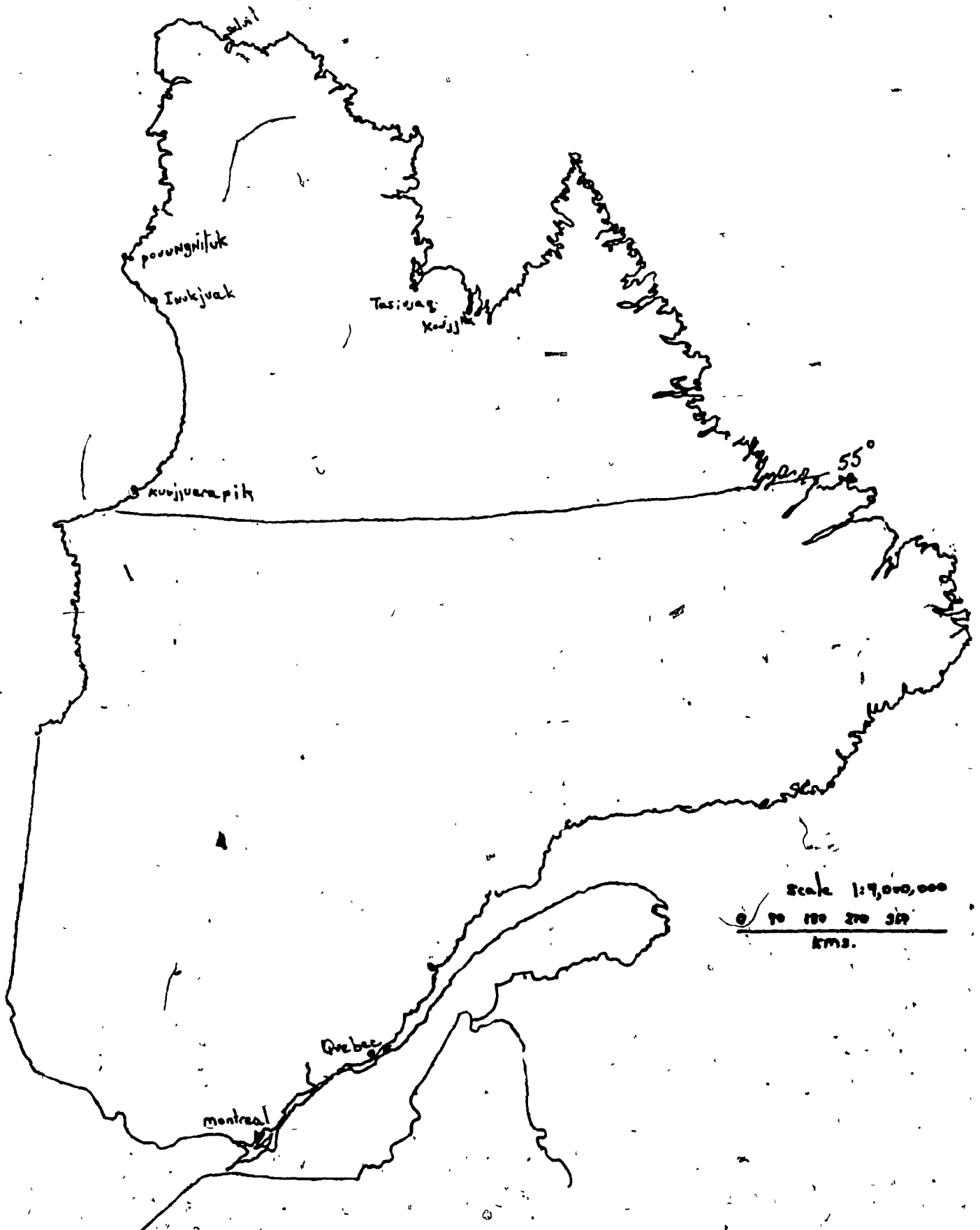
Chapter 1; The Problem and Its Background

EDUCATION IN NORTHERN QUEBEC

The Inuit occupy 563 515 square kilometers north of the 55th parallel, or approximately one third of Québec (fig. 1). From 1000 A.D. Inuit all over the North followed an essentially similar way of life--that of the kayak and the snowhouse. They remained generally on the coast and in the tundra, and spoke variations of Inuktitut. Although some contact and trade between Vikings from Scandinavia and Inuit north of Newfoundland occurred, Inuit underwent very few changes to their traditional way of life. This way of life included the presence of loose locality groupings, widespread formal patterns of reciprocity and food-sharing, and an animistic religious system in which the shaman was the central figure (Devine, 1982).

With greater contact from 1845, the Inuit gradually adopted new hunting and fishing methods. Other notable changes in the North included the introduction of new diseases and of Christianity. In Northern Quebec, up until 1958, The Hudson's Bay Company enjoyed a monopoly over trade with the Inuit. In 1912 the province of Québec purchased the land rights of the native people living in the area. At the beginning of the 1970's these rights became the subject of negotiations which led to the signing of the James Bay and Northern Québec Agreement.

Figure 1: Map of Québec



Until 1950 federal action in the North was limited mainly to scientific exploration, the administration of a few government services to Inuit, and military endeavours including the construction of sizeable military bases in Kuujjuak (1942) and Kujjuarapik (1955). At that time most of the Inuit were still nomadic and government action in their lives was confined to a yearly medical examination, emergency famine assistance and an irregular police patrol. Between 1950 and 1963 the Inuit became increasingly sedentary, settling near the trading posts; in 1963 the Québec government decided to offer social services in the region. By 1970 most seasonal camps had been abandoned for permanent villages. Today, approximately 6,000 Inuit, whose first language is Inuktitut, live in thirteen villages along the coastline.

The James Bay and Northern Québec Agreement was signed in November 1975 and came into effect in October 1977. It set up the administrative organization of Northern Québec in the form of the Kativik Regional Government and Makivik Corporation (Gouvernement du Québec, 1984). The Kativik Regional Government, which consists of regional councilors elected in each municipality, plays an administrative role on the regional level in the fields of health and social services, the environment, education, and economic development.

At the beginning of the 20th century, Anglican and Catholic missionaries offered the first school services to the Northern Québec Inuit. In 1949 the

federal government opened its first school in Inukjuak, then known as Port Harrison. By the end of the 1950's there were federal schools offering English-only instruction in all major communities. In 1964 the Québec government began to assume some responsibility for providing school services and began opening schools in which children were taught in Inuktitut for the first three years of primary education and then were given the choice of proceeding in either English or French (Gouvernement de Québec, 1984).

Since 1977, the Kativik Regional Government has played an administrative role in education in Northern Québec. It established The Kativik School Board which is responsible for education north of the fifty-fifth parallel, except for the Cree settlement of Kuujuarapik. The school board is run by a council consisting of commissioners elected by the residents of each village and a regional councilor appointed by the Kativik Regional Government. In each municipality there is a school committee to advise the principal of the school. (The communities of Povungnituk and Ivujivik, which did not sign the James Bay Agreement, formed their own organizations.) The Kativik School Board has responsibility, subject to the Quebec School Act, for elementary, secondary and adult education. Seventy-five per cent of the funding for the school board is provided by the provincial government and twenty-five per cent by the federal government (Roberts, 1982); all monies are channelled through Quebec and administered by the Board.

CROSS-CULTURAL ISSUES WITHIN ADULT EDUCATION

According to UNESCO (1976) "adult education denotes the entire body of organized educational processes, whatever the content, level, and method, whether formal or otherwise, whether they prolong or replace initial education in schools, colleges and universities as well as in apprenticeship, whereby persons regarded as adult by the society to which they belong develop their abilities, enrich their knowledge, improve their technical or professional qualifications or turn them in a new direction and bring about changes in their attitudes or behavior in the twofold perspective of full personal development and participation in balanced and independent social, economic and cultural development."

Developing nations have a common faith in education to contribute to their goals of economic growth, nationhood and the enhancement of human dignity (Adams and Bjork, 1969). As an immigrant country Canada has always made demands on adults to learn new ways of living and since World War One, to meet new needs by learning things they had never been expected to learn (Tomkins, 1986). But what should be the guiding principles in developing educational programs for adults? Kidd (1973) states that adult learners either symbolize and organize all new experiences into some relationship to the self, or they ignore these experiences because (1) there is no perceived relationship, or (2) the experience seems inconsistent with the structure of the self. Because adults have already developed a cognitive style for information processing, which remains constant and consistent throughout adulthood (Crawley et al., 1976), the adult learner reacts to a

learning experience as he perceives it, not as the teacher presents it (Kidd 1973). Past experience always enters into adult learning, unless the learning experience or content is wholly new to the learner. Since all adults do not necessarily possess the meanings, values, strategies and skills required for new learning activities, needs assessments must identify each individual's strengths and weaknesses (Brundage, 1980).

Brundage (1980) delineates three prevalent orientations of adult education. The first orientation presupposes that each individual brings a unique model of reality, unique needs and goals to the learning situation. The task of adult education is to accommodate these with a diverse program and flexible processes. The second orientation presupposes one objective reality which can and should be integrated into the knowledge and skills of each individual. In this case adult education values the goal to be reached, rather than the means for doing so; its goal is to allow all members of the society to learn the basic components of the approved model of reality. The third orientation presupposes that individuals tend to lose or repress aspects of their experience and that the task of adult education is to provide learning programs to assist in the recovery of these lost or repressed models and traditions. Although these three orientations are presented as polarities, Brundage points out that it is common to find varying combinations of them within one system.

The prime fact about cultural minorities is that, educationally speaking, they are a member of not one society, but two. They live in a society that is dominated by forms and values different from their own. This implies the

need for an expanded education which includes radically redesigned curricula and textbooks (Cairns, 1969). Cairns points out that, generally, curricula designed for the dominant society are adapted for cultural minorities by inserting references to local customs, by changing illustrations etc. What is actually required, however, is a thorough commitment to the preliminary research and long-term creative effort involved in examining characteristics and needs of the target population before devising appropriate educational materials. He further points out that these materials must take into account the needs and characteristics of the teachers as well as of the students. This view is supported by Houle (1972) who, recognizing that any learning episode occurs in and is profoundly influenced by a specific situation, proposes that the analysis and planning of educational activities be based on the realities of human experience and upon their constant change.

Because of a shortage of people with enough education, underdeveloped areas tend to rely heavily upon teachers from other areas (Adams and Bjork, 1969). This is clear in the case of the Kativik region where, during the 1986/1987 academic year, all full-time teachers in the academic-upgrading adult education program were non-native.

Another educational problem in developing areas is the high drop-out rate. Scarcely 20% of the Canadian native population achieves a secondary one level; of these, 90% abandon their studies before finishing secondary three (Larose, 1984). Adams and Bjork point out that for those who stay, there is a tendency for the school to make each year a repetition of the last.

As a result of Inuit concern regarding the development of Northern education a symposium was held in Kujjuuak, Northern Quebec in November 1985. The Kativik School Board's operating principles and the Inuit Circumpolar Conference draft principles regarding curriculum development were subsequently circulated by the school board for consultation with the population. The school board maintains that all materials in a second language must be developed specifically for Inuit students and must reflect the changes in northern society. Such development must be done in close consultation with Inuit educators (Anngutivik, 1986). In the operating principles, no mention is made of either formative or summative materials evaluation.

Inuit society as a whole is in a period of rapid social change; and many adult students, upon stepping into the classroom, are placing themselves in a situation with a high degree of uncertainty and unfamiliarity. Brundage (1980) states that developmental theories in the literature of education, social change, and trauma postulate similar general patterns of behaviour. This pattern moves from dependent-type behaviours, when an adult enters a new experience, to independent behaviour and finally to interdependent behaviour. When a learner enters a situation with a high degree of novelty s/he may have a perception of disorientation and may make inappropriate assumptions based on past experience. The teacher can ease this stage by creating a reliable environment which operates on explicit behavioural norms.

ADULT EDUCATION IN NORTHERN QUEBEC

The Adult Education sector of the Kativik School Board has existed for six years (established in 1981) and has the mandate of providing a full range of education and training services to adults in the Kativik Region. These services are divided up into the following areas: academic up-grading (full-time and part-time), technical-vocational education (full-time and part-time). Full-time classes are offered in Kuujuarapik, Kuujjuak, Inukjuak, Povungnituk and Salluit.

The full-time academic upgrading courses are designed for students who either left school before a high-school was available in their community, or else dropped out of school before they had completed the grades that were offered. Students are tested when they begin and start working at their level of ability. They enter the program as spaces are available, follow an individual course of study, and leave when they have achieved their individual goal or when they drop out. The subjects taught in the adult upgrading program during the 1986/1987 academic year were: English, mathematics, Inuttitut, French, science, introduction to micro-computers, computer programming, typing, office procedures, filing and geography.

Full-time students are paid an allowance by Manpower Canada. This link between adult education, a provincial matter, and Manpower Canada, needs a note of explanation. Full-time vocational courses, chosen and developed in accordance with Manpower Canada guidelines, allow students to be paid an allowance, which is determined according to need. Because of the need for

adult basic education, this arrangement has been extended to full-time secondary level upgrading students and to full-time primary level upgrading students in the Kativik region.

The Manpower representative in each community registers students for the next academic year, before the teachers have arrived in the community. As long as applicants meet the Manpower requirements of being over eighteen years of age and having been out of school for at least one year, registration is done on a first come, first serve basis. Since the Manpower representatives are not qualified to conduct academic screening procedures to determine applicants' level of ability, teachers often find that they have students who do not meet the Kativik School Board's requirement for full-time students to have at least a grade four level in basic subjects. Since it is often impossible, for social and financial reasons, to ask these students to drop out of the program, teachers have to cope with an extremely wide range of ability levels within one classroom and often have neither adequate learning materials nor time to devote to the lowest levels.

Many adults, because of job or family commitments, cannot take full-time courses. Therefore, many of the same subjects that are taught full-time during the day are available in the evening. Students taking evening courses are not paid.

Full-time technical-vocational courses are designed to give specific job skills to people who are either looking for a job, or who need skill-improvement for their present job. The courses change from year to year and are

generally offered in one northern, or occasionally southern, location.

Part-time vocational courses are offered in the evenings or full-time during the day for periods of one to two weeks. These courses, often requested by employers, are for people already working but who need to improve their job skills.

These four categories of courses tend to function adequately in the larger communities. However, smaller communities often can not register enough students to permit the appointment of a full-time, or even a part-time, teacher. Also, for specialized subjects, such as bookkeeping, a specialist teacher is often unavailable. In 1986 Adult Learning Centres were opened on an experimental basis in the communities of Quaqtaq, Kangiqsuk and Tasiujaq. A full-time adult education teacher was placed in each centre and provided with self-teaching instructional materials that would not require a specialist teacher. The role of these teachers was seen as that of a coach or tutor, and the advantage of these materials was the possibility for even a single student to follow a particular course.

Chapter 2: The Study Methodology

FORMATIVE EVALUATION AND NEEDS ASSESSMENT

Scriven coined the term formative evaluation in 1967; he used it to refer specifically to the evaluation of educational programs during their developmental stages. According to Dick and Carey (1978), formative evaluation is a process used to obtain data for the purpose of revising instructional materials. When the same materials have reached their final version, other data may be collected to determine their effectiveness. This type of evaluation is referred to as summative. Baggaley (1986) points out that information gleaned from a summative evaluation may be used formatively at the needs assessment stage of other products. There does not seem to be disagreement in the literature as to the definition of formative evaluation, nor is there any controversy as to its value.

There are, however, a number of methods by which formative evaluation may be carried out. According to Weston (1984), they are: (1) self-evaluation of the material by the developer him- or herself; (2) expert review, in which one or more experts review the instructional material and suggest revisions; and (3) developmental testing, which requires that learners be used as the main source of feedback.

Developmental testing can be divided into three phases: (1) one-to-one evaluation which can identify major failures; (2) small group evaluation, which can provide extensive information; and (3) field evaluation in a situation closely resembling the intended context, which can determine

how the material would function in actual use. Extended testing includes data from learners as well as from teachers and other potentially useful sources; it can indicate if materials, which are already in use, continue to be effective.

A comprehensive formative evaluation can include all of these phases--each bringing additional information as it is completed. Although this would be ideal, Weston accurately points out that selection of an approach for the formative evaluation of particular instructional materials is generally determined by practical constraints. Since time constraints are often the major restriction, Ardaway (1983) suggests a time-saving model for formative evaluation, which combines pilot-testing and field-testing into a single on-site activity. In this model, a working version of the material is administered to the target group under actual field conditions, with groups small enough to allow for the kind of detailed feedback normally obtained from learners during pilot testing. Since the data are obtained under natural conditions, they serve as a sound starting point for probing problem areas.

Scriven (1967) recommends that we examine the merit of our educational goals themselves, not just our success rate in achieving those goals. We should also examine all the outcomes of our program--intended or not. Although he is a proponent of the rationalistic paradigm, this latter recommendation has some similarities with the method of naturalistic inquiry insofar as it recommends a holistic look at factors which may be multiple and interactive. Guba and Lincoln (1982), in their discussion of the naturalistic method, suggest that the choice of the rationalistic or naturalistic axiom system should consider the greater degree of "fit".

Problem, paradigm, method, and context must be congruent with each other in order to produce meaningful results.

The transitions which have occurred in Northern Quebec during the last ten years have resulted in dramatically changed educational needs. The assessment of these needs affects the decision-making process which in turn affects the viability of the system, its cost, and, ultimately, student achievement.

Stufflebeam (1985) identifies four basic definitions of needs assessment. The first, best characterized in the work of Kaufman (1976), involves the definition of a need as the discrepancy between desired performance and observed or predicted performance. The second, or democratic view, is derived more from practice than from theory. In this view a need is defined as a change, or direction, desired by the majority of some reference group. Stufflebeam points out that the problem with this approach is in how easily the needs and preferences of members of the reference group can be confused and in how much their informedness can affect their responses. A third, future-oriented approach, describes a need as the direction in which improvement can be predicted to occur, given information about current status. This approach depends on informed judgement, systematic in-depth problem analysis, and the full and complete description of a situation. The fourth approach, which defines a need as something whose absence or deficiency proves harmful or whose presence proves beneficial, is difficult to use in the educational context where causal relationships between deprivation and harm are often difficult to establish.

Stufflebeam proposes the CIPP model of needs analysis, which has four stages. (1) The demographic, cultural, historical, and socio-economic factors related to the problem are systematically analysed. (2) The available input to the program, in terms of facilities, personnel, and services, is studied. (3) The procedures used in the program are evaluated. (4) The product of a program is evaluated in terms of intended and unintended changes.

A needs assessment is not simply a description of "what is". Minutely analysing constituent components is not a prescription for survival in a complex world. If people are to increase their capacity to "make it happen" for themselves, needs assessment in adult education must be defined through a synthesis of defining aptitudes and defining tasks (Hunt, 1986).

Kaufman (1972) proposes that, in a needs assessment, data must be collected from the learners, the community and the educators. These data must represent the actual world of the learners and related people, as it exists now, and as it could and should exist in the future. Needs statements are tentative and their validity should constantly be questioned. Kaufman suggests that needs based on empirical data of discrepancies will have greater utility for educational system design than will a list of "felt needs". These discrepancies should be defined in terms of end-products or actual behaviours, not in terms of processes.

EVALUATION OBJECTIVES

The purpose of the procedures described in this thesis equivalent is to evaluate *Math 204* in order to:

- (1) determine the accuracy of the material and the appropriateness of the instructional design through expert review;
- (2) determine the instructional effectiveness of this material by comparing student scores to the MEQ (ministere de l'education Quebec) established criterion of 50%;
- (3) determine if there are problems with the format, level of difficulty, student affect or instructional design of the material through responses on the students' and teachers' questionnaire forms;
- (4) determine, through responses on the students' and teachers' questionnaire forms, if there were problems within the process of teaching and learning that arose while this material was in classroom use;
- (5) suggest viable procedures to be used in formative evaluations for the Kativik School Board's future curriculum development projects.

WHY *MATH 204* WAS DEVELOPED

Until 1985, the materials which were used in the Northern upgrading program were developed by southern school boards for use in their own adult education programs. This material was designed for an urban target

population which is studying in its first language. Because teachers felt that these materials were inadequate for Inuit students, they supplemented the official program with whatever auxiliary textbooks or instructional materials were available. These supplementary materials were not designed for the target population, nor were they chosen with a clearly formulated educational policy in mind. The difficulties of organization, communication, and transportation involved in any Northern project (particularly in a relatively new one) contributed to the varying content and quality of the instruction from community to community.

The initial investigation into the need for redevelopment of the upgrading curriculum was conducted by those pedagogical counsellors who had dealt with the difficult first years of the upgrading program. The investigation focussed on opinion data gleaned from the teachers and did not utilize the empirical data of discrepancies. This needs assesment followed what Kaufman (1972) termed the "classical model". It started with general statements of goals or intents and proceeded directly to the development of the educational program. These intents, which were stated in terms of process rather than product, are: (1) to cover content that must be mastered to succeed at tests established by the MEQ (ministere de l'éducation Québec); (2) to present this content at a language level appropriate for the target population; and (3) to present the content in a way relevant to the Northern context.

Although acute shortcomings were found in all sections of the program, priorities had to be set, because of financial and time restrictions. *Math 204* (pre-secondary mathematics) and *En 204* (pre-secondary English), the most elementary sections of the upgrading curriculum, were given first priority.

It was felt that redevelopment of these sections would produce the highest payoff in the reduction of reported frustration of students.

Math 204 was written during the summer of 1986 and was first used in Northern communities from January to May 1987, during which time it was formatively evaluated. During the evaluation period an answer key and teachers' manual had not yet been written. The cost of development of *Math 204* was \$18,000 and the cost of evaluation was \$2,000.

DESCRIPTION OF *MATH 204*

The development of *Math 204* was carried out, during the summer of 1986, by two adult education teachers who had had experience teaching the elementary level of mathematics during the 1985/86 academic year. The rationale for this choice of developers was that their familiarity with the target population would enable them to create materials that were appealing and appropriate. A secondary reason was related to the conditions under which adult education teachers are hired. These teachers, who spend 7-8 months in an arctic community, have no formal contract with the Kativik School Board, and are paid according to the number of hours they teach (supplemented by a Northern allowance). During the summer months they have either to look for other work, or to apply for unemployment insurance. The high annual turnover of teachers is detrimental to positive student affect and to the consistency of program content from year to year. Hiring teachers to work on curriculum

development during the summer months is seen as a way of increasing their involvement with, and hopefully their continued commitment to, the department.

Math 204 is a ninety-hour program of printed modules in textbook/workbook format. It contains 310 pages, which were typed on a MacIntosh computer and printed on a laser printer. A format of individualized modules was chosen to allow the students to work as independently as possible, since Northern adult education classrooms contain students working at many different levels, and only one teacher. However, because of the elementary academic level of the ESL students who would be using *Math 204*, it was recognized that teacher back-up would probably be required. The frequency of required teacher support would vary, depending on the student's mastery of the particular segment that s/he would be working on.

Math 204 is divided into six units; each of the first five units has a pretest and a posttest. The purpose of these pretests is: (1) to aid both teacher and student in determining the student's entry level for each unit; and (2) to aid in determining which units of *Math 204* are most efficient and effective in improving student learning. The sixth unit, which does not introduce new material, is conceived as a review of the other five units. (Appendix 1 shows the table of contents of *Math 204*.)

Because of the students' elementary level of functioning in English, the developers attempted to introduce only the most basic vocabulary, and to carefully define unfamiliar terms. Generally speaking, simple sentences are used in the instructional portions, and the word problems use language

which deals with concrete and environmentally familiar subject matter.
(Appendix II contains one sample page from each of the first five units.)

EVALUATION DESIGN

The Kativik adult education department has never undertaken a formal study to determine whether materials developed specifically for use within the Northern context are more effective than selected, commercially-available materials in achieving efficient and effective learning for the target population. Nor has it systematically determined the curriculum development and instructional design process to be followed or the type of instructional strategy, for specifically developed material. Nevertheless, the department has embarked on a massive project of curriculum development and instructional design in order to produce materials for the target population. *Math 204* was developed as part of this project.

The central problem of this study is to ascertain the efficiency and effectiveness of *Math 204*. A comparison of the effectiveness, efficiency and cost of commercially available instructional materials in relation to *Math 204* goes beyond the scope of the present study. The information from this evaluation was used to revise *Math 204* during the summer of 1987; it will also be used formatively in the development of subsequent sections of the upgrading curriculum.

The evaluation design has four distinct components:

- (1) an expert examination of the the material, to determine the accuracy and appropriateness of the instructional design;

(2) an analysis of the student performance scores to determine the extent to which the MEQ (Ministre de l'éducation Québec) criterion has been met;

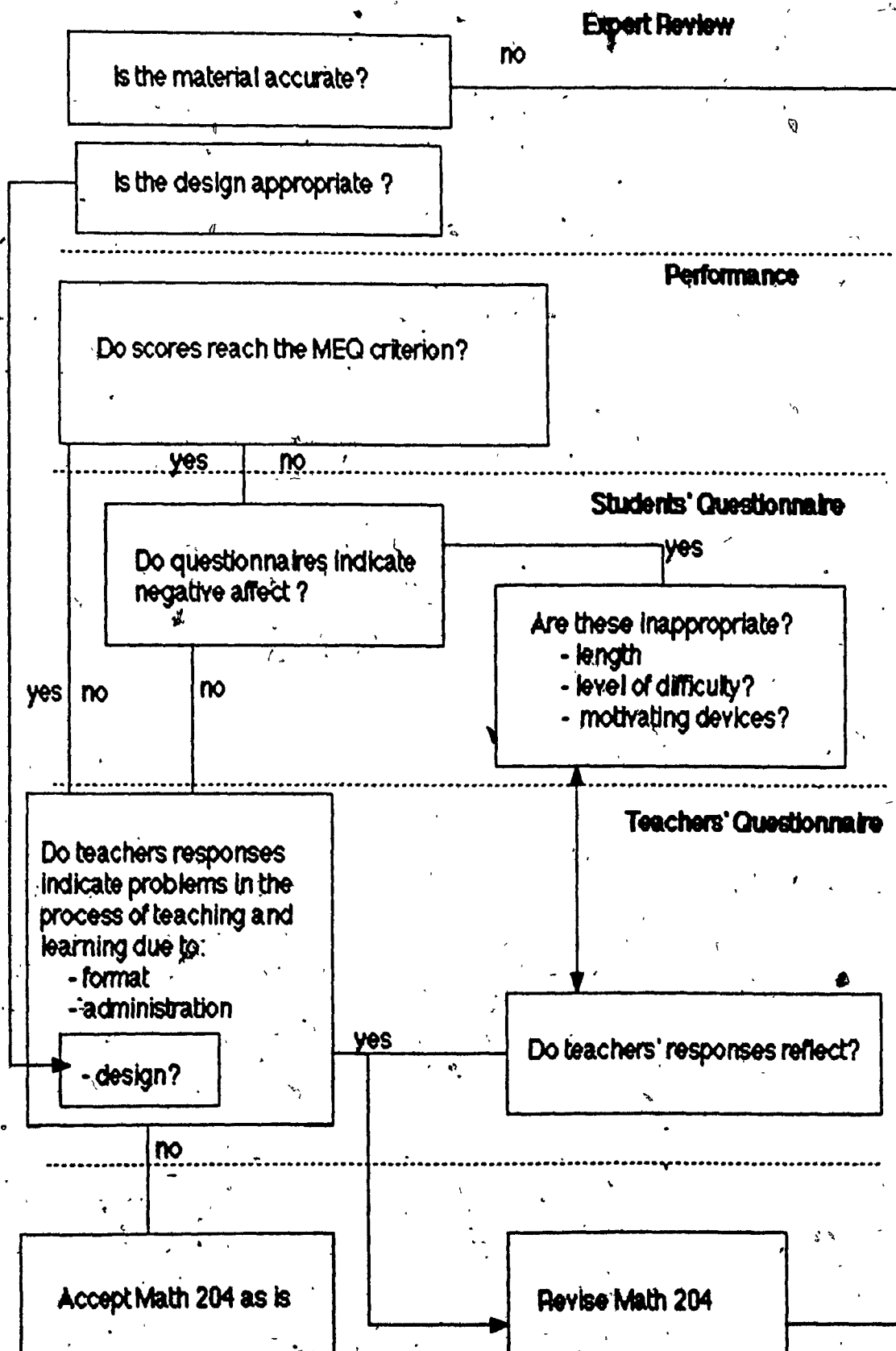
(3) an analysis of responses on a questionnaire designed to measure the student's affective response to the material;

(4) an analysis of responses on a teacher questionnaire, designed to identify factors upon which the effectiveness and efficiency of the material is contingent. These factors include: (a) teacher characteristics; (b) material format and organization; (c) language level; (d) use of illustrations, examples, review exercises, and motivating devices; (e) teacher support materials; (f) transactions that occurred during instruction; (g) teacher attitude towards the material; and (h) unanticipated side-effects.

The study provides information about the viability, in the Northern situation, of the evaluation instruments and procedures used. This information will be used to recommend procedures to be followed in future formative evaluations of specifically developed instructional material.

It is hoped that the findings of this study will contribute to the Kativik Adult Education Department in the establishment of a clear policy regarding (1) curriculum development, (2) instructional design; and (3) instructional materials evaluation. Figure 2 is a summary of the evaluation design.

Figure 1: Evaluation Design



OPERATIONAL DEFINITIONS

Instructional effectiveness refers to the students' level of performance; it will be measured by comparing scores on the posttest to the MEQ (ministère de l'éducation Québec) criterion.

MEQ Criterion refers to the passing grade for pre-secondary mathematics within adult education departments in the Province of Québec. This criterion is 50%.

Specifically Northern content refers to content with particular relevance to people who live in Northern Québec. This has been included in *Math 204* as a motivating device in the form of familiar place names, facts about the North and the use of environmentally-familiar situations as the setting for word problems.

Appropriateness of instructional design refers to strategies employed to organize and present the information content of *Math 204*. Such strategies include choice of instructional objectives and their sequence of presentation; analysis and presentation of subordinate skills; motivating devices; and format factors such as size of typeface and visual aids, and number of practice exercises.

Level of difficulty refers to such variables as required entry-level skills, "chunk size" of units of instruction, and level of language used in the instructional sections, the directions for the practice exercises, as well as in the exercises themselves. An appropriate level of difficulty for the target population is reflected in the students' ability to work independently.

Problems within the process of teaching and learning while the material is in classroom use may arise from features of the organization and administration of the pretests, posttests, units or subsections of the material. These problems may be reflected in the length of time required by students to complete the material, and negative student affect or teacher affect. They are indications that aspects of the material are inappropriate (1) for these students because of their cultural and/or educational background; or (2) for use within the given context because of teacher or teaching situation characteristics.

Administrative material refers to such teacher support materials as a teaching manual, training sessions, or the availability of an expert in the use of the material.

OVERVIEW

Math 204 was designed for use by Inuit in Adult Education classes at the presecondary level in all villages in Northern Quebec where these classes are offered. Full-time classes are conducted in Kuujjuarapik, Kuujuaq, Inukjuak, Povungnituk, and Salluit; part-time classes are conducted in Quaqtaq, Kangiqsuk and Tasiujaq.

The students entering the program have been out of school for at least one year. Many, however, are returning after a much longer absence. A number of the students received their previous formal education in French and many have spoken little or no English since they left school, as the language of daily life is Inuktitut.

The teachers in the adult education program come from a variety of backgrounds. A teaching diploma is not required, and there has been a relatively high turnover of personnel. In hiring, preference is given to individuals with experience in: (1) the teaching of English as a second language; (2) adult education; and (3) cross-cultural contexts. However, not all teachers in fact possess these advantages. A number of teachers have tended to remain with the program over a period of years and, in so doing, become an important source of on-going feedback concerning curriculum content, as well as other aspects of the program.

The instruments for this evaluation are: (1) student performance scores; (2) expert review form; (3) student questionnaire forms designed to evaluate affective reaction to each unit; and (4) teacher questionnaire forms containing demographic information, questions on format, general questions about *Math 204* and questions about individual units of *Math 204*.

Math 204 was used by Northern adult education teachers from January to May 1987. During the pedagogical development week in Kuujuaq, in the month of February, the teachers were informed by the pedagogical counsellor in charge of mathematics that a formative evaluation of the material was to be conducted. At that time they were requested by the counsellor to observe and note problems with the material and its use in the classroom. They were informed that a lengthy questionnaire would be distributed towards the end of the semester and that they would be remunerated for the two hours of their time required to complete it. Student questionnaires, forms for recording pretest and posttest scores, and written instructions for the teachers were distributed at this time.

On March 16, 1987, an additional request was mailed to teachers by the pedagogical counsellor, reminding them of the purpose and importance of the data collection. (Appendix III includes all written instructions which were given or sent to the teachers concerning the formative evaluation.)

Kate LeMaistre, a math and science consultant with experience in developing instructional materials for native adults, was hired to conduct an expert review of the material. This was submitted in April 1987.

Completed questionnaires and performance scores were collected at the end of May 1987.

PROCEDURAL CONSTRAINTS

Because of the distances involved the researcher was unable to have direct contact, during the evaluation period, with the teachers who used *Math 204*. The viability and efficiency of the planned evaluation procedures were discussed by the researcher and the pedagogical counsellor responsible for adult education mathematics. This pedagogical counsellor had personal contact with the teachers during the second week in February, when the evaluation procedures were presented, as well as occasional telephone contact during the subsequent evaluation period. Except for the letter dated March 16, 1987, all written instructions for the teachers concerning the evaluation were composed by the researcher.

The pedagogical counsellor informed the researcher that sixty to seventy students were expected to use the material during the period of the evaluation. However, for the following reasons it was uncertain what number of students would contribute performance scores. (1) This new

version of the material was used during the second semester when some students, having probably completed equivalent old-version units during the first semester, might choose not to repeat them. (2) Unpredictable Northern school attendance might produce meagre data. (3) Students might prefer using the older version with which they were more familiar.

Although eight teachers were expected to use *Math 204* there was an awareness that the following factors might contribute to fewer teachers completing the teachers' questionnaire. (1) A number of teachers might have no students working in the new version of *Math 204*. This might occur because the students in those particular villages had already completed the requirements at this level or because they preferred using the older version of *Math 204*. (2) Although teachers were to be paid for the time required to fill out the teachers' questionnaire, they were under no obligation to do so.

Foreseeable in any Northern undertaking are transportation and communication difficulties due to climatic conditions, vast distances and human error. It was possible that these factors would play a role in diminishing the amount of data collected.

In the next chapter each of the four instruments is examined as a separate study, namely: (1) study of the performance data; (2) teachers' questionnaire study; (3) students' questionnaire study; and (4) expert review. Subjects, method, instrument and results are described for each.

Chapter 3: Analysis of Results

Phase A: STUDENT PERFORMANCE

Subjects

An undetermined number of students used parts of *Math 204* during the evaluation period; however, only 41 posttest scores were collected from 17 students. These students, in the villages of Kuujuak, Salluit, and Tasiujaq, ranged in age from 18 to 33. The teacher in the village of Povungnituk used part of *Math 204* with one student, but did not record any posttest scores. The teacher in Kuujjuarapik, who did have a number of students working at this level, continued to use the older version of *Math 204*. Performance data were not recorded in the part-time adult education classes in Quaqtaq and Kangiqsuk. Table 1 indicates the village, gender and age range of the students who used *Math 204*.

Table 1: Village, gender and age range of the students who used *Math 204*.

	Tasiujaq	Kuujuak	Salluit
number of male students	2	1	3
male age range	18	25	unknown
number of female students	0	9	2
female age range	0	18-33	19-25

Instrument

The pretest and posttest are designed to provide a measure of students' initial and final performance on each of the first five units of the material.

Unit 6, which is conceived as a review, does not have a pretest.

It was expected that the pretest scores would provide indices of whether the actual entry behaviours were congruent with the anticipated entry behaviours. It was expected that the posttest scores would indicate whether the skills presented in the unit had been mastered to the level of the criterion. Data from the other instruments will be used to determine the causes of a failure to reach mastery or the existence of problems within the process of teaching and learning, whether mastery has been reached or not. A record sheet (Appendix IV) on which to record the pretest and posttest scores was given to each teacher who used the material.

Procedure

During the pedagogical development week in Kuujjuak (the second week in February), the pedagogical counsellor, who had been briefed concerning the rationale, procedures and instruments of the evaluation, presented these aspects to all adult education teachers who were teaching mathematics. The form for recording pretest and posttest scores and written instructions for the teachers were distributed at that time. On March 16, 1987, an additional request by the pedagogical counsellor was mailed to the teachers, reminding them of the purpose and importance of the data collection procedures. (Appendix III includes the written communications to the teachers concerning collection of performance data.)

Results

Posttest

Totalling forty-one, the following number of posttest scores were collected:

Unit 1 - 5 scores

Unit 2 - 10 scores

Unit 3 - 7 scores

Unit 4 - 10 scores

Unit 5 - 9 scores

Unit 6 - 0 scores.

Six male students contributed 21 posttest scores, or 51% of the total number; eleven female students completed 20 posttest scores, or 49% of the total number. Ten posttest scores, or 24.5 %, of the total number, are from Tasiujaq; twenty-one posttest scores, or 51 % are from Kuujjuaq; ten posttest scores, or 24.5 % are from Salluit. Table 2 indicates the village and the number of students that completed posttests .

Table 2: The number of male and female students that completed posttests
for *Math 204*.

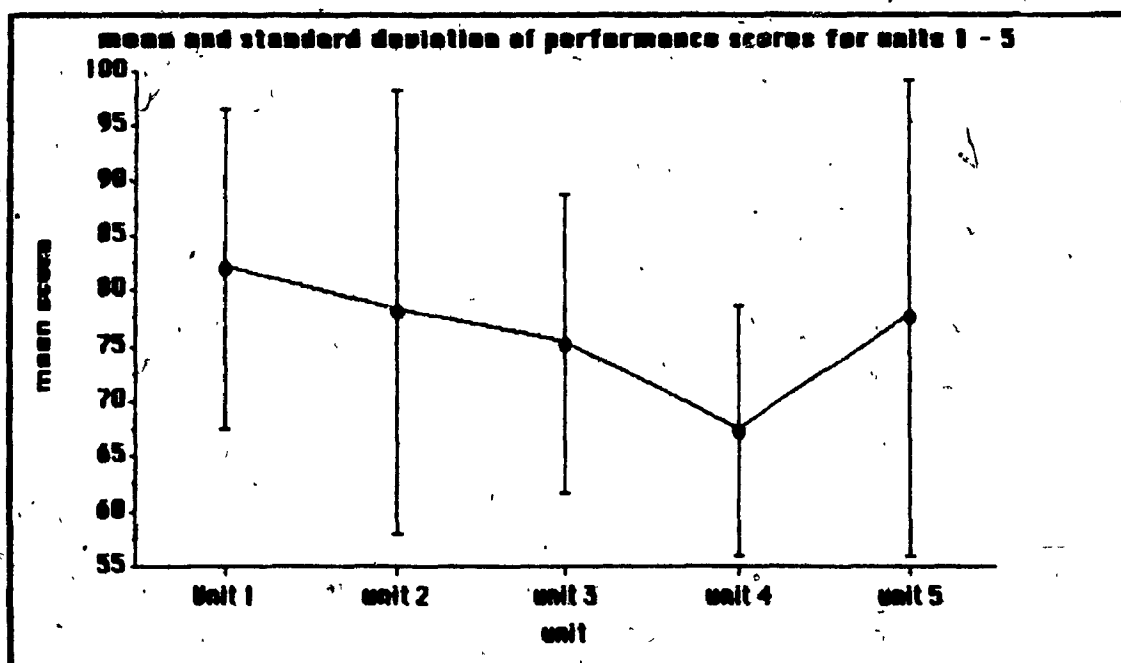
	Tasiujaq	Kuujjuaq	Salluit
number of posttests by men	10	4	7
number of posttests by women	0	17	3

The mean of posttest scores for Unit 1 (82%) was the highest and for Unit 4 the lowest (67.3%); the standard deviation for unit 5 was the highest (21.57) and for Unit 4 the lowest (11.22). No significant correlation ($p > .05$) between students' age or gender and performance scores was found. The raw data on the posttest scores is presented in Appendix V and the descriptive data are indicated in Table 3 and in graphic form in Figure 3.

Table 3: Descriptive data on posttest scores from units 1-5, *Math 204*.

unit	number	mean	standard deviation	range
1	5	82	14.405	40
2	10	78.1	20.13	58
3	7	75.1	13.484	38
4	10	67.3	11.216	34
5	9	77.7	21.575	70

Figure 3: Mean and standard deviation of performance scores for Units 1-5, *Math 204*.



Students' performance on the posttests was compared to the MEQ criterion of 50%. Two scores (Unit 2 and Unit 5), or 4.2% of the scores, fell below the criterion level. 23% of the scores fell in the 50 - 65 range.

Pretest

Only the village of Salluit recorded pretest scores. Eighteen pretest scores were recorded, but only eleven of them were for units that had also recorded posttest scores. Table 4 indicates the descriptive data for units that have both pretest and posttest scores. The mean of the eleven pretest scores for which there are also posttest scores is 36.1. The seven pretest scores for there are no posttests range from 66 to 93, with a mean of 82.25.

Table 4: Descriptive data for eleven pretests with their corresponding posttests.

measure	mean	standard deviation	range
pretest	36.1	23.85	73
posttest	84.73	11.94	40
posttest minus pretest	48.64	23.27	66

Phase B: TEACHERS' QUESTIONNAIRE

Subjects

Although teachers in eight villages had students working on mathematics at this level, only seven teachers used *Math 204*; the eighth teacher used the older version. Two of the seven teachers used *Math 204* very little, because few of their students were working at this level. Five teachers completed the teachers' questionnaire. The one male and four female teachers who completed the questionnaire had all taught previously; however, one had never taught in the North, two had not taught adults and three had not previously taught this level of mathematics. Three teachers had degrees in education and two had degrees in other areas. Demographic information on the five teachers is summarized in Table 5.

Table 5: Demographic information on the five teacher respondents

1. Sex: Male - 1; Female - 4 -	
2. Age:	25-30 - 1
	30-35 - 2
	35-40 - 1
	40-45 - 1
3. Are you an Inuk? 0	
4. Have you taught before this year? yes - 5, no - 0	
If yes, have you taught in the North? yes - 4, no - 1	
If yes, how many years have you taught before this one?	
6 years, 4 years, 2 years, 1 year	
5. Have you taught adults before this year? yes - 3, no - 2	
6. Have you taught adults in the North before this year? yes - 3, no - 2	
If yes, how many years? 3 years, 2 years, 1 year	
7. Have you taught math at this level before? yes - 2, no - 3	
8. Do you have a B.Ed. or a Dip. Ed? yes - 3, no - 2	
9. Do you have a university degree in an area other than education?	
yes - 2, no - 3	

Instrument

The teachers' questionnaire is composed of statements followed by a Likert scale. These statements are designed to identify factors upon which the effectiveness and efficiency of the material depends. They include: (1) teacher characteristics; (2) material format and organization; (3) language level; (4) use of illustrations, examples, review exercises, motivating devices; (5) teacher support materials; (6) transactions that occurred during instruction; (6) teacher attitudes toward the material; and (7) unanticipated side-effects.

Part I of the teachers' questionnaire solicits demographic information about the group of teachers.

The teachers' questionnaire has three major parts relating to *Math 204*. Part II solicits information about the format and includes statements on:

- typeface (statement 10)
- length (statements 11 & 12)
- functional divisions within units (statements 13 & 14)
- use of graphic aids (statements 15 & 16)
- efficiency of table of contents & answer key
(statements 17 & 18)

Part III solicits information about the content of *Math 204*. These statements deal with *Math 204* as a whole. They cover the following topics:

- logic of sequence in which the units are presented
(statement 19)
- logic of sequence of presentation within each unit
(statement 20)
- balance within units (statement 21)
- level of language (statement 23)
- adequacy of definition of terms (statement 24)
- importance of specifically Northern content
(statements 25, 26, 27)
- student affect (statements 28 & 32)
- ability of students to work independently:
examples (statement 22)
directions (statement 29)
general (statement 31)
- appropriateness for lowest level students
(statement 30)
- review exercises: student view (statement 33)
teacher's view (statement 34)
- pretest (statement 35)
- posttest (statement 36)
- adequacy as preparation for the next level (statement 37)
- adequacy of administrative materials (statements 38 & 39)
- efficiency compared to previous version of *Math 204*

(statement 40)

- usefulness as a review for more advanced students

(statement 41)

Part IV is divided into six sections. Each section evaluates an individual unit of *Math 204* and is made up of fourteen statements. There is a space for comments after each statement, and an open-ended question at the end of each section which encourages the respondents' comments, observations and criticisms of the material. These open-ended opportunities are provided to counteract the possible influence on teacher responses caused by the form of the statements in the Likert sections of the questionnaire. They are an attempt to focus awareness on influencing factors which may not have been included in the design of the questionnaire.

Part IV of the questionnaire asks the following information in regard to each of the six units of *Math 204*:

- clarity & appropriateness of goal and objectives of the unit
(statements 1, 2 & 3)
- adequacy of the given information for achieving the goals
(statements 4 & 5)
- logic of sequence of presentation (statement 6)
- adequacy of practice exercises (statements 7 & 8)
- student affect (statement 9)
- homogeneous level of difficulty throughout (statement 10)

- ability of students to work independently in:
 - instructional sections (statement 11)
 - directions to practice exercises (statement 12)
 - practice exercises (statement 13)
- adequacy of posttest (statement 14)

(An example of the Teachers' Questionnaire can be seen in Appendix XIV. The number inserted into the Likert scale is the number of teachers who responded with the given rating.)

Procedure

During the pedagogical week in Kuujjuak (second week, February 1987), the pedagogical counsellor responsible for mathematics education requested that the teachers observe and note problems with *Math 204* and its use in the classroom, in preparation for the teachers' questionnaire. The evaluation procedures were explained at this time. Suggestions were given about the type of problem areas which might arise, as well as methods of making notes and recording observations. They were informed that a lengthy questionnaire would be distributed towards the end of the semester and that they would be remunerated for the two hours of their time required to complete it. The questionnaires were subsequently mailed to the communities, and on March 16, 1987 an additional request was mailed to teachers by the pedagogical counsellor, reminding them about the purpose and importance of the data collection (Appendix III).

Results

All scores from the teachers' questionnaire are reported in a form representing a four-point scale from -2 (strongly disagree) to +2 (strongly agree). The given scores are the mean ratings by the five teachers.

(1) Format

The following nine statements on the teachers' questionnaire (Part III, statements 10 - 18) concern the format of *Math 204*.

PART II

statement :	mean
10. Students found the typeface used in <i>Math 204</i> easy to read.	+1.6
11. Students found that there was too much information on each page.	-1
12. Students found <i>Math 204</i> frustratingly long.	-1.4
13. Students found the division between instruction and exercises clear.	+1
14. Students found the divisions between the pretest, the main body of the unit and the posttest clear. (4 teachers only)	+.8
15. Students would learn more efficiently with more illustrations.	-1
16. Students would learn more efficiently with fewer lines, boxes, arrows, etc.	-.8
17. Students found the table of contents easy to use.	+.8
18. Students found the answer key difficult to use.	N/A

These ratings can be summarized as follows: teachers generally found the format adequate. The strongest rating was given to the readability of the type-face. The weakest ratings were given to: (1) ease of use of the table of contents, and (2) usefulness of deleting lines, boxes, arrows, etc. Statement 12 received the lowest rating.

Teachers' Comments

Three teachers commented that the visual aids in the instructional sections have too many arrows and boxes. Graphics should be simplified and the use of marginal illustrations avoided. It was suggested that thinner lines be used for visual aids and a bolder typeface used for the most essential part of the examples. These comments disagree with the general response (-.8) on the teachers' questionnaire to statement 16 (Students would learn more efficiently with fewer lines, boxes, arrows, etc.).

Two teachers commented that none of the students objected to the relatively large typeface. One teacher recommended that the instructional sections use a smaller typeface to avoid the confusion which occasionally occurred when students failed to differentiate between the instructional sections and the practice exercises.

Statement 18 was not answered as it was not applicable, since the answer key was not sent to the villages during the period that the material was being evaluated. However, one teacher commented that he had made his own by completing a copy of *Math 204*. Since he showed his work for all problems, students found this answer key format helpful.

(2) Specifically Northern Content and Student Affect

The following statements on the teachers questionnaire concern student affect.

Part III:

statement:	mean
28. Students did not enjoy working on <i>Math 204</i>	-.8
32. Student self-confidence decreased throughout the course.	-1

These two statements were significantly correlated ($r = .932$, $p < .05$).

Part IV:**statement 9: Students enjoyed working in Unit****mean**

Unit 1	+8
Unit 2	+1.2
Unit 3	+.4
Unit 4	+.8
Unit 5	+1.2

Unit 3 rated the lowest on student affect, while units 2 and 5 ranked equally as the highest. Statement 28, Part III is significantly correlated with statement 9, Part IV for Unit 5 ($r=.919$, $p<.05$). Statement 32, Part III is also significantly correlated with statement 9, Part IV for Unit 5 ($r=.913$, $p<.05$).

The following statements on the teacher's questionnaire concern specifically Northern content.

PART III**statement :****mean**

25. There are too many references that students didn't understand because they require knowledge of the South.	-.8
26. There are enough references to Inuit culture and the North.	+1.6
27. The examples and word problems with Northern content aid student learning.	+1.8

The value of Northern content as an aid to student learning was rated very highly, and the amount of Northern content within *Math 204* was rated as

adequate. No significant correlation ($p > .05$) was found between opinions about specifically Northern content and student affect.

(3) a. Level of difficulty

The following general statements are designed to determine the teacher's judgement about the appropriateness of the level of difficulty for the target population.

Part III

Statement	mean
22. The examples are confusing.	-1.4
23. The level of language used in <i>Math 204</i> is too complex.	-.8
24. All necessary terms are adequately defined.	1.2
29. Students had difficulty understanding the instructions for the exercises.	-1
30. <i>Math 204</i> is too difficult for the lowest level of students in your class.	-.2
31. Students were able to work in <i>Math 204</i> independently.	.6

Some teachers felt that *Math 204* was too difficult for the lowest level students and that these students were unable to work independently. The clarity of the examples and the adequate definition of terms were rated highly. There is a significant correlation between statements 23 and 31 ($r = .953, p < .05$).

Statements 10, 11, 12, and 13, Part IV of the teachers' questionnaire refer to the level of difficulty of each of the six units. They are repeated six times, in reference to each unit. Table 6 indicates the mean scores for units 1-5. Unit 6 is excluded from the evaluation because of inadequate data.

PART IV

Statement

10. Students found some sub-sections of this unit much more difficult than others.
11. Students worked independently in the instructional sections.
12. Students asked for help in understanding directions for the practice exercises.
13. Students asked for help while working through the practice exercises.

Table 6: Mean scores for Part IV, statements 10 - 13, teachers' questionnaire.

question	unit 1	unit 2	unit 3	unit 4	unit 5
10. some subsections more difficult	-.4	1.2	1.4	-.4	.6
11. worked independently in instructional	.6	.8	1.2	.4	.8
12. needed help with directions	.6	.2	.2	.2	.2
13. needed help with exercises	0	0	0	.2	.6

Teachers felt that students found some sub-sections of Unit 3 much more difficult than others. They worked independently in the instructional sections least often in Unit 4. They asked for help in understanding directions for the practice exercises in all units, but particularly in Unit 1.

They asked for help in working through the practice exercises particularly for Unit 4 and Unit 1.

Statements 12 and 13 aim at determining the appropriateness of the level of difficulty in the directions for the practice exercises and in the practice exercises themselves. There is a significant positive correlation between statement 12 and statement 13 in Unit 2 ($r=.968, p < .05$), Unit 3 ($r=.968, p < .05$) and Unit 4 ($r=.968, p < .05$) & Unit 5 ($r=.968, p < .05$). Overall, students worked independently least often in Unit 4 and most often in Unit 5.

Statement 23 in Part III of the teachers' questionnaire states that the language level is too complex in *Math 204*. There is a significant negative correlation between statement 23, Part III and statement 11, Part IV for Unit 1 ($r=-.963, p < .05$), Unit 2 ($r=-.944, p < .05$) and Unit 5 ($r=-.944, p < .05$).

Statement 31, Part III, aims at determining the overall level at which students worked independently in *Math 204*. There is a significant positive correlation between statement 31, Part III and statement 11, Part IV, for Unit 1 ($r=.958, p < .05$), Unit 2 ($r=.919, p < .05$), and Unit 5 ($r=.919, p < .05$), which aims at determining the level at which students worked independently in the instructional sections of each unit.

(3) b. Level of Difficulty and Student Affect

Statement 9, Part IV aims at determining the teachers' perception of student affect towards each unit; statement 24, Part III concerns adequate definition of all necessary terms. There is a significant positive correlation between these two statements for Unit 1 ($r=+.1, p < .01$).

There is a significant positive correlation between statement 31, Part III and statement 9, Part IV for Unit 4 ($r = .919$, $p < .05$).

There a significant negative correlation between statement 9, Part IV, for Unit 4, and statement 23, Part III ($r = -.944$, $p < .05$).

There is a significant negative correlation between statement 9, part IV and statement 10, Part IV, for Unit 5 ($r = -.958$, $p < .05$). Unit 5 was rated the highest on questions 11, 12 and 13, Part IV.

Teachers' Comments

Students could often handle the math but found the language too difficult; this particularly applied to the lowest level of students. The geometry section tended to decrease student self-confidence. Units requiring new vocabulary (such as the geometry section) should go at the end of the book.

(4) Pretests & Posttest

The following statements in Part III of the teachers' questionnaire deal with the adequacy of the pretests and posttests that begin and end each of the first five units.

Part III

Statement	mean
35. The pretests do not clearly indicate the student's initial level. (4 teachers answered)	+.5
36. The posttests clearly indicate student achievement in each unit.	+.8

The following question deals with the adequacy of the posttest for each unit

Part IV

Statement 14: The (post) test for Unit ... is a good indicator of what the student learned in this unit.

	mean
Unit 1	+1
Unit 2	+1.8
Unit 3	+.8
Unit 4	-.2
Unit 5	+.8

The posttest for Unit 2 was judged the best indicator and for Unit 4 the worst. Statement 36, Part III, a general statement about the posttests as a good indicator of student achievement is significantly correlated with statement 14, Part IV for Unit 1 ($r=.932, p<.05$), Unit 2 ($r=.919, p<.05$), Unit 3 ($r=.944, p<.05$) and Unit 5 ($r=.944, p<.05$).

Teachers' comments

One teacher indicated that students did not want to do the pretests; another teacher felt that posttests generally did not have enough problems to adequately evaluate students' mastery of the material.

(5) Miscellaneous information about the content of *Math 204*

Design

The following statements solicit information about the design of *Math 204*

Part III:

Statement	mean
19. The sequence of <i>Math 204</i> is logical.	+1
20. The reason for the organization of sub-sections within each unit is not clear.	1.4
21. Each unit provides a good balance between instruction, exercises, and evaluation.	+1
33. Students found that there were not enough review exercises at the end of each unit.	-1.8
34. You, the teacher found the review exercises helpful in keeping track of students' progress.	+1.4

The highest score was given to the adequate amount of review at the end of each unit. The helpfulness of the review exercises for keeping track of student progress and the logic of unit organization were also positively rated. The balance between instructions, exercises and evaluation was rated the lowest.

Teachers' Comments

One teacher made the following suggestions concerning the design of *Math 204*:

(1) units should be organized using a modular approach so that sections already mastered can more easily be omitted;

(2) a flow chart recommending sequences depending upon students' performance would be a helpful aid;

(3) alternatively, exercises should be prescribed depending on pretest results. This might be done in a student guide by indicating which pages of instruction and practice relate to each pretest item.

Another teacher suggested that exercises be divided so that the student could check his or her answers after completing five examples.

Math 204 Within the Presecondary Program

The following statements solicit information about the value of *Math 204* within the context of the entire presecondary mathematics program.

Part III:

Statement	mean
37. <i>Math 204</i> does not adequately prepare students for <i>Math 205</i> (4 teachers answered)	-5
40. This new version of <i>Math 204</i> does not increase student learning in comparison to the old version of <i>Math 204</i> (4 teachers answered)	-1.5
41. <i>Math 204</i> would be useful as review material for students at more advanced levels.	+6

Although only four teachers responded to statement 40, they strongly indicated the effectiveness of the new version *Math 204* compared to the old version.

Teachers' comments

Except for geometry and order of mathematical operations one teacher felt that all his students had previous exposure to the topics covered. Both he and a second teacher felt that, since *Math 204* represents a review of skills

previously covered in the regular sector, a somewhat shorter text would be adequate, possibly placing the basic operations in a module that students would be required to master before entering the pre-secondary adult education program.

Another teacher specified that the multiplication and division section should be shortened, and a third suggested that the number of word problems be expanded.

Need for Teacher-support Materials.

The following statements solicit information about the need for teacher-support materials.

Part III:

Statement	mean
38. A teachers manual for <i>Math 204</i> would increase the effectiveness of your teaching. (4 teachers answered)	-.75
39. Suggestions for remedial exercises to address specific student problems would increase the effectiveness of your teaching.	+1.4

Although only four teachers rated statement 38, there is a generally negative reaction to the availability of a teachers' manual but a rather positive reaction from all five teachers to the availability of suggested remedial exercises to address specific student problems.

Teachers' Comments

One teacher asked for a clear marking scheme for unit posttests. She commented that she has no idea of the point value of each test item or of each test as a whole.

6) Content of Units 1 - 5

Part IV of the teachers' questionnaire contains the following 14 statements.

Each statement is repeated 6 times--once for each of the first five units.

Unit 6 is excluded from the evaluation since inadequate data was collected.

PART IV

Statement

1. The goal of Unit 1 is clear.
2. The objectives of the sub-sections are clear.
3. It is unnecessary for students to master this goal at the 204 level.
4. Not enough information is given for students to successfully achieve the objectives of Unit ...
5. The student is given unnecessary information to complete the objectives of this unit.
6. The information is presented in a logical sequence.
7. The amount of practice for each subskill is generally: <input type="checkbox"/> adequate <input type="checkbox"/> fairly adequate <input type="checkbox"/> rather inadequate <input type="checkbox"/> inadequate.
8. The number of practice exercises which integrate all the subskills of Unit 1 are: <input type="checkbox"/> adequate <input type="checkbox"/> fairly adequate <input type="checkbox"/> rather inadequate <input type="checkbox"/> inadequate.
9. Students enjoyed working in Unit 1.

10. Students found some sub-sections of Unit 1 much more difficult than others.
11. Students worked independently in the instructional sections. <input type="checkbox"/> always <input type="checkbox"/> usually <input type="checkbox"/> rarely <input type="checkbox"/> never
12. Students asked for help in understanding directions for the practice exercises: <input type="checkbox"/> often <input type="checkbox"/> sometimes <input type="checkbox"/> rarely <input type="checkbox"/> never
13. Students asked for help while working through the practice exercises: <input type="checkbox"/> often <input type="checkbox"/> sometimes <input type="checkbox"/> rarely <input type="checkbox"/> never
14. The test for Unit 1 is a good indicator of what the students learned in this unit.

Table 7 indicates the mean scores for Part IV, statements 1 - 14, Units 1 - 5. Means for Unit 6 have not been included since inadequate information was collected. Means with an asterisk indicate that only 4 out of 5 teachers scored that statement.

Table 7: Mean scores for Teachers' Questionnaire, Part IV, Units 1-5.

	statement	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
1	goal clear	1.6	1.5*	2	1.4	1.2
2	objectives clear	1.4	1.4	1.2	1.6	1.8
3	unnecessary to do at this level	-1	.4	-.6	-1.4	-1.2
4	not enough information	-1.4	-1.8	-1	-1.2	-2
5	unnecessary information	-.1*	0	-1	-2	-1.8
6	logical sequence	1	1.4	1.4	1.8	1.8
7	adequate subskill practice	1.4	1.8	1.6	1.6	1.8
8	adequate integration of subskills	1.5*	1.6	1.4	1.5*	1.8
9	enjoyed this unit	.8	1.2	.4	.8	1.2
10	some sub-sections more difficult	-.4	1.2	1.4	-.4	.6
11	worked alone: instructional sections	.6	.8	1.2	.4	.8
12	needed help: directions for exercises	.6	.2	.2	.2	.2
13	needed help: exercises	0	0	0	.2	.6
14	posttest adequate	1	1.8	.8	-.2	.8

Teachers' ratings can be summarized as follows.

Unit 1

The highest scores are given for the clarity of the goal and objectives, for adequacy of information to achieve objectives and adequacy of amount of subskill practice. Lowest scores are given for homogeneity of difficulty among sub-sections, students ability to work independently on instructional sections, directions and practice exercises. (Teachers' comments are summarized in Appendix, VI.)

Unit 2

Highest scores are given to adequacy of information for achieving objectives, adequacy of amount of subskill practice and of exercises integrating subskills, as well as to the quality of the posttest. Lowest scores are given for inclusion of unnecessary information; for the necessity of students to master this goal at the '204 level' and for statements 11, 12 and 13, which refer to the appropriateness of level of difficulty for the target population.

Statements 12 and 13 are significantly correlated ($r = .968$, $p < .05$).

(Teachers' comments are summarized in Appendix VII.)

Unit 3

Highest scores are given for the clarity of the goal, logical sequence of presentation, adequacy of subskill practice and number of subskill integrating exercises. Lowest scores were given for homogeneity of level of difficulty, and ability of students to work independently to interpret on their own the directions for practice exercises and to work through the practice exercises. Unit 3 rated the lowest of all five units on positive student affect.

Statements 2 and 11 are significantly correlated ($r = +1$, $p < .01$). Statements 12 and 13 are significantly correlated ($r = .968$, $p < .05$).

(Teachers' comments are summarized in Appendix VIII.)

Unit 4

Highest scores were given to the logic of sequence of presentation; the inclusion of only necessary information; the clarity of objectives; and the adequacy of subskill practice. Lowest scores were given to the posttest as a good indicator of student learning, and the appropriateness of the level of difficulty for the target population, as indicated in statements 10 - 13.

Statements 12 and 13 are positively correlated ($r = .95$, $p < .05$).

(Teachers' comments are summarized in Appendix IX.)

Unit 5

Highest scores are given for clarity of objectives, adequacy of information for achievement of unit objectives; noninclusion of unnecessary information; logic of sequence of presentation; adequacy of subskill practice and number of subskill integrating exercises. Lowest scores are given for the appropriateness of the level of difficulty for the target population, as indicated in statements 10, 12 and 13.

There is a significant negative correlation between statement 9 and 10 ($r = -.958$, $p < .05$). Statements 12 and 13 are significantly correlated ($r = .963$, $p < .05$).

(Teachers' comments are summarized in Appendix X.)

Phase C: STUDENTS' QUESTIONNAIRE

Subjects

Two students completed three student questionnaire forms. Both were from the village of Tasiujaq, which had only male students working in *Math 204*

Instrument

The student questionnaire aims at determining the student's affective response to the material. The rationale for the development of a large body of pre-secondary material with specifically Northern content is that it will be more relevant for the target population and hence more motivating. Since there is no systematic documentation regarding motivational problems with the previous version of *Math 204* a comparative analysis is not possible; however the students' questionnaire is designed to investigate reaction to the new version of *Math 204*.

The questionnaire is written in simple language. Statements deal with:

- difficulty of the unit (statement 1 & 4)
- interest in the unit (statement 2 & 5)
- length of unit (statement 3)
- amount learned (statement 6)
- adequacy of Northern content (statement 7)

These are the statements in the students' questionnaire:

1. I found this unit too hard.
2. I found this unit interesting.
3. I found this unit too long.
4. I asked my teacher for help often.
5. I am looking forward to doing more math.
6. I learned a lot in this unit.
7. This unit should talk more about the North.

(An example of the questionnaire can be seen in Appendix XV.)

Procedure

During the pedagogical week in Kuujjuak (second week in February 1987), the pedagogical counsellor responsible for mathematics introduced the teachers to the students' questionnaire and to the procedures required for its administration. Teachers were given written instructions requesting that they ensure students' understanding of the purpose of the questionnaire, as well as of the manner in which it was to be completed (Appendix III).

The questionnaire was to be completed after the student finished each unit but before s/he had taken the posttest, so that the test experience did not colour his/her reaction to the unit just completed.

As reported by the pedagogical counsellor, the teachers' initial reaction was that students would probably be reluctant to express their opinion on a questionnaire. The teachers were also reluctant to insist that such a form be

completed. On March 16, 1987, the pedagogical counsellor sent a letter to the teachers requesting that the questionnaire be brought to the students' attention, and that the decision concerning its completion be left up to the individual student (Appendix III).

Results

Three questionnaires were completed.

Two of the three obtained students' questionnaires refer to Unit 6 and the third refers to Unit 3. (The raw scores collected on the students' questionnaire are shown in Appendix XI.)

Because of inadequate collection of data, responses to the five elements of the students' questionnaire did not yield usable information.

Phase D: EXPERT REVIEW

To ensure the accuracy of its content as well as the pedagogical soundness of its presentation, the material was submitted for expert review. The expert reviewer was chosen on the basis of her qualifications in (1) the design and evaluation of mathematics teaching material; (2) adult education, (3) work with native peoples. Kate LeMaistre, a math and science consultant with experience in working with native peoples, and in developing instructional materials for adults, was hired to conduct an expert review of the material. This was submitted to the researcher in April, 1987.

Instrument

The expert review form has three sections:

- Part A: Technical content
- Part B: Relevance
- Part C: Course design

(The Expert Review Evaluation Form can be seen in Appendix XII.)

Results

The expert listed a number of errors to be modified within each unit. She evaluated the pre- and posttests as being accurate and consistent, and considered the level of difficulty as generally consistent. She felt that there was occasionally an excessive amount of practice for subskills and that the geometry section was the least relevant and contained the fewest real-life examples. She suggested that the geometry section be replaced by a section

on measurement of length, area and volume, which would better prepare students to work in subsequent MEQ mathematics modules. She did not feel that she could rate *Math 204* for relevance to the needs of the target population.

(The suggested modifications and comments of the expert reviewer are included in Appendix XIII.)

Chapter 4: Discussion of Results

Phase A: STUDENT PERFORMANCE

Effectiveness

The forty-one posttest scores, obtained from three communities, indicate that this material is effective, since only 4.2% of the scores fell below the MEQ criterion of 50%. Twenty-three per cent of the scores fell below 65%.

The 41 collected performance scores indicate that *Math 204* is effective for the seventeen students who completed posttests. Although only seventeen did complete them, a larger number used parts of *Math 204*. It is possible that some of the students at a lower achievement level did not feel confident enough to write posttests, causing the sample of students who completed posttests to be non-representative of entry-level students.

Comments on the teachers' questionnaire reflect the experience of using the material both with those students that completed posttests and those that worked in *Math 204* without writing posttests. There are repeated teachers' comments concerning the difficulty of the vocabulary level, and a number of comments that the lowest level students had particular difficulty with given units. This problem, stemming from the fact that English is the second language of this population, is made more complex by the registration of

students for adult education classes on a "first come, first serve" basis. As previously mentioned, this is done by the Manpower representative in each community, before the teachers' arrival, academic screening procedures not being conducted to determine applicants' level of ability. The 4.2% of students who failed to obtain the criterion mark may be those who had not obtained a grade four level in basic subjects.

Usefulness of The Pretests

Only the teacher in the village of Salluit recorded pretest scores. A number of pretest scores were recorded without posttest scores. The mean for pretests that have recorded posttest scores is 36.09%; the mean for pretest scores for units that have no recorded posttest score is 82.25%. It seems likely that the teacher suggested that the students achieving high scores on the pretest need not spend time doing the given units. In such a case, the pretests succeeded in accomplishing the goal of determining if the student had already mastered the skills presented in the unit.

Constraints

The collection of performance data was handicapped by the following factors:

(1) Use of this material began in the second semester; a number of students had already completed the older version of *Math 204* during the first semester.

(2) There were no administrative or teacher-support materials to indicate to the teachers the usefulness and importance of the pretests, the purpose of the formative evaluation, or the procedures that should be

followed in recording data. This lack seems to have worked in a number of ways:

a. One teacher, in Kuujjuarapik, refused to use the new version of *Math 204*. The pedagogical counsellor responsible for mathematics reported that this teacher felt insecure about using material with which she was unfamiliar and for which she felt unprepared.

b. Although instruction sheets were sent along with each aspect of the formative evaluation, it is possible that the teachers perceived the evaluation procedures as additional tasks, without much direct benefit either to themselves or the students. This may have led to a lax attitude towards recording performance data as well as to the curtailing or omission of certain other procedures.

(3) Prior to beginning the evaluation, the researcher had explained to the pedagogical counsellor responsible for mathematics the reasons certain evaluation procedures had been chosen, and what they were expected to accomplish. However, because the researcher could have no direct contact with the teachers during the formative evaluation period, queries had to be answered by the pedagogical counsellor over the telephone or in writing. Since the evaluation of *Math 204* is the first formative evaluation of instructional materials for the Kativik School Board's Adult Education Department, it is possible that queries and doubts about the efficacy of the evaluation procedures were not dealt with as fully as possible.

Phase B: TEACHERS' QUESTIONNAIRE

Subjects

Although teachers were paid for two hours of their time, they were under no obligation to complete the questionnaire. Nonetheless, five teachers did complete it, some adding lengthy comments and suggestions. One of the three remaining teachers had used only the old version of *Math 204* during the evaluation period; and the other two teachers had used sections of the new version with one or two students who had not completed any unit in its entirety. If direct contact with the researcher had been possible it is likely that these two teachers could have been successfully encouraged to complete the general and relevant specific sections of the teachers' questionnaire:

Although all teachers completing the questionnaire had taught before, one had not previously taught in the North, two had not taught adults, and three had not taught this level of mathematics. This lack of familiarity with characteristics of the students and/or the material may have led to instances of: (1) misinterpretation of the interactions that occurred during the teaching and learning process, or (2) misunderstanding of the instructional goals, objectives of subordinate skills or instructional strategy in *Math 204*.

Format

The teachers' questionnaire generally indicated that teachers felt the format to be adequate, although the length was rated as frustratingly long for some students. Although teachers tended to disagree (-.8) with the statement that students would learn better with fewer lines, boxes, arrows, etc., three teachers indicated the opposite in their comments, and made a number of

alternative suggestions. Since the teachers' questionnaire is relatively long, fatigue may have contributed to a lack of thought given to some ratings. Since three of the five respondents are not primarily anglophone, some questionnaire statements may have been interpreted differently from their intended meaning. For both reasons, greater weight should be given to teachers' written comments and suggestions than to the Likert rating of statements on corresponding topics.

Level of Difficulty

The issue of language level in instructional materials has been raised repeatedly in regard to the entire presecondary and secondary upgrading curriculum. It is a particular problem with entry level students, since many of them have not spoken much English and have not read any since having left the regular school system.

On the teachers' questionnaire the statements indicating that the level of language was too complex is negatively correlated with the statement that students were able to work on *Math 204* independently; however, both scores were relatively low (-.8 and +.6 respectively). A possible interpretation is that when the language level is appropriate students were able to work independently; however, the language level within *Math 204* was not seen as entirely appropriate.

The statements that students did not work independently in (1) interpreting the directions, and (2) working through the practice exercises were correlated for four units. This might indicate that because

students had difficulty understanding the directions, they therefore had difficulty carrying them out. Additionally, or alternatively, it might indicate that the trouble experienced in working through the practice exercises, even with help to understand the instructions, results from the nature of the exercises or of the students themselves. The exercises may not have been (1) of a homogeneous level of difficulty, or (2) appropriate practice material for the skills being taught. The students may have been fearful of making errors or simply in need of teacher attention and approval.

From teachers' comments it would seem that student characteristics accounted for some of the lack of independent work in the practice exercises. Unit 1 was rated second lowest in students' ability to work independently. It is likely that this is related to the novel structure of *Math 204* as well as of the school situation for these students. It is unlikely that it is related to Unit 1 itself, since a number of teachers commented that it is really a review of skills already mastered.

Unit 4, which introduced geometry, was rated lowest for students' ability to work independently. This seems a result of both student and material characteristics. The totally unfamiliar concepts, as well as the use of the compass and protractor introduced in this unit, seem to have caused students to react with an increased level of anxiety, which in turn made them turn to the teacher for assistance and support.

Interrelationship of Specifically Northern Content,

Level of Difficulty, and Student Affect

The rationale for redevelopment of large sections of the adult education curriculum is that the learning of Inuit adults will be improved if instructional materials use an instructional strategy appropriate to the target population. For *Math 204* this instructional strategy includes: (1) motivating devices such as the inclusion of specifically Northern content and specific choices for various format factors (typeface size, textbook/workbook format, etc.); (2) the use of vocabulary and sentence structure easily accessible to ESL students working at the presecondary level; (3) the appropriate choice of instructional objectives and sequence of presentation; and (4) analysis and presentation of subordinate skills that maximize the chances of student success on the posttests.

Answers in Part III of the teachers' questionnaire reflect a general impression of student attitudes and responses to *Math 204*; however, these general impressions were not always supported when translated into particular instances within given units (Part IV of the teachers' questionnaire). For example, the general statement that students were able to work independently in *Math 204* (Part III, question 31 on the teachers' questionnaire) significantly correlated with the specific statement that students worked independently in the instructional sections in Units 1, 2 and 5 but not in Units 3 and 4.

In Part III of the teachers' questionnaire, statements 28 (-.8) and statement 32 (-1) measure the teachers' perception of student affect towards *Math*

204 as a whole. These statements indicate rather (though not overwhelmingly) positive student affect toward *Math 204*. They are significantly correlated ($p < .05$), indicating strong inter-item reliability. However, they correlate only to the question referring to affect specifically for Unit 5, but not for the other units.

No significant correlation was found between statements 25, 26, and 27, Part III, which refer to specifically Northern content, indicating low inter-item reliability. A very high rating (+1.8) was given to the statement that examples and word problems with Northern content aid student learning (statement 27, Part III). No significant correlation was found between any statement referring to specifically Northern content and any statement referring to student affect (statements 28 and 32, Part III). It is possible that the inclusion of specifically Northern content aided student learning but was not related to student affect; however, other factors in the learning context or in the material might have influenced students' response to specifically Northern content and/or general student affect towards *Math 204*. For example, since these are the lowest level adult education students and are most likely new to the classroom, they may have disliked the discipline necessary to complete a mathematics program, this would account for the teachers' perception of only moderate positive student affect. The Northern content in *Math 204* is primarily in the form of familiar names and a number of isolated facts about the North. This form of specifically Northern content may have been seen as paternalistic or childish, further lowering student affect, although effective in improving student learning by relating the content to contextually familiar terms and facts.

Student affect seems to be more strongly related to other factors in the chosen instructional strategy than to specifically Northern content. Statements referring to an adequate definition of terms, an appropriate language level, and an appropriate and homogeneous level of difficulty throughout a given unit were significantly correlated with Statement 9, Part IV ("Students enjoyed working in this unit."). It is likely that these factors played a part in the high rate of student success in achieving the criterion pass mark, as well as in perceived student affect. It is unfortunate that no data from the student questionnaires were collected, since this would have deepened our understanding of the interrelationship of student affect, Northern content and level of difficulty.

Pretests and Posttest

Only the teacher in the village of Salluit recorded pretest scores; however, four teachers indicated moderate agreement (+.5) with the statement that the pretests did not clearly indicate the students' initial level of achievement. It is unclear whether these teachers administered pretests for which they neglected to record scores, or whether they rated the above statement simply on their own estimation of the value of the pretests. Only one of the teachers who did not use the pretests referred to them in comments on the teachers' questionnaire, stating simply that students were unwilling to do them. Teachers, however, had no manual or other support material that explained the purpose and usefulness of the pretests. If they had no idea why, or how, to use the pretests, it is possible that they made no attempt to overcome (and possibly even encouraged) students' reluctance.

The teacher who did use the pretests made a number of useful suggestions concerning their possible use as diagnostic tools.

In part III of the teachers' questionnaire, it was generally felt that the posttests clearly indicated student achievement (+.8); this statement is significantly correlated to the corresponding specific statements in part IV for units 1, 2 and 5. The posttest for Unit 2 was judged the best indicator. Unit 2 was also rated highest on adequacy of given information and amount of practice.

The posttest for Unit 4 received the lowest rating. The mean performance score for Unit 4 was the lowest and it was rated the lowest by the teachers on the adequacy of given information and on students' ability to work independently on the instructional sections, on interpreting the directions for the practice exercises, and the practice exercises themselves. Since no additional comments were recorded concerning the validity of the Unit 4 posttest, it seems that teachers were reacting to the difficulties of students on the posttest, rather than to the value of the posttest as an evaluation tool.

Design

Teachers generally rated the design of *Math 204* favourably, with the lowest rating (+1) going to the balance between instruction, exercises, and evaluation. Suggestions concerning alternative arrangements indicated that student self-evaluation should occur more frequently, and that the material should be organized so that sections already mastered could more easily be omitted. Suggestions were also made concerning the usefulness of 1) a

flowchart recommending various learning sequences, and 2) prescriptions for learning sequences which are tied into diagnostic information obtained from the pretests.

These comments seem to suggest that teachers did not encourage students to complete *Math 204*. Rather, the material seems to have been used, as needed, to help students increase mathematical skills. Teachers' suggestions seem to point to the need for revisions and teacher-support materials which would make more efficient use of the time spent in mastering the skills presented in *Math 204*.

Math 204 Within the Presecondary Program

Only four teachers rated the statements concerning (1) *Math 204* as adequate preparation for *Math 205*, and (2) the effectiveness of the new version of *Math 204* in comparison to the old version. Since three teachers had not previously taught mathematics at this level, it seems that the teachers who did not respond to these statements had no experience in using the old version of *Math 204*, or in using *Math 205*.

The adult education department has assumed that students entering the program already have the skills needed to succeed in *Math 204*. The statement that *Math 204* would be useful as review material for students at more advanced levels was only rated +.6. Teachers commented that, except for two topics (geometry and order of operations), *Math 204* is a review for most students. In other words, the entry level for the majority of students already includes most of the skill introduced in *Math 204*. That teachers

also felt *Math 204* was too difficult for the lowest level students is likely due to the uneven educational history of most Inuit adults, as well as the lack of screening procedures for admitting students to the academic upgrading program.

Concern was also expressed about the excessive length of time required to complete the material. This ties in with teachers' suggestions and comments concerning more efficient use of the material (e.g. flow charts for suggested learning paths through *Math 204*, a list of pages within each unit which corresponds to given pretest items).

Need for Teacher-support Material

Only four teachers responded to statement 38, part III that a manual would increase teaching effectiveness. The teacher who did not respond to this statement was the one who had the most Northern experience teaching this level of mathematics to adults. The statement was generally rated negatively (-.75). The teacher who had no experience teaching adults and none teaching this level of mathematics was the only one who strongly agreed with the statement.

Two others strongly disagreed with the statement; one disagreed a little. These three teachers had all taught in the North before 1986/87, although only one of them has formal training in education (for children).

The generally negative reaction towards teacher-support material in the form of a teachers' manual might be explained by the attributes required of

teachers in an isolated and relatively disadvantaged context. Since there is little or no support in the form of professional colleagues and material resources tend to be minimal, teachers are required to be independent and resourceful. Because of the vast distances there can be little or no on-going direct teaching supervision or pedagogical development, which allows teachers the freedom to determine their own patterns of classroom organization and teaching practices. It seems that some of the teachers, perceiving a teachers' manual to infringe on their autonomy, responded negatively to this item. Additionally, those teachers with no background in the field of education may have felt that admitting to a need for teacher-support materials implied a lack of competence.

On the other hand, statement 39, part III ("Suggestions for remedial exercises to address specific student problems would increase the effectiveness of your teaching") received a generally positive rating (+1.4). This might be due partially to the word "suggestions", which does not seem to pose a threat to autonomy. Three of the teachers, not having previously taught this level of mathematics, were probably unfamiliar with auxiliary mathematics materials in the classroom. It seems that these teachers would be particularly receptive to "suggestions for remedial exercises".

Discussion of Specific Units

Statements 1 and 2, Part IV, which refer to the clarity of the goal and objectives of each unit, were rated highly for all units, though teachers were given no formal list of goals and objectives. This perceived clarity seems to be due partially to the elementary nature of the content of *Math 204*, and

to the fact that the goals and objectives of each unit were quite easy to discern (since teachers generally felt that the information was presented in a logical sequence [statement 6, Part IV]). Statements referring to the logic of sequence of presentation and the clarity of goals were correlated for units 4 and 5; the statements referring to the logic of sequence presentation and the clarity of objectives were correlated for Unit 5.

Other factors common to all units, such as level of difficulty and student affect, will not be repeated in the following discussion.

Unit 1

One of the lowest scores in Unit 1 was given to the statement concerning the homogeneous level of difficulty among sub-sections (-.4). The sub-sections of greatest difficulty, according to teachers comments, are the ones on place value and rounding of numbers. Although teacher opinion is divided about the importance of including this material at the entry level, there is general agreement that the language level in this unit is too difficult for the most elementary section of the mathematics curriculum. The teachers' comments point to the fact that students generally have the mathematical skills but not the verbal skills.

Unit 2

One of the lowest scores was given to inclusion of unnecessary information (0). According to teachers' comments, the unnecessary information includes: (1) the identification of steps involved in solving word problems; and (2) practice in doing addition, using numbers from one to twenty. The former was felt to be redundant and to involve unnecessarily difficult language; and

the latter was also felt to be redundant, since students generally had already mastered this skill. These comments further point to the difficulty in predicting the actual entry level of incoming students.

Unit 3

This unit rated the lowest on student affect (+.4) and teachers' comments pointed to the perception of long division by most students as a chore, although the content was generally well presented and included adequate skill practice. This feeling was reinforced by the excessive length of some of the practice exercises and the overly high level of vocabulary in some of the word problems, which prevented independent work. The lowest level students found this unit to be a stumbling block and, after completing the unit, continued working on the content from auxiliary sources.

Since there seems to be pre-existing negative affect towards the content of this unit, it is an excellent example of the difficulties arising from the exclusive use of individualized modules. Students experience the lack of social stimulation which would normally be provided by a variety of class, or small-group, activities. Also, the oral/aural component of communication and second language education is notably lacking, leading to repeated comments by teachers concerning the difficulty of the vocabulary level.

Unit 4

Teachers' comments indicated that the content of Unit 4 was new to most students. This is supported by the range in performance scores for this unit, which is the lowest, since students generally had the same entry skills. Comments also emphasize the difficulty in using a format of individualized

modules to introduce new material to students working at an elementary level, and to teach a manipulative skill, such as use of compass and protractor. This difficulty was illustrated by the frequency with which students had to request help from the teacher. Teachers also indicated that student anxiety was relatively high in approaching unfamiliar content, but that generally they enjoyed doing this unit because of its novelty and its inclusion of manipulative tasks. Since the entire academic upgrading program is based on individualized modules, it is understandable that any novel activity would be a powerful stimulus to positive student affect.

Unit 5

Generally low scores are given to appropriateness of the level of difficulty in this unit. This is reflected in the range of performance scores for this unit (70), which is the highest.

There is a significant negative correlation between student affect (statement 9) and the homogeneous level of difficulty among sub-sections (statement 10). Teachers' comments pointed to the word problems and "order of operations" as the sub-sections which caused students to ask for help most often.

Compared to the other units, this unit received the highest score for clarity of objectives and adequate integration of sub-skills. This is puzzling, since teachers raised questions concerning the rationale for introducing fractions at this point, and for grouping "mastering division" and "order of operations" in the same unit.

Phase C: STUDENTS' QUESTIONNAIRE

The student questionnaire aims at determining the student's affective response to the material. Although, on the teachers' questionnaire, we have collected some information concerning student affect, this additional source of information would have increased the sensitivity and depth of analysis, possibly pointing towards interacting context-dependent variables. The reason no usable data were collected in this study may lie: (1) with the teachers; (2) with the students; or (3) with the questionnaire itself.

Math 204 was sent in the last half of December and arrived in the Northern communities by mid-January. The teachers had had very little opportunity to become familiar with this new material by the time the pedagogical counsellor responsible for mathematics introduced them to the students' questionnaire (second week in February). As reported, teachers' initial reaction to the students' questionnaire was negative; they felt that students would not respond favourably to requests to fill out the questionnaire, and they themselves were unwilling to insist that it be completed. It seems that unfamiliar materials, arriving without teacher-support materials, coupled with unfamiliar evaluation procedures, caused teachers to balk at this point. Since they had made no previous attempts to administer a questionnaire to their students, their initial assessment of probable student reaction seems to have little basis in past experience.

Even if teachers had fully cooperated in administering the questionnaire, it is possible that students would have been unwilling to complete it. Since the classroom experience is likely an anxiety-provoking one for this population, the questionnaire might have added an additional unfamiliar and worrisome

element. Or alternatively, students may have cooperated happily, but invalidated the questionnaire by being unwilling to express disapproval. A number of scores on the three questionnaires that were collected express various degrees of disapproval; however, there is inadequate information to conclude that students in all villages would have thoughtfully and honestly indicated their reactions on the questionnaire.

Although the questionnaire itself uses simple sentences and elementary vocabulary, it is possible that such an unfamiliar procedure would seem complicated and intimidating to the students. The teachers' questionnaire indicated that students had difficulty understanding the instructions for the practice exercises. This difficulty might have extended to understanding the instructions given on the students' questionnaire; if this were the case students, initially willing to cooperate, might have withdrawn from the procedure.

On March 16, 1987, the pedagogical counsellor responsible for mathematics sent a memorandum to the teachers requesting that the questionnaire be brought to the students' attention and that the decision concerning its completion be left up to the individual student. Although three completed questionnaires were collected, there is no conclusive information as to why one teacher chose to administer it while the rest did not. The fact that this teacher has a degree in education, experience teaching this level of mathematics, and six years teaching experience in the North (three of them with adults), may be relevant. Since she is very familiar with the context and the student population she may have been confident enough to encourage students to complete the questionnaire: since she had previously

taught this level of mathematics, she was likely aware of the role evaluation plays in the development of appropriate instructional materials.

Phase D: EXPERT REVIEW

The role of the subject matter expert within the formative evaluation process is to comment on the accuracy and currency of the instruction. This review should be done upon completion of the first draft so that suggested modifications can be considered by the designers (Dick and Carey, 1978).

Although the Kativik Adult Education Department is committed to an extensive program of curriculum development, it is still in the process of establishing the procedural steps in the design, development and evaluation of materials. Since an expert review by a subject matter specialist was omitted entirely from the development stages of *Math 204*, the decision was taken to incorporate it into the formative evaluation of the material.

The chosen mathematics specialist did not have first-hand experience with the target population, but she had worked with other native adults. It was expected that, from those experiences, she would be able to make useful generalizations concerning the relevance of *Math 204* for the target population; however, she did not feel that she could do so with any authority.

Although most suggested modifications are related to technical accuracy, it is notable that both the subject matter expert and the teachers raised a number of questions concerning: (1) the relevance of introducing geometry at this level, and (2) the excessive length of Unit 3. Had the expert review

been incorporated into the development process, rather than into the evaluation process, it is probable that these deficiencies would not have appeared in the field-tested version of *Math 204*.

Chapter 5: CONCLUSIONS

REVISION OF *MATH 204*

Course objectives, unit objectives and subskill objectives should be clearly indicated, for use by both teachers and students.

Directions for the practice exercises must be clarified throughout *Math 204*

A glossary of terms used in the instructional sections and in the directions for the practice exercises should be added. Instruction on how to use such a glossary must be given.

Math 204 should be shortened. This can be accomplished by eliminating Unit 4 and shortening the sections containing practice exercises for addition and subtraction. Teachers should be given directions concerning sources of auxiliary materials for those students who need addition practice. The material will be used more efficiently and hence student time shortened if teachers are supplied with flow charts for suggested learning paths through *Math 204*, and a list of pages within the unit which correspond to given pretest items.

An answer key for the practice exercises should be supplied to each classroom. The pages of *Math 204* should be numbered consecutively from beginning to end and a detailed table of contents should be placed at the beginning.

Observations by the expert reviewer and the teachers concerning the accuracy of the material should be incorporated in the revision process. The graphics (lines, arrows, boxes, etc.) should be simplified.

A clear marking scheme for the posttests should be provided so that teachers are aware of the relative value of test items as well as of the overall value of the posttest.

CRITERION

The criterion which will best allow students to succeed at the next level should be determined. Although the criterion set by the MEQ cannot be changed, a different criterion can be adopted as an internal department policy. This can be accomplished by the use of designated exercises (embedded tests) to formatively evaluate if the student has mastered each subskill to the chosen criterion. Comprehensive review exercises at the end of each unit will indicate if it is likely that the student's performance will reach the chosen criterion on the posttest. If performance does not reach this criterion on the review exercises, teachers should direct students to auxiliary sources for further skill practice. Recommendations for remedial practice material for each subskill should be supplied to the teachers.

THE DEVELOPMENT PROCESS

The two teachers who were hired to develop *Math 204* did not have training in instructional design, nor did the adult education department provide them with clear guidelines, procedures, or principles prior to commencement of

the project. According to Dick and Carey the steps in the instructional design process are: (1) identifying the instructional goals; (2) conducting the instructional analysis; (3) identifying entry behaviours; (4) writing performance objectives; (5) developing criterion-referenced test items; (6) developing the instructional strategy; (7) developing and selecting instructional materials; (8) designing and developing a formative evaluation; and (9) designing and conducting a summative evaluation. Dick and Carey (1978) suggest that the subject matter expert can contribute to the design process in stages (1) through (7) and that the material should be scrutinized by an individual familiar with the target population. Although *Math 204* was written by individuals familiar with the target population, the subject matter specialist was omitted entirely from the development process.

If the adult education department continues to feel that the involvement of teachers in the development process is beneficial, not only for the quality of the products, but also for other aspects of adult education in Northern Quebec, the following options exist.

- a. Training in instructional design and development can be given to the teachers, prior to the commencement of a project. The first draft should be submitted to an instructional designer of greater experience and to a subject matter expert, for comments and suggestions.

- b. The design and development can be done by an expert in instructional design, in consultation with (i) teachers who are familiar with the target population, and (ii) a subject matter specialist.

STUDENTS' MANUAL

Since the teacher has to divide his/her attention among students working at multiple levels, any aid to students' ability to work independently will also increase the efficient running of the upgrading program. A students' manual should detail how to use the resources of *Math 204*. It should give, in simple language, the objectives and an overview of the material, and explain why a pretest begins each unit and how it should be used. If the material is to be formatively or summatively evaluated, those procedures which require the students' cooperation should be explained.

TEACHER SUPPORT MATERIALS

Teachers' Manual

The development of a teachers' manual seems imperative, given the diversity of teachers' backgrounds. The sample described in this study can be considered representative of those that will use *Math 204* in the future. A carefully designed manual will provide some of the support and structure otherwise lacking for teachers working in isolated, and possibly unfamiliar, situations.

Such a manual should provide an overview of the entire presecondary mathematics curriculum. This will help teachers new to the Northern context to see how the program fits together. The characteristics of the target population should be described in detail to help prepare teachers for the uneven achievement levels that will be encountered among students with diverse educational backgrounds. The manual should provide a general description of *Math 204* and carefully explain the rationale for the format of individualized modules as well as the pretests that accompany each unit. A teachers' manual would be the appropriate location for suggested remedial exercises to address specific student problems. Peer tutoring techniques should be described and the suggestion given that teachers integrate them in the classroom whenever possible. If a formative or summative evaluation is planned, procedures which require the teachers' cooperation should be detailed.

The teachers' manual should be formatively evaluated after three months use by teachers in the communities.

Teacher Training

Teachers in the adult education department attend one week of pedagogical development prior to the first semester and one week in the middle of the second semester. The time tends to be tightly scheduled and, as reported by the pedagogical counsellors responsible for professional development, teachers complain of "information overload".

Training in the use of *Math 204* or any other newly developed material, would increase its efficient use in the classroom. Although a short training

session could be conducted during the pedagogical days, an individualized medium would allow teachers to receive the training at their own pace and in a more peaceful environment.

Since each village, as well as the administrative offices of the school board (located in Dorval, Quebec) is equipped with VCR's, this is the preferred medium. This training should be developed in several units. The first, conceived as a general orientation for teachers who have never previously taught in the Arctic, should be used prior to travelling to the North. It should include the following topics: a brief history and sketch of economic and daily life in arctic communities; a brief history of education in Northern Quebec and an overview of its present structure; a more detailed look at the organization of the presecondary and secondary academic upgrading program; and, a look at the facilities and materials generally available to an adult education teacher. Each subsequent unit should correspond to one newly developed portion of the curriculum and should include the following topics: a statement of the objectives chosen and the rationale for their choice; a description of the organization of the material and the chosen instructional strategy; an explanation of procedures to be followed in pre- and posttesting; a demonstration of the administration of unusual procedures such as games or the use of equipment; and an explanation of formative or summative evaluation procedures. These subsequent units should be available in each village so that teachers can refer to them as needed.

Some of the topics suggested for the second and subsequent units of teacher training materials are also suggested for inclusion in the teachers' manual.

Because of the extreme professional isolation of these teachers and their widely differing backgrounds, this redundancy is requisite if one of the goals of teacher training is for the content and quality of the instruction to remain consistent from community to community. The Adult Learning Centres, opened on an experimental basis in the communities of Quaqtaq, Kangiqsuk and Tasiujaq in 1986 will be maintained; a new centre will also be added in the 1987/1988 academic year, in the new community of Amiviaq. The full-time adult education teacher placed in each centre and provided with self-teaching instructional materials is seen as a coach or tutor. For these teachers, in particular, extensive teacher support materials are essential.

INDIVIDUALIZED MODULES

The entire academic upgrading program is organized according to individualized modules, which are designed to allow students in multi-level single-teacher classrooms to work as independently as possible. This kind of individualized written instruction does not fully address the students' needs, because (1) aural/oral practice is essential in mastering a second language and (2) students tend to feel isolated since they have no learning or social contact with each other in the classroom.

Although the use of other media would provide some diversification of student activity, a cost analysis has already shown that the development of instruction, in any medium but print, is too costly for the small target population involved. An unusually large number of games have been described by ethnographers and early explorers who have lived among the Inuit. Today, games -- ranging from open-ended hockey games in the

middle of the village to marathon Scrabble sessions and Bingo or poker games at night -- are played with passionate involvement both by children and adults, in and outside of school. Games are invented and incorporated into major and minor occasions with remarkable spontaneity (Corber, 1987). Coleman (1967) has said: "The school model has none of the remarkable lifelike properties that a game has, but appears to be a simplistic use of the fact that information is transmitted by communication and that repetition aids learning." In the past the Inuit used games to practice skills and to instill values. In games "the learner is always *learning to act by acting*...learning is incidental to his goal; the goal is not learning itself."

Given how strongly games are rooted in the Inuit culture, both past and present, they have great potential as a learning tool within the adult education program. Some of the advantages of using games and simulations within this program are ones that apply to many learning situations. A successful game stimulates interest and motivation by providing social stimuli that are integral components of the learning situation (Mitchell, 1982). Players may challenge and correct inappropriate behavior, thus providing supplementary instruction in an individualized and informal way. In Adult Education classes, where the teacher has to divide his/her attention among students working at many levels, the advantages of students providing each other with supplementary instruction are obvious. In the classes as they are currently organized, with students working alone on individualized modules, the advantages of introducing social stimuli as integral components of the learning situation are even stronger than in traditionally taught classes.

Games designed for this context have a number of practical restrictions. Because of the individualized nature of the academic upgrading program and the chronic lack of classroom space in the North, they generally must be designed so that they (1) are not too distracting to others working in the same physical area, and (2) do not take up much space either to play or to store (a traditional restriction, as well). Because the teacher would most likely have to divide his/her attention among those students working on modules and those students playing a game, the equipment and procedural rules should be as simple and clear as possible. Rules written in English for second language users could produce confusion since Inuit may not infer, generalize or interpret a written rule or an event as we would. Not only must the language be very carefully used but terms must be scrupulously defined.

THE CURRICULUM DESIGN PROCESS

Instruction is the solution to a problem, and it is generally accepted that the instructional design process begins with the identification of a need -- a gap between what is and what should be (Dick and Carey, 1985). The goal of the presecondary upgrading program is to allow students to enter the secondary program and eventually to obtain their high school leaving diploma. *Math 204* was developed to provide Inuit students with material that (1) covers content that must be mastered as entry level skills for the secondary program; (2) is at an appropriate language level; and (3) is relevant to the Northern context.

Needs Assessment

It would be beneficial if the adult education department adopted what Kaufman (1972) terms an inductive model of needs assessment. In this model the goals, expectancies, and outcomes for education are first obtained from the members of the subcommunities; the program is then based on these data. The subcommunities in this case are the students themselves, their communities (represented by the local school committees), and the educators. The steps in this model are to determine how the students are behaving now; compile and classify behaviours into programs and behaviour expectancies; compare these to existing broad goals and reconcile discrepancies; set detailed objectives, develop and implement educational programs and evaluate their outcomes. In identifying needs, objective data should be used as well as subjective data.

A needs assessment is a continuing procedure (Kaufman, 1972). The world of the Northern Quebec Inuit, to which the Kativik adult education department is responsible, is a changing one. Revision must be built into the design process.

Content and Language Level

An instructional analysis of skills required to enter the secondary program should be conducted prior to designing the presecondary curriculum. If such an analysis had been done, the unit on geometry would have been excluded from *Math 204*.

After the instructional analysis, the preliminary stages of development also include identifying entry behaviours, writing performance objectives, developing criterion-referenced test items, and developing the instructional strategy. Once these have been accomplished, it will be cost effective to search out already-prepared instructional materials. This in no way precludes the development of portions of the curriculum specifically for the target population. However, instructional materials for second language adults are available commercially, through other adult education departments, or through adult literacy programs in the United States. Portions of selected instructional material will likely be found to be appropriate for use, or adaptation, within the upgrading program.


Teachers pointed out repeatedly that although the mathematics in *Math 204* was easy for most of the students (since it was generally a review of skills already learned) the language level was difficult. English language skills that fall below the level required to master academic content is a problem throughout the entire presecondary and secondary program. Use of already-available instructional materials will allow a portion of the curriculum development budget to be used for other purposes. The area most likely to improve student learning at all levels, but particularly the lowest level of the upgrading program, would be the introduction of instruction to address directly the problem of learning English as a second language.

Specifically Northern Content

One of the operating principles of the Kativik School Board is that materials in a second language be developed specifically for Inuit students, in close

consultation with Inuit educators, and reflect the changes in northern society (Anngutivik, 1986). The adult education department must decide how this principle will be interpreted within academic upgrading and vocational courses that will be developed for the adult population.

The Northern content in *Math 204* is primarily the use of Northern place names, and a number of isolated facts about the North (e.g. "An Air Inuit airplane can fly 7 kilometers on a liter of fuel.") This type of Northern content is intended primarily as a motivating device. During the development process Inuit educators were not consulted, nor was the discussion focussed on how a presecondary mathematics program can reflect changes in Inuit society. As Reigeluth (1983) points out, it is important to relate new knowledge to a learner's experience. Learning is aided when- (1) a new generality can be applied to already available instances; (2) a reference example can be supplied to facilitate visualization; (3) retrieval occurs because a link is created to the new knowledge from past experience; and (4) the organization of memory allows new knowledge to be related to already mastered subordinate ideas. Northern content would be more effective if included, not only as a motivating device, but as part of the instructional strategy aimed at aiding acquisition, organization and retrieval. Although the form and details of such a strategy must be developed in consultation with Inuit educators, it might use content specific to the history, present concerns, and aspirations of Inuit in developing mnemonics, sequencing (general to detailed), synthesizers, instances, analogies and cognitive strategy activators. It is likely that many cognitive strategies will have to be taught before they can be effectively used.



RECOMMENDATIONS FOR EVALUATION

Evaluations that are planned well in advance will allow the researcher to have direct contact with the teachers during the pedagogical week prior to the first semester, which is held in Dorval, Quebec. At this time several aspects of particular evaluation procedures can be explained: (1) why they were chosen; (2) their description; and (3) instructions concerning the handling and collection of the evaluation instruments and procedures for collecting test scores. Teacher training in the administration of new materials, as well as a teachers' manual, will increase the probability that the materials' potential will be maximized during the field testing period and that performance and other evaluation data will be collected.

As previously mentioned, future curriculum development projects should incorporate the expert review when the first draft of the material under development has been completed. An ideal formative evaluation would then require developmental testing with an individual and/or a small group of students working at the level of the target population. This is both costly and time-consuming, and not feasible in the given situation. Nonetheless, based on the experience of evaluating *Math 204*, if the developers and/or the expert reviewer feel that there may be problems of affect, instructional design or level of difficulty with particular sections of the material, an effort should be made to developmentally test those sections with an individual or small group of the target population. The feedback from these sessions should be in the form of a written or audio record of the learners' questions,

comments and suggestions (Weston, 1986). This procedure does not have to be carried out in the setting in which the final product will be used.

The teachers' questionnaire yielded useful information about *Math 204*, and an adapted and somewhat shorter form could be used in the evaluation of other curriculum development projects. The administration by telephone of an open-ended questionnaire would motivate the teachers to fully cooperate in the evaluation procedure by providing the opportunity to discuss reactions to and problems with the material. Teachers should continue to be paid for their participation in evaluation procedures. Questions should be added which are designed to determine the effectiveness and efficiency of the chosen type of Northern content in achieving given educational objectives. Since there is no existing research on this topic, information from these questions will help in the process of determining precisely what kind of specifically Northern content is effective in increasing learning and positive affect for this target population.

Successful collection of feedback from students will contribute a further useful source of information. Some feedback may be obtained during the development process if sections of newly developed material are formatively evaluated with an individual or small group of students. An attitude survey would be a useful source of information about student reactions to newly developed material during the field testing phase. If teachers have the support of a manual and training sessions for administering such a survey or questionnaire, they will likely be more willing to attempt this form of data collection and to see if, in practice, students are unwilling to cooperate.

Although students can join the upgrading program any time that places become available during the semester, the majority of students are enrolled prior to the first semester. Materials written for the lower levels should be field tested during the first semester, when more incoming students will be working at that level.

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APPENDIX I

Table of Contents: *Math 204***Unit 1**

<i>Pretest</i>	1
Number Theory	
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Reading and Writing Numbers	18, 21, 48
Greater and Less Than	27
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Unit 6

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Order of Operation Review	13

APPENDIX II

Sample pages from *Math 204*

One page from each of five units

Words found on cheques

- Amount** - The total value of something. "What was the **amount** of your last paycheque?"
- 'Pay to the order'** - This line names the person or company that will get the cheque.
- Signature** - The name of the person who signs the cheque.

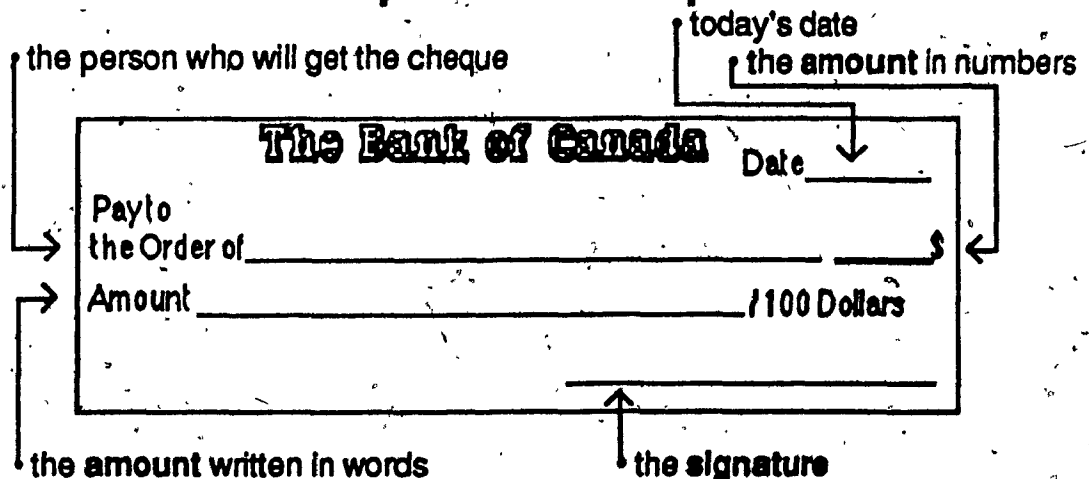
Math Symbols for Dollars

Often we see ten dollars written \$10. The new international way to write ten dollars is just as you say it, 10\$. Notice the difference:

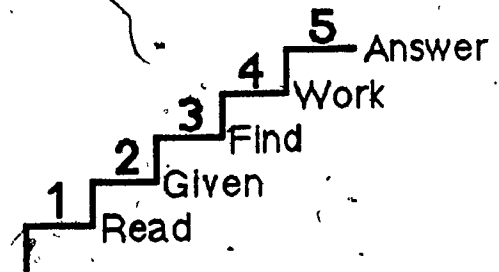
<u>old way</u>	<u>new way</u>
\$10	10\$

We all use cheques in our everyday lives. We get government cheques, work cheques, personal cheques, and so on. When writing a cheque, make sure that you write the **amount** in words correctly. Below is an example of a cheque and its different parts.

The personal cheque



Remember the **five steps**
when solving word problems.



Now you try it!

Example: 2

Adamie and his brother Charlie went ptarmigan hunting. Adamie shot four ptarmigan while Charlie shot five ptarmigan. How many ptarmigan did they shoot all together?

Ask yourself

1) Did I **read** the problem carefully?

Ans: Circle yes or no

2) What is **given**?

Ans: _____

3) What I am asked to **find**?

Ans: _____

4) **Work**: What do I do to find the answer?

Ans: _____

5) Write out the **answer** in a complete sentence.

Ans: _____

? ? ? EXERCISE

Working at the Co-op

	Work Area
1) Jobie worked 8 hours on Monday, 6 on Tuesday, 9 on Wednesday, 8 on Thursday, and 7 on Friday. If he was paid 8\$ an hour, how much did he make during the week? Ans: _____	
2) The payroll each week at the Co-op is 1 925\$. This is divided among 7 part-time workers. How much will each worker get? Ans: _____	
3) The Co-op received 12 cases of juice. Each case contained 24 tins of juice. How many tins of juice did the Co-op receive in all? Ans: _____	
4) One Co-op made 877 526\$ in 1986. How much did the Co-op make each month? Ans: _____	
5) You are the manager of a Co-op. You order: 480 pops at 2\$ each, 675 litres of milk at 1\$ each, 70 cases of tin food at 12\$a case, and 1 652 tins of carnation at 1\$ each. How much will the total cost of the order be? Ans: _____	

JUST FOR FUN

Draw as many different lines as you can through the point below.

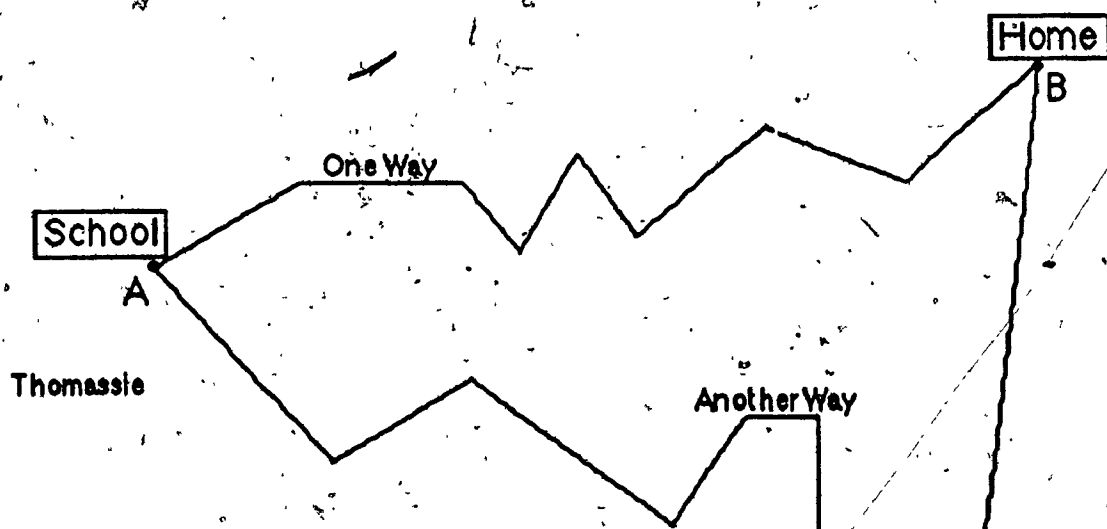
A

Draw as many different lines as you can through points A and B below.

A

B

Tomassie wants to get from point A (school) to point B (home). Which way is shorter?
Remember to use your compass to measure.



ORDER OF OPERATIONS¹⁰⁷

Operation-

There are 4 operations:

$+$, $-$, \times , \div .

Brackets



Brackets look like curved lines

() Brackets are used to "close" off numbers that have to be added, subtracted, multiplied, or divided. We use brackets to help us do more than one operation ($+$, $-$, \times , \div) correctly. Below are some examples of how we use brackets:

ex. $(3+6) \times 3$

9×3

Ans: 27

ex. $(2 \times 3) + 11$

$6 + 11$

Ans: 17

Operation Rules

When you work with more than 2 operations, such as $4 + 6 + 8 - 7$, everyone must agree to follow the same rules; otherwise, everyone will get different answers. Rules are as important in Mathematics as they are in real life. Did you know that there are over 75 rules in the National Hockey League rulebook? To understand why rules are so important, study the following example:

$$9 \times 2 - 7 \times 2 + 5$$

Let's say three different students (Timiac, Jesse, and Eva) worked on the problem. Each got a different answer:

Timiac
27

Jesse
9

Eva
77

Who's Right?

APPENDIX III

Written instructions to teachers
regarding the evaluation of *Math 204*

EVALUATION OF MATH 204

TEACHERS' INSTRUCTIONS

As you know, Math 204, written during the summer of 1986, was sent up to the communities for you to start using in January 1987. This initial period of use can be considered as a field test. Your cooperation is requested (in fact, it is essential) in gathering the necessary information for the revision of Math 204.

There are three elements of the evaluation which involve teachers:

1 • Please, carefully record all student pretest and posttest marks on the form labelled Record Sheet Math 204.

* Bring this sheet down with you when you return in May.

2 • Before each posttest have the student complete the questionnaire called Math 204, Student's Evaluation of one Unit.

It is quite likely that many students will need some help filling out this questionnaire for the first few units. Please make sure that:

- the student understands the purpose of the questionnaire and the fact that it cannot effect his/her marks.

- the student understands each question and the choice of answers

- the student completes the entire questionnaire including:

- name
- number of unit
- all questions

*Please, bring these questionnaires with you when you come South in May.

3 • After having used Math 204 for one semester you will be asked to complete a detailed questionnaire concerning its value.

Thanks for your cooperation!

Math 204 Formative Evaluation Teacher's Questionnaire

Earlier in the semester you were requested to help with two important aspects of the formative evaluation of Math 204. These aspects are:

- 1 • carefully recording all student pretest and posttest marks on the form labelled "Record Sheet Math 204".

**PLEASE BRING THE RECORD SHEET WITH YOU
WHEN YOU RETURN IN MAY**

- 2 • having students complete the questionnaire called "Math 204 Student's Evaluation of one Unit" before taking each posttest.

**PLEASE BRING THE STUDENTS'
QUESTIONNAIRE WITH YOU WHEN YOU
RETURN IN MAY**

This is the third and final element of the evaluation of Math 204.

It is an extensive questionnaire which may take up to two hours of your time. Kativik has agreed to pay for this time at the rate of \$15.00 per hour (for up to two hours), so keep a precise record of how long it takes.

How to Complete the Questionnaire

- The first three sections are:
 - I. Personal Information
 - II Information about the format of Math 204
 - III Information about the content of Math 204

Please, answer every question. Tick one box only for each question.

- Each of the next six sections evaluates an individual unit of Math 204.

If there are any units of Math 204 which you did not use with at least one student, please do not complete those evaluation sections(s).

While completing the questionnaire sections which evaluate individual units use a copy of Math 204 as a reference and a reminder.

Each section contains fourteen questions. Tick one box only for each question.

There is additional space provided for your comments and examples after each question. Please feel free to comment and give examples since these will be a great help in revising and improving Math 204.

**PLEASE BRING THIS QUESTIONNAIRE WITH
YOU WHEN YOU RETURN IN MAY**



DATE: MARCH 16, 1987
 TO: Mathematics Teachers (English) Adult Education services
 FROM: Micheline Chartrand, Pedagogical Counsellor
 SUBJECT: Teachers' Questionnaire for the Evaluation of MATH 204

As mentioned during ped. days, we are forwarding the above mentioned questionnaire along with the directions prepared by Tzippy Corber, the person who developed the questionnaire. We would appreciate that you carefully fill it out and bring it back with you when you return in May.

The results of this evaluation will help, not only in revising Math 204, but also in future development of teaching materials.

I personally informed Tzippy Corber of the content of our discussion at ped. days. She is aware that the students are reluctant to fill out the students' questionnaire and that the teachers expressed certain reserves with respect to the evaluation process.

Concerning the matter of taking into account the reason why each student uses the book, as well as the number of students working in it, Tzippy replied that this information is retrieved through the "Record Sheet" and will be taken into account. For instance, the gap between results in pretests and posttests indicates if the student had covered or not the subject matter in previous years.

Consequently, if you want this information to be considered, it would be advisable to fill out the form labelled "Record Sheet Math 204" which was forwarded along with the students' questionnaire. Regarding the latter, you recommended at ped. days that it should not be filled out by the students; nevertheless, would it be possible to bring it to the attention of the students and to leave the decision up to each one of them? Some students might wish to collaborate and it would provide us with some feed-back from their part.

I leave this last matter to your professional discretion and thank you for your collaboration.

Micheline Chartrand

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APPENDIX IV

Record sheet for recording pretest and posttest scores

subject & village	age	unit	obtained score
male 1 - Tasujuaq	18	1	80
		2	100
		3	70
		4	60
		5	90
male 2 - Tasujuaq	18	1	100
		2	95
		3	87
		4	64
		5	90
female 1 - Kuujuaq	25	1	85
		2	72
female 2 - Kuujuaq	21	2	65
female 3 - Kuujuaq	21	1	85
		2	42
female 4 - Kuujuaq	21	3	85
		4	62
		5	72
female 5 - Kuujuaq	21	2	53
female 6 - Kuujuaq	33	3	53
		4	72
		5	78
female 7 - Kuujuaq	20	4	60
		5	60
female 8 - Kuujuaq	23	3	91
		4	81
female 9 - Kuujuaq	18	3	74
male 1 - Kuujuaq	25	2	94
		3	66
		4	56
		5	30
female 1 - Salluit	19	2	80
female 2 - Salluit	25	4	80
		5	100
male 1 - Salluit	?	4	73
		5	93
male 2 - Salluit	?	1	60
		2	80
male 3 - Salluit	28	2	100
		4	86
		5	86

APPENDIX V

Demographic information
of students who completed
Math 204 posttest
and
posttest scores

APPENDIX VI**Comments on Teachers' Questionnaire
- Concerning Unit 1****Level of difficulty**

Three teachers commented that place value and rounding numbers should have more practice exercises since these two subsections were more difficult for students. Some of the weaker students were unable to master rounding of numbers and yet were able to go on to Unit 2 and Unit 3.

Two teachers commented that the unit is too abstract and requires too much vocabulary with which students are unfamiliar. Two teachers mentioned that the language level is more difficult than the math level. Another suggests that less emphasis be given to place value and that the objectives of this unit be made clear to the students. However, a third teacher felt that number theory, especially place value, rounding, and the notion of a balanced equation, are essential at this level.

Comments by individual teachers on specific items:

- "There is too much variation in approaching the instructional sections, for example, page 7 in comparison to page 13."
- "The first exercise on page 24 seems useless since the students just copy the numbers without thinking."
- "The exercise on keeping things straight (page 37) should be closer to exercises on place value (page 13)."

• "The examples of cheques should have an account number. The exercises on writing cheques should use smaller amounts that have both dollars and cents (eg. \$ 29.65). Two teachers pointed out that an example of a completed cheque should be provided . "

• "An abacus should be provided to each classroom."

• "In the exercise 'word form' to number form' the students seem not to really read the text but simply to jump from one space to the next."

APPENDIX VII

Comments on Teachers' Questionnaire concerning Unit 2

Three teachers mentioned that students don't need as much practice in adding numbers from one to twenty, since they seem to already have this ability. "For most students most of this unit is a review." One teacher suggested that "There could be more exercises in subtracting with zero, since some students have difficulty mastering this idea."

Four teachers mentioned that the students had difficulty with the word problems. The following is a synthesis of their comments. "Students found the problems the most difficult part of this unit and a simpler way to teach them should be found." If word problems have to be introduced so early in the book, simpler language and only simple sentences should be used. "The goal of 'How to solve a word problem' is unclear; students generally can't work independently when they have to identify the five steps to solving problems." One teacher suggested that, in practice, solving word problems involves; 1) reading twice; 2) finding the key words and the operations they imply; and 3) working out the problem. Complete sentences should not be demanded from students in their answers to word problems. "The concept of 'given' and 'find' was very difficult, even though students could easily get the answer."

The following are comments by individual teachers:

- "Less emphasis should be given to ~~fact~~ families."

- "Rounded numbers for addition is unnecessary information."
- "The 'Just for Fun' problems are more frustrating than funny."
- "The exercises on borrowing, pages 56-58, are confusing to many students and should be deleted."

APPENDIX VIII

Comments on Teachers' Questionnaire concerning Unit 3.

Teachers felt that although Unit 3 is adequate, students generally do not enjoy division, no matter how well it is presented. For the lowest students this unit was a stumbling block, particularly because of the level of vocabulary used; they needed to continue working on this subject matter using supplementary material. Students generally found sub-sections with rounded numbers and word problems more difficult than others. The section on converting units of time was also difficult for most students.

"Students found the warm-up exercises (pages 15, 16, 30, 38, 78, 79) more difficult than the actual word problems, and generally needed help with them."

Suggestions on specific items:

- "More examples of word problems should be provided before students are asked to do them on their own."
- "There should be more exercises on dividing with one digit divisors, before going on to two digit divisors."
- "A little more information on borrowing should be given, recapitulating place value beforehand."

- "The exercises on complex multiplication and division are too long for most students." "The exercises should be shorter, and, if remedial work is necessary, other sources should be exploited by the teacher."

- "Converting English words into numbers and vice versa is redundant at this point."

- "A posttest that didn't require complete sentences would be a fairer assessment of math ability."

APPENDIX IX**Comments on Teachers' Questionnaire
concerning Unit 4**

One teacher found that the goal of this unit was unclear and that (if the purpose is to learn how to measure distance and angles and to identify shapes) this material could be presented later. In general, students doing geometry for the first time asked for help frequently, particularly in understanding the directions for using compass and protractor. Nonetheless, students enjoyed this unit because it was new, different, and included manipulative tasks such as measuring and drawing.

Comments on specific items:

• "Students should be asked to draw more figures and there should be more exercises in naming lines, rays, and segments (page 6) as well as naming and measuring angles (pages 16 - 18)."

• "More examples of angles with the degrees indicated should be provided."

• Two teachers rated the last two exercises poorly. One wrote: "Comparing quadrilaterals is a sad way to end this unit since students have a great deal of difficulty in summarizing and comparing information. None of them could complete this exercise independently and even with help they did not completely understand what they were looking for. As a result most did not do well in the test."

• "The mini reviews are helpful."

APPENDIX X**Comments on Teachers' Questionnaire
concerning Unit 5**

One teacher found the goal of this unit unclear and questioned the reason for grouping "mastering division" and "order of operations" in the same unit. Another felt that "proving long division" should be covered in Unit 3, rather than Unit 5.

Three teachers mentioned that students found word problems to be difficult sub-sections and generally needed help in these as well as in exercises dealing with order of operations.

Comments on specific items:

- "Students particularly asked for help in the last exercise on page 24 and in understanding the directions for the first practice exercise on page 21."
- "The mention of fractions is lost on the students in this unit."
- "The posttest should have some more word problems."

APPENDIX XI

Score on each statement of
each of the three Student Questionnaires

	statement	unit 3	unit 6 (a)	unit 6 (b)
1	unit too hard	-2	2	-2
2	unit interesting	1	-1	2
3	unit too long	1	1	1
4	asked for help often	1	1	1
5	looking forward to more	-1	2	2
6	learned a lot	2	1	1
7	should talk more about North	2	1	1

APPENDIX XII**Expert Review Form**

**EXPERT REVIEW
EVALUATION FORM**

Name of book/material under review: _____

Name of reviewer: _____

Address: _____

Date reviewed: _____ Phone number: _____

DIRECTIONS:

1. Take the entire course just as the students would. If this is not possible, review the content of the major units, exercises, problems, general course organization, etc.

2. Complete the **Error/Modification Sheet** (page 2) as you work through the course. Note any errors in the content or any areas requiring modification. This sheet will help you determine your recommendations at the end of the review.

3. The **Review Summary Form** has 3 parts:

- Part A: Technical Content
- Part B: Relevance
- Part C: Course Design

Answer all questions in each part.

ERROR/MODIFICATION**PAGE NUMBER****ERROR/MODIFICATION
REQUIRED**

PART A: Technical Content**YES****NO**

1. The content is accurate. (All information is correct.)

Comments:

2. The information in the course is complete. (All important topics are included.)

Comments:

3. All information given to the student is necessary. (The course does *not* contain superfluous information.)

Comments:

4. The level of difficulty is appropriate for the target population. (Material is neither too easy nor too difficult.)

Comments:

5. Test items are consistent with the content they are intended to test.

Comments:

6. The charts, diagrams, illustrations & other visual aids etc. are relevant and meaningful.

Comments:

Part B: Relevance**YES NO**

1. The course will satisfy the needs of the target population to a greater extent than already-existing material of which you are aware.

Comments: _____

2. Students completing this course will be able to perform adequately at the next level.

Comments: _____

Part 3: Course Design

1. The course sequence is logical. (Flows smoothly, organized properly.)

Comments: _____

2. The number of exercises provided is sufficient for learning. (Neither too many nor too few.)

Comments: _____

3. The course objectives are clear.

Comments: _____

4 All necessary terms are adequately defined.

Comments: _____

5. All instructions to the student are clear and complete. (Students know what they are to do.)

Comments: _____

6. The following information for use by teachers is complete and adequate

• information & recommendations on how to use the material

• information on how to use the tests

• suggestions for auxilliary or remedial exercises

• information concerning the entry level requirements for students to use this material

• indication of the average course length

• instructions on how to use the answer key

Additional comments:

APPENDIX XIII

Suggested modifications and comments of the expert reviewer

The information is complete, and no superfluous information is given for all important topics within the limited context of the course. The level of difficulty is generally consistent with the inclusion of some more challenging items and there is coherence between the pretests and posttests. She felt that there sometimes appeared to be too many practice exercises. Unit 3 was felt to be particularly long and could possibly be shortened by introducing the use of calculators once the theory of multiplication and division has been mastered.

The expert reviewer didn't feel that she could rate *Math 204* concerning its relevance in satisfying the needs of the target population.

She felt that the geometry section is the least relevant to the students' lives and has the fewest real-life examples. She suggested that it might be more relevant to include work on measurement of length, area and volume, rather than angles and geometric shapes.

The following is a list of suggested modifications to the technical content of *Math 204*.

Unit 1

page 2

#8 - instructions unclear

#10 - kilometres per second (strictly: km/s, since numerals and words should not be mixed)

- 3 Use numerals, not number in lines 1, 8, 10 and throughout this unit
- 7 line 8 and 16 increases and decreases
- 14 delet 'and' in 1 - 5
- 19 Should there be rings on the abacus?
- 29 Are students asked to count the symbols in the shapes, or to estimate the areas of the shapes?
- 31 KG should be on the dial instead of kg. Delete period after "8 kg is the....."
- 33 I imagine the rule to "round up" numeals ending in 5 is done for simplicity sake. This is not strictly true.
- 37 "Place values" labels would be easier to read if thousands, etc. were moved up. Strictly, these are columns, not rows.
- 43 Cheque you answers? Bad pun.
- 47 The diameter should be shown completely across the circle.

Unit 2

- page 1 #2 - no room for a complete sentence
- 7 The two rows are not in logical order. More important, I don't think this is the best approach to teaching addition. It might be better to have the addition table on page 7.
- 11 The instructions are not clear. Should they answer with or without repetition?
- 16 twice, not two times, as on page 15
- 19 #7 - is, not equals
- 20 2 \$ or two dollars
- Should pages 19 and 20 come before pages 15 - 18?
- 22a line 2 - "After subtracting, the answer is....."
- 23 (end) This statement gives a wrong impression because if you have 0°C and the temperature drops five degrees it is -5°C and on a number line, if you walk backwards to zero, you can keep walking to negative numbers.

- 25 It is better to use () or [].
- 29 line 2 and throughout the rest of the unit as well as in the posttest - write kilograms, not kilos.
- 35 #4 - should be "How many more kilograms did the first duck weigh?"
- 37 #5 - numerals.
- 42 Are students allowed to ring (rather than circle, vertically and diagonally as well as horizontally?
- 46 Instructions are unclear.
- 59 You can subtract 78 from 52.
- 62 This page would be easier to read if the exercise numbers and the questions themselves were better spaced.
- 74 Is number 13 reasonable?
- 79 - 6 (down) - Is there some reason why the answer has to be 45?
- h (down) doesn't match with k (across). Why not use upper case letters for the clues as well as the squares?

Unit 3

page 32

33

Is question 3 realistic?

What answer is expected for number 8?

Multiplying, like adding, is walking on the number line.

35 Check 9 across and 19 down.

47 Zero is only added to one factor.

70 Write 'from'.

88 #9 - remove one 'ax'

89 #11 - Is the wording accurate? If so, the problem is more difficult. The population in 2050 will be five times the present population, if the question is correctly worded.

posttest There are no questions on time.

general comment

This seems to be a very long unit. Once the theory of multiplication and division has been mastered, why not use

calculators? If there is a fear that decimal answers will cause problems, the decimal can be explained as a remainder.

Unit 4

page 7

These assumptions have been made:

- 1) measurement is in centimetres
- 2) decimal values are understood
- 3) "arc" is understood.

- We speak of "a pair of compasses" not "a compass"

- The decimal marker in Quebec is a comma, not a period.

15 The symbol for 'angle' is not the same as the symbol for 'less than'.

16 Should the angles be numbered?

17 The third step should be: "Read 50 degrees...."

18 It would be better so say: " Don't forget to use the symbol for degree."

20 The example should read: "...your landing and take-off at Salluit".

24 Correct to: "The total of the angles in triangle ABC = _____°; or The total number of degrees in the three angles of triangle ABC = _____°; or

< ABC = _____°

< BCA = _____°

< CAB = _____°

Total- _____°

27 The symbol for equal sides has not been introduced.

30 A trapezoid does not have to have one pair of equal sides.

36 All convex quadrilaterals have angles whose sum is 360 degrees.

Unit 5

page 9

Are more divisions necessary?

* 7 - Round to the nearest 1 000.

- 11 Are the statistics accurate in the first example?
- 13 Are you sure that there are 9 855 revolutions in one year? It seems extremely high.
- 21 The first exercise may be difficult at this point.
- 27 The multiples in the "How old am I?" don't help understanding.

APPENDIX XIV**The Teachers' Questionnaire**

(The number inserted into the Likert scale following each item are the number of teachers who responded with the given rating.)

FORMATIVE EVALUATION OF MATH 204**I PERSONAL INFORMATION**

Name: _____

Community: _____

TICK ONE BOX ONLY FOR EACH QUESTION1. Sex: Male ☐ Female ☐2. Age: 25 - 30 ☐30 - 35 ☐35 - 40 ☐40 - 45 ☐45 - 50 ☐3. Are you an Inuk? yes ☐ no ☐4. Have you taught before this year? yes ☐ no ☐If yes, have you taught in the North before this year? yes ☐ no ☐If yes, how many years have you taught before this one?
(to the closest full year)1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐5. Have you taught adults before this year? yes ☐ no ☐6. Have you taught adults in the North before this year? yes ☐ no ☐If yes, how many years?
(to the closest year)1 ☐2 ☐3 ☐

4 ☐

7. Have you taught math at this level before? yes ☐ no ☐
8. Do you have a B. Ed. or a Dip. Ed.? yes ☐ no ☐
9. Do you have a university degree in an area other than education?
yes ☐ no ☐

III INFORMATION ABOUT THE FORMAT OF Math 204

PLEASE CHECK ONE BOX FOR EACH QUESTION
TO SHOW HOW MUCH YOU AGREE WITH IT.

10. Students found the typeface used in Math 204 easy to read.

3 ☐ strongly agree 2 ☐ agree a little ☐ disagree a little ☐ strongly disagree

11. Students found that there was too much information on each page.

☐ strongly agree 1 ☐ agree a little 2 ☐ disagree a little 3 ☐ strongly disagree

12. Students found Math 204 frustratingly long.

1 ☐ strongly agree 1 ☐ agree a little 1 ☐ disagree a little 2 ☐ strongly disagree

13. Students found the division between instruction & exercises clear.

3 ☐ strongly agree 1 ☐ agree a little ☐ disagree a little 1 ☐ strongly disagree

14. Students found the divisions between the pretest, the main body of the unit and the posttest clear.

2 ☐ strongly agree 1 ☐ agree a little 1 ☐ disagree a little ☐ strongly disagree

15. Students would learn more efficiently with more illustrations.

☐ strongly agree ☐ agree a little 5 ☐ disagree a little ☐ strongly disagree

16. Students would learn more efficiently with fewer lines, boxes, arrows, etc.

☐strongly agree ☐agree a little ☐disagree a little ☐strongly disagree

17. Students found the table of contents easy to use.

☐strongly agree ☐agree a little ☐disagree a little ☐strongly disagree

18. Students found the answer key difficult to use.

☐strongly agree ☐agree a little ☐disagree a little ☐strongly disagree

III GENERAL INFORMATION ABOUT THE CONTENT OF Math 204

PLEASE CHECK ONE BOX FOR EACH QUESTION.
TO SHOW HOW MUCH YOU AGREE WITH IT.

19. The sequence of units in Math 204 is logical.

☐strongly agree ☐agree a little ☐disagree a little ☐strongly disagree

20. The reason for the organization of sub-sections within each unit is not clear.

☐strongly agree ☐agree a little ☐disagree a little ☐strongly disagree

21. Each unit provides a good balance between instruction, exercises and evaluation.

☐strongly agree ☐agree a little ☐disagree a little ☐strongly disagree

22. The examples are confusing.

☐strongly agree ☐agree a little ☐disagree a little ☐strongly disagree

23. The level of language used in Math 204 is too complex.

☐strongly agree ☐agree a little ☐disagree a little ☐strongly disagree

24. All necessary terms are adequately defined.
☐strongly agree ☐agree a little ☐disagree a little ☐strongly disagree
25. There are too many references that students didn't understand because they require knowledge of the South.
☐strongly agree ☐agree a little ☐disagree a little ☐strongly disagree
26. There are enough references to Inuit culture and the North.
☐strongly agree ☐agree a little ☐disagree a little ☐strongly disagree
27. The examples and word problems with Northern content aid student learning.
☐strongly agree ☐agree a little ☐disagree a little ☐strongly disagree
28. Students did not enjoy working in Math 204.
☐strongly agree ☐agree a little ☒disagree a little ☐strongly disagree
29. Students had difficulty understanding the instructions for the exercises.
☐always ☐usually ☐rarely ☐never
30. Math 204 is too difficult for the lowest level of students in your class.
☐strongly agree ☐agree a little ☐disagree a little ☐strongly disagree
31. Students were able to work in Math 204 independently.
☐always ☐usually ☐rarely ☐never
32. Student self-confidence decreased throughout the course of Math 204.
☐always ☐usually ☐rarely ☐never
33. Students found that there were not enough review exercises at the end of each unit.
☐always ☐usually ☐rarely ☐never

34. You, the teacher, found the review exercises helpful in keeping track of students' progress.

2 ☐ always 3 ☐ usually ☐ rarely ☐ never

35. The pretests do not clearly indicate the student's initial level.

☐ always 3 ☐ usually 1 ☐ rarely ☐ never

36. The posttests clearly indicate student achievement in each unit.

1 ☐ always 3 ☐ usually 1 ☐ rarely ☐ never

37. Math 204 does not adequately prepare students for Math 205.

1 ☐ strongly agree ☐ agree a little 2 ☐ disagree a little 1 ☐ strongly disagree

38. A teachers' manual for Math 204 would increase the effectiveness of your teaching.

1 ☐ strongly agree ☐ agree a little 1 ☐ disagree a little 2 ☐ strongly disagree

39. Suggestions for remedial exercises to address specific student problems would increase the effectiveness of your teaching.

4 ☐ strongly agree ☐ agree a little 1 ☐ disagree a little ☐ strongly disagree

40. This new version of Math 204 does not increase student learning in comparison to the old version of Math 204.

☐ strongly agree ☐ agree a little 2 ☐ disagree a little 2 ☐ strongly disagree

41. Math 204 would be useful as review material for students at more advanced levels.

☐ useful 4 ☐ sometimes useful 1 ☐ rarely useful ☐ useless

IV INFORMATION ON UNITS 1 - 6

To complete the following sections of the questionnaire, use a copy of Math 204 as a reference and reminder.

There are six questionnaire sections, one for each unit of Math 204.

Please answer every question.

Your comments will be very helpful in revising Math 204. When possible, please give examples (page, lesson, exercise & item numbers).

If the space provided for your comments is inadequate, turn the page over and continue on the back.

Please, number your comments on the back. Make sure the number corresponds to the number of the question to which your comments refer.

EVALUATION OF UNIT 1.

PLEASE CHECK ONE BOX FOR EACH QUESTION.
TO SHOW HOW MUCH YOU AGREE WITH IT.

1. The goal of Unit 1 is clear.

3 ☐ strongly
agree

2 ☐ agree
a little

☐ disagree
a little

☐ strongly
disagree

Comments & Examples:

2. The objectives of the sub-sections are clear.

2 ☐ always

3 ☐ usually

☐ rarely

☐ never

Comments & Examples:

3. It is unnecessary for students to master this goal at the 204 level.

1 ☐ strongly agree ☐ agree a little 1 ☐ disagree a little 3 ☐ strongly disagree

Comments & Examples:

4. Not enough information is given for students to successfully achieve the objectives of Unit 1.

☐ strongly agree ☐ agree a little 3 ☐ disagree a little 2 ☐ strongly disagree

Comments & Examples:

5. The student is given unnecessary information to complete the objectives of this unit.

☐ strongly agree 1 ☐ agree a little 1 ☐ disagree a little 2 ☐ strongly disagree

Comments & Examples:

6. The information is presented in a logical sequence.

2 ☐ strongly agree 2 ☐ agree a little 1 ☐ disagree a little ☐ strongly disagree

Comments & Examples:

7. The amount of practice for each subskill is generally:

2 ☐ adequate 3 ☐ fairly adequate ☐ rather inadequate ☐ inadequate

Comments & Examples:

8. The number of practice exercises which integrate all the subskills of Unit 1 are:

2 ☐ adequate 2 ☐ fairly adequate ☐ rather inadequate ☐ inadequate

Comments & Examples:

9. Students enjoyed working in Unit 1.

1 ☐ always 3 ☐ usually 1 ☐ rarely ☐ never

Comments & Examples:

10. Students found some sub-sections of Unit 1 much more difficult than the others.

1 ☐ strongly agree 1 ☐ agree a little 1 ☐ disagree a little 2 ☐ strongly disagree.

Comments & Examples:

11. Students worked independently in the instructional sections:

1 ☐ always 3 ☐ usually ☐ rarely 1 ☐ never

Comments & Examples:

12. Students asked for help in understanding directions for the practice exercises.

1 ☐ often 3 ☐ sometimes ☐ rarely 1 ☐ never

Comments & Examples:

13. Students asked for help while working through the practice exercises:

☐ often 3 ☐ sometimes 1 ☐ rarely 1 ☐ never

Comments & Examples:

14. The test for Unit 1 is a good indicator of what the students learned in this unit.

2 ☐ strongly agree

2 ☐ agree a little

1 ☐ disagree a little

☐ strongly disagree

Comments & Examples:

Do you have any additional comments about Unit 1?

EVALUATION OF UNIT 2.

1. The goal of Unit 2 is clear.

2 ☐ strongly agree

2 ☐ agree a little

☐ disagree a little

☐ strongly disagree

Comments & Examples:

2. The objectives of the sub-sections are clear.

2 ☐ always

3 ☐ usually

☐ rarely

☐ never

Comments & Examples:

3. It is unnecessary for students to master this goal at the 204 level.

3 ☐ strongly agree

☐ agree a little

☐ disagree a little

2 ☐ strongly disagree

Comments & Examples:

4. Not enough information is given for students to successfully achieve the objectives of Unit 2.

☐ strongly agree

☐ agree a little

1 ☐ disagree a little

4 ☐ strongly disagree

Comments & Examples:

5. The student is given unnecessary information to complete the objectives of this unit.

1 ☐ strongly
agree

2 ☐ agree
a little

☐ disagree
a little

2 ☐ strongly
disagree

Comments & Examples:

6. The information is presented in a logical sequence.

4 ☐ strongly
agree

☐ agree
a little

1 ☐ disagree
a little

☐ strongly
disagree

Comments & Examples:

7. The amount of practice for each subskill is generally:

4 ☐ adequate

☐ fairly
adequate

1 ☐ rather
inadequate

☐ inadequate

Comments & Examples:

8. The number of practice exercises which integrate all the subskills of Unit 2 are:

3 ☐ adequate

2 ☐ fairly
adequate

☐ rather
inadequate

☐ inadequate

Comments & Examples:

9. Students enjoyed working in Unit 2.

1 ☐ always

4 ☐ usually

☐ rarely

☐ never

Comments & Examples:

10. Students found some sub-sections of Unit 2 much more difficult than the others.

1 ☐ strongly
agree

4 ☐ agree
a little

☐ disagree
a little

☐ strongly
disagree

Comments & Examples:

11. Students worked independently in the instructional sections:

1 ☐ always 3 ☐ usually 1 ☐ rarely 1 ☐ never

Comments & Examples:

12. Students asked for help in understanding directions for the practice exercises:

1 ☐ often 2 ☐ sometimes 1 ☐ rarely 1 ☐ never

Comments & Examples:

13. Students asked for help while working through the practice exercises:

1 ☐ often 3 ☐ sometimes 1 ☐ rarely 1 ☐ never

Comments & Examples:

14. The test for Unit 2 is a good indicator of what the students learned in this unit.

4 ☐ strongly agree 1 ☐ agree a little 1 ☐ disagree a little 1 ☐ strongly disagree

Comments & Examples:

Do you have any additional comments about Unit 2?

EVALUATION OF UNIT 3.

1. The goal of Unit 3 is clear.

5 ☐ strongly agree 1 ☐ agree a little 1 ☐ disagree a little 1 ☐ strongly disagree

Comments & Examples:

2. The objectives of the sub-sections are clear.

2 ☐ always 3 ☐ usually ☐ rarely ☐ never

Comments & Examples:

3. It is unnecessary for students to master this goal at the 204 level.

1 ☐ strongly agree 1 ☐ agree a little ☐ disagree a little 3 ☐ strongly disagree

Comments & Examples:

4. Not enough information is given for students to successfully achieve the objectives of Unit 3.

☐ strongly agree 1 ☐ agree a little 1 ☐ disagree a little 3 ☐ strongly disagree

Comments & Examples:

5. The student is given unnecessary information to complete the objectives of this unit.

☐ strongly agree 1 ☐ agree a little 2 ☐ disagree a little 2 ☐ strongly disagree

Comments & Examples:

6. The information is presented in a logical sequence.

4 ☐ strongly agree ☐ agree a little 1 ☐ disagree a little ☐ strongly disagree

Comments & Examples:

7. The amount of practice for each subskill is generally:

3 ☐ adequate 2 ☐ fairly adequate ☐ rather inadequate ☐ inadequate

Comments & Examples:

8. The number of practice exercises which integrate all the subskills of Unit 3 are:

2 ☐adequate

3 ☐fairly
adequate

☐rather
inadequate

☐inadequate

Comments & Examples:

9. Students enjoyed working in Unit 3.

1 ☐always

2 ☐usually

2 ☐rarely

☐never

Comments & Examples:

10. Students found some sub-sections of Unit 3 much more difficult than the others.

2 ☐strongly
agree

3 ☐agree
a little

☐disagree
a little

☐strongly
disagree

Comments & Examples:

11. Students worked independently in the instructional sections:

1 ☐always

4 ☐usually

☐rarely

☐never

Comments & Examples:

12. Students asked for help in understanding directions for the practice exercises:

☐often

3 ☐sometimes

2 ☐rarely

☐never

Comments & Examples:

13. Students asked for help while working through the practice exercises:

☐often

3 ☐sometimes

1 ☐rarely

1 ☐never

Comments & Examples:

14. The test for Unit 3 is a good indicator of what the students learned in this unit.

2 ☐ strongly agree

2 ☐ agree a little

☐ disagree a little

☐ strongly disagree

Comments & Examples:

Do you have any additional comments about Unit 3?

EVALUATION OF UNIT 4.

PLEASE CHECK ONE BOX FOR EACH QUESTION.
TO SHOW HOW MUCH YOU AGREE WITH IT.

1. The goal of Unit 4 is clear.

4 ☐ strongly agree

☐ agree a little

1 ☐ disagree a little

☐ strongly disagree

Comments & Examples:

2. The objectives of the sub-sections are clear.

3 ☐ always

2 ☐ usually

☐ rarely

☐ never

Comments & Examples:

3. It is unnecessary for students to master this goal at the 204 level.

☐ strongly agree

1 ☐ agree a little

☐ disagree a little

4 ☐ strongly disagree

Comments & Examples:

4. Not enough information is given for students to successfully achieve the objectives of Unit 4.

☐ strongly agree

1 ☐ agree a little

1 ☐ disagree a little

3 ☐ strongly disagree

Comments & Examples:

5. The student is given unnecessary information to complete the objectives of this unit.

☐strongly agree ☐agree a little ☐disagree a little 5 ☐strongly disagree

Comments & Examples:

6. The information is presented in a logical sequence.

4 ☐strongly agree 1 ☐agree a little ☐disagree a little ☐strongly disagree

Comments & Examples:

7. The amount of practice for each subskill is generally:

3 ☐adequate 2 ☐fairly adequate ☐rather inadequate ☐inadequate

Comments & Examples:

8. The number of practice exercises which integrate all the subskills of Unit 4 are:

2 ☐adequate 2 ☐fairly adequate ☐rather inadequate ☐inadequate

Comments & Examples:

9. Students enjoyed working in Unit 4.

1 ☐always 3 ☐usually 1 ☐rarely ☐never

Comments & Examples:

10. Students found some sub-sections of Unit 4 much more difficult than the others.

1 ☐ strongly
agree

1 ☐ agree
a little

1 ☐ disagree
a little

2 ☐ strongly
disagree

Comments & Examples:

11. Students worked independently in the instructional sections:

1 ☐ always

2 ☐ usually

2 ☐ rarely

☐ never

Comments & Examples:

12. Students asked for help in understanding directions for the practice exercises:

2 ☐ often

1 ☐ sometimes

☐ rarely

2 ☐ never

Comments & Examples:

13. Students asked for help while working through the practice exercises:

1 ☐ often

2 ☐ sometimes

1 ☐ rarely

1 ☐ never

Comments & Examples:

14. The test for Unit 4 is a good indicator of what the students learned in this unit.

1 ☐ strongly
agree

1 ☐ agree
a little

2 ☐ disagree
a little

1 ☐ strongly
disagree

Comments & Examples:

Do you have any additional comments about Unit 4?

EVALUATION OF UNIT 5.

1. The goal of Unit 5 is clear.

4 ☐ strongly

agree

☐ agree

a little

☐ disagree

a little

1 ☐ strongly

disagree

Comments & Examples:

2. The objectives of the sub-sections are clear.

4 ☐ always

1 ☐ usually

☐ rarely

☐ never

Comments & Examples:

3. It is unnecessary for students to master this goal at the 204 level.

1 ☐ strongly

agree

☐ agree

a little

☐ disagree

a little

4 ☐ strongly

disagree

Comments & Examples:

4. Not enough information is given for students to successfully achieve the objectives of Unit 5.

☐ strongly

agree

☐ agree

a little

☐ disagree

a little

5 ☐ strongly

disagree

Comments & Examples:

5. The student is given unnecessary information to complete the objectives of this unit.

☐ strongly

agree

☐ agree

a little

1 ☐ disagree

a little

4 ☐ strongly

disagree

Comments & Examples:

6. The information is presented in a logical sequence.

4 ☐ strongly agree 1 ☐ agree a little ☐ disagree a little ☐ strongly disagree

Comments & Examples:

7. The amount of practice for each subskill is generally:

4 ☐ adequate 1 ☐ fairly adequate ☐ rather inadequate ☐ inadequate

Comments & Examples:

8. The number of practice exercises which integrate all the subskills of Unit 5 are:

4 ☐ adequate 1 ☐ fairly adequate ☐ rather inadequate ☐ inadequate

Comments & Examples:

9. Students enjoyed working in Unit 5.

1 ☐ always 4 ☐ usually ☐ rarely ☐ never

Comments & Examples:

10. Students found some sub-sections of Unit 5 much more difficult than the others.

1 ☐ strongly agree 3 ☐ agree a little ☐ disagree a little 1 ☐ strongly disagree

Comments & Examples:

11. Students worked independently in the instructional sections:

1 ☐ always 3 ☐ usually 1 ☐ rarely ☐ never

Comments & Examples:

12. Students asked for help in understanding directions for the practice exercises:

☐often 3☐sometimes 2☐rarely ☐never

Comments & Examples:

13. Students asked for help while working through the practice exercises:

2☐often 1☐sometimes 2☐rarely ☐never

Comments & Examples:

14. The test for Unit 5 is a good indicator of what the students learned in this unit.

2☐strongly agree 2☐agree a little ☐disagree a little 1☐strongly disagree

Comments & Examples:

Do you have any additional comments about Unit 5?

APPENDIX XV**Student Questionnaire****(form for evaluating one unit)**

Student's Evaluation of one unit

To the Student:

This is called a questionnaire. Your answers to these questions will help Kativik improve Math 204 for students who will use it next year.

- Please fill out one of these questionnaires before every test.
- If you don't know how to fill it out, ask your teacher.
- Answer every question.
- Write what you really think.

Student's Name _____

Circle the number of the unit you have just finished:

1 2 3 4 5 6

PUT AN **X** NEXT TO THE ANSWER YOU AGREE WITH THE MOST.

1. I found this unit too hard.

☐strongly
agree

☐agree
a little

☐disagree
a little

☐strongly
disagree

2. I found this unit interesting

☐strongly
agree

☐agree
a little

☐disagree
a little

☐strongly
disagree

3. I found this unit too long.

☐strongly
agree

☐agree
a little

☐disagree
a little

☐strongly
disagree

4. I asked my teacher for help often.

☐strongly
agree

☐agree
a little

☐disagree
a little

☐strongly
disagree

5. I am looking forward to doing more math.

☐strongly
agree

☐agree
a little

☐disagree
a little

☐strongly
disagree

6. I learned a lot in this unit.

☐strongly
agree

☐agree
a little

☐disagree
a little

☐strongly
disagree

7. This unit should talk more about the North.

☐strongly
agree

☐agree
a little

☐disagree
a little

☐strongly
disagree