SECONDARY MATHEMATICS TEACHERS

and

LOCAL CURRICULUM DEVELOPMENT

by

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ABSTRACT

This study sought to determine, by means of a questionnaire, the answers to the following research questions.

1. To what extent are secondary mathematics teachers in British Columbia currently participating in local curriculum development?
2. What are the attitudes of secondary mathematics teachers toward curriculum development at the local level?
3. What are the characteristics of teachers with respect to involvement in local curriculum development and attitudes toward local curriculum development?

A special three-part questionnaire was constructed to answer these questions. The first part asked fifteen factual Yes/No type questions about the current participation of mathematics teachers in local curriculum development activities. The second part of the questionnaire determined teacher attitudes toward local curriculum development through a 20-item Likert scale. The third part gathered descriptive data from the respondents. After a pilot study, the final questionnaire was sent to 200 secondary mathematics teachers randomly selected from the membership list of the British Columbia Association of Mathematics Teachers. The return rate for the questionnaire was 57%, and the Hoyt reliability estimate of the Likert scale was .86. Face validity of the Likert scale was determined by a panel of judges.

Analysis on the first part of the questionnaire revealed that in general, there was a lack of support for curriculum development at the district, school and individual levels.

In answer to question two, the attitudes of secondary mathematics teachers generally were favourable to local curriculum development activities as measured by the Likert scale. An examination of specific items revealed that teachers generally supported the provincial core program but were

undecided as to whether districts should develop their own core. Furthermore, most teachers expressed a desire to be more involved in curriculum planning and indicated their willingness to serve on district and school curriculum committees.

In answer to question three, the only characteristic of teachers that seemed to have some relationship to their attitudes was teaching level. Junior secondary teachers had significantly higher scores on the attitude scale than senior secondary teachers. The study found no significant differences between male and female mathematics teachers, between those with graduate education and those without, between teachers in small schools and large schools, and between teachers who were or were not department heads. Also, age, years of teaching experience and educational diversity did not have any significant relationship to attitudes.

Recommendations were that more support be given for local curriculum development activities at the district, school and individual levels, that some form of provincial learning assessment program be used, and that teachers be allowed to choose their textbooks from an approved list. Final recommendations were that support of secondary mathematics teachers in local curriculum development activities should be directed to mathematics teachers as school groups at the junior secondary school level and that the attitudes of mathematics teachers toward local curriculum development should be further studied since only a small portion of the variance in their attitudes was explained.

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Chapter 1

THE PROBLEM

1.1 INTRODUCTION

The involvement of teachers in curriculum development has grown substantially in recent years throughout the world. Teacher involvement in curriculum development and factors which influence their involvement have furthermore been a subject of study in many countries. Teachers, especially in North America, appear to be more actively concerned with the actual content of school courses. Kirst notes that:

> "Curriculum issues are beginning to appear in contract demands of teacher organizations . . . but as yet they have not been central issues."[1]

The educational system in British Columbia has not been immune to these trends. Recently curriculum decentralization and its effect on local curriculum development has begun to emerge as an issue. In a presentation given to the Surrey Teachers'

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[1] M. W. Kirst and D. F. Walker, "An Analysis of Curriculum Policy-Making," Review of Educational Research, vol. 41 no. 5 (December, 1971), p. 479.

Association in February 1975, Pedersen noted this concern.

> "It is my impression from visiting a number of school districts that the notion of decentralizing the curriculum function is causing marked concern among teacher and administrator groups."[1]

The argument has often been made that the teacher, who knows the student best and ultimately controls the learning process, should have a greater role in deciding what is to be taught. Jampolsky stated that:

> "The Department of Education may offer guidelines, the Minister of Education may prescribe, boards of trustees may demand all they like, but in the final analysis, the teacher must teach. The real maker of curriculum, the decision-maker, the question-answerer, the one responsible for what ultimately occurs in the educational process, is the classroom teacher."[2]

The views of British Columbia mathematics teachers on teacher involvement in curriculum development are not known, and cannot be inferred from other studies since subject field, geographic region and experience with curriculum development seem to influence the attitudes that teachers hold. Professional groups differ in their policies toward decentralizing the curriculum development process. Some have not yet taken a position. One group in particular, the teachers of secondary school mathematics in British Columbia, does not appear to have a definite policy on teacher involvement in local curriculum development.

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[1]K. G. Pedersen, "Educational Decision-making: an irrational process?" Education Canada, vol. 15 no. 3 (Summer 1975), p. 33.

[2]Murray Jampolsky, "The Teacher is the Critical Factor in Curriculum," The ATA Magazine, vol. 54 no. 1 (September-October, 1973), p. 35.

1.2 IMMEDIATE BACKGROUND

Classroom teachers have been involved in curriculum development since Dewey's day, although their role has generally been a subsidiary one.[1] In British Columbia, where the curriculum has been the responsibility of the Ministry of Education, it has been the custom that government-appointed specialists organize and direct curriculum development programs. The teacher's role has been mainly that of "an operative who puts new curriculum plans into effect."[2]

To some educators, more teacher control over the curriculum is an indication of increasing professionalization. As Nasstrom explains, "For public school teachers, claims to professionalism encompass substantial power over the curriculum."[3] To others, the decentralization of control over the curriculum is a reaction to the top-down approach of curriculum development with its large scale projects irrelevant to the local situation.[4] The term 'teacher-proof curriculum' shows the extreme to which some experts in curriculum development have gone. These views have obviously influenced various groups in British Columbia.

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[1]Thomas W. Miller, "Ten Principles of Curriculum Development . . . . for Classroom Teachers," Ontario Education, vol. 5 (May 1973), p. 12.

[2]Robert G. Koopman, Curriculum Development (New York: Center for Applied Research in Education, 1966), p. 22.

[3]Roy R. Nasstrom, "Teacher Authority Over the Curriculum?" Educational Leadership, vol. 31 (May, 1974), p. 713.

[4]Michael R. Simonson, Charles Poncelow and John McLure, "Attitudes Toward Decision-making in Instructional Development," Educational Technology, vol. 16 no. 1 (January, 1976), p. 51.

One highly influential group in the province is the British Columbia Teachers' Federation (BCTF). The Federation supports the participation of teachers in curriculum development activities as indicated in these statements.

> "34.B.04 -That the BCTF provide professional guidance to teachers in the design and evaluation of locally-developed courses. (1972 AGM)
> 34.B.18 -That each local association be encouraged to appoint a curriculum committee. (January 1976)"[1]

In September 1973, a group from the BCTF wrote and presented a brief[2] on curriculum development to the Minister of Education. The brief generally advocated a move toward decentralization of curriculum authority so that local boards and teachers would have room to provide for their own local requirements. Acting on certain recommendations, the government changed some sections of the Public Schools Act (PSA). Authority over curriculum was taken from the Lieutenant-Governor in Council and transferred to local Boards of School Trustees. This was expressed in Section 168 of the PSA as:

> "Subject to the regulations, a Board may approve courses of study, textbooks, supplementary readers, and other instructional materials for use in the public schools in the school district. 1974,c.74,s.14; 1975,c.58,s.14."[3]

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[1]British Columbia Teachers' Federation, Members' Guide to the BCTF 1976-1977 (Vancouver: British Columbia Teachers' Federation), p. 70.

[2]BCTF, Curriculum Development (brief submitted to the Minister of Education, September, 1973).

[3]Province of British Columbia, "Public Schools Act," Statutes of British Columbia (Victoria: Government of British Columbia), chap.319 sec.168.

Tentative regulations[1] for curriculum decentralization were prepared by a committee representing teachers, trustees, and government personnel and distributed throughout the province in the spring of 1975. The purposes of the regulations were to facilitate the implementation of Section 168 and to serve as a vehicle for thorough consideration of the process of curriculum decentralization. Reaction toward the draft regulations revealed considerable disagreement over the assignment of authority for curriculum development. However, due to the government turnover in late 1975, the draft regulations neither resurfaced nor became policy.

In March 1976, the Educational Research Institute of British Columbia (ERIBC) examined various issues concerning authority for school curricula. The intent of that study was to "show that confusion over authority for public education in British Columbia is the result, in large part, of vague legislation and regulations."[2] Responses to an open-ended questionnaire supported this claim and the study concluded that much conflict existed over authority and roles in curriculum development.

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[1]Province of British Columbia, Department of Education, Provincial Advisory Committee on Curriculum Decentralization, Draft Regulations for Curriculum Decentralization (Victoria: Department of Education, 1975).

[2]Lloyd MacDonald and Janet Werker, Authority Patterns in B. C. Education: An Analysis of Authority for School Curriculum (Vancouver: ERIBC, May, 1976), p.16.

1.3 RELATED CONCERNS

Views on the involvement of teachers in local curriculum development differ widely. For some subject fields, such as English and Social Studies, the changes to the Public Schools Act were necessary to reflect what is in reality going on in classrooms. There are also some teachers who have, through locally-developed courses, been completely involved with curriculum development, from the formation of objectives to the evaluation of learning.[1] Beneficial effects of such teacher participation on their professional development are well documented in studies like Project Canada West and Project Atlantic Canada.[2] Some research on preferred levels of participation also indicates that:

> "There are numerous indications that various groups and individuals wish to become involved in significant decisions to a greater extent than they have been in the past."[3]

However, involvement in curriculum development may not be practical for all teachers or for all subject fields. Developing a complete course from scratch is a very complex process and takes much knowledge, experience, and ability.

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[1]Ralph H. Sabey, ed., Project Canada West (Vancouver: British Columbia Teachers' Federation, May 1975).

[2]Project Canada West was a 5-year Social Studies project which enabled classroom teachers to be the major developers of curricula. Project Atlantic Canada is a similar Social Studies project currently under way in the Atlantic provinces.

[3]E. Miklos, "Increasing Participation in Decision-Making," The Canadian Administrator, vol. 9 no. 6 (March, 1970), p. 25.

The Board of the National Council of Teachers of Mathematics has recently stated:

> "We decry the imposition on the classroom teacher of hastily adopted educational innovations which essentially redefine the teacher's role into that of a manager, clerk, or curriculum developer. We take the position that the classroom teacher should teach and that he or she should be supported in, rather than diverted from, that important role."[1]

In support of this view, MacPherson[2] recently remarked that local curriculum development might be an enormous task dumped onto teachers who can then expect limited help, little release time, and few rewards for their labour.

Another objection is that, for the highly content-oriented subject fields, local curriculum development might result in unnecessary duplication of effort. The British Columbia Science Teachers' Association was partly concerned about this when at a recent meeting it resolved:

> "That the BCScTA go on record as being opposed to wholesale decentralization of science curriculum particularily at the senior secondary science level."[3]

In the same statement the Association further claimed that a provincial core curriculum was essential and that decentralization in Science would result in a great deal of duplication of effort in the production of suitable curriculum materials.

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[1]Board of Directors, National Council of Teachers of Mathematics, "Time to Teach," NCTM Newsletter (September 1976), p.4.

[2]Eric MacPherson, Keynote Address at the Fifth Mathematics Summer Workshop at Carson Graham School, Vancouver, August, 1976.

[3]Doug A. Black, "Communications: With the Curriculum Branch," B. C. Science Teacher, vol.17 no.3 (January, 1976), pp.18-19.

A recent indication from the Minister of Education[1] was that the curriculum would be divided into three categories.

1. That which must be learned. (Provincial level)
2. That which should be learned. (Provincial level)
3. That which may be learned. (District level)

A booklet[2] describing the goals of the core curriculum was distributed in December 1976 and the Minister said the following about this booklet.

> "Assuming there is broad consensus that these are the appropriate skills and knowledge that every child must learn in the various grades, then in September they will become part of the core curriculum."[3]

These policies could very well affect current procedures of curriculum development.

In summary, teacher involvement in local curriculum development is likely to become an issue in British Columbia, but the views of professional groups on this issue are not clear. One group in particular, the secondary mathematics teachers of British Columbia, does not appear to have a definite policy on teacher involvement in local curriculum development.

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[1]Patrick McGeer, "Minister's Policy Statement," Education Today, vol. 3 no. 3 (November, 1976), p. 49.

[2]Province of British Columbia, Ministry of Education, What should our children be learning; Goals of the core curriculum (Victoria: Ministry of Education, November, 1976).

[3]Province of British Columbia, Ministry of Education, "Core Goals Booklet Now Available," Education Today, vol. 3 no. 4 (December, 1976), p. 2.

1.4 PURPOSE of the STUDY

Since little has been done to elicit response from mathematics teachers on the various issues presented above, the author studied the current involvement of secondary mathematics teachers in local curriculum development, their attitudes toward such involvement, and the relationship between teacher attitudes and various personal variables. Other studies, which are reviewed in the following chapter, showed that the characteristics of teachers with respect to involvement in and attitudes toward local curriculum development varied tremendously with time and place. This study therefore examined many of the personal variables that the other studies had used.

The study also involved the construction of a questionnaire which was sent to various mathematics teachers across the province. The data were used to answer the following basic questions.

1. To what extent are secondary mathematics teachers currently participating in local curriculum development?

2. What are the attitudes of secondary mathematics teachers toward curriculum development at the local level?

3. What are the characteristics of teachers with respect to involvement in local curriculum development and attitudes toward local curriculum development?

1.5 DEFINITION of TERMS

Curriculum: A brief survey of the literature on curriculum theory shows that there is little agreement on the definitions of 'curriculum' or on the theory of curriculum development. For example, the word 'curriculum' still has a range of possible meanings, from "all the learning experiences encountered by a student in a school" to "a set of intended learning outcomes."[1] Babin[2] reports that a recent perusal of twenty-five curriculum textbooks gave twenty-five different definitions of curriculum. To some, curriculum means subject matter, to others it means a guide of what to teach and to yet others, curriculum means life itself. Secondary and elementary teachers often differ on their interpretation of curriculum and current researchers must acknowledge and tolerate these differences. Recently there has been some effort[3] to narrow down the concept of curriculum to include content only, thus eliminating the aspect of instruction entirely. In this study, the attempt is not so much to restrict the concepts to precise definitions but rather to anticipate what mathematics teachers understand about curriculum development.

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[1]Ted Aoki, "Curriculum and Instructional Design," Project Canada West, ed. R. H. Sabey (Vancouver: BCTF, 1975), p. 51.

[2]Patrick Babin, "Slaughtering some sacred cows," Education Canada, vol. 14 no. 1 (March, 1974), p. 41.

[3]Mauritz Johnson, "On the Meaning of Curriculum Design," Curriculum Theory Network, vol. 3 (1969), p.6.

Attitudes: Attitudes toward local curriculum development can be determined from underlying factors and specific duties associated with curriculum development. Therefore, the term 'attitude' has been operationally defined as the measure that results from the attitude section of the questionnaire, which examines underlying factors and specific activities of local curriculum development.

Local: Local curriculum development in this study means curriculum development at the district or school level. Instead of the current practice of involving a few select teachers on a provincial revision committee, teachers at the district or school level would develop outlines of courses.

1.6 LIMITATIONS of the STUDY

This study is limited due to the fact that a questionnaire was used to gather the data. In general, questionnaires have many weaknesses, some of which will be examined in the following chapter. Another limitation is that the survey population may or may not be truly representative of secondary mathematics teachers in general. The members of the population were not forced to join their association and could therefore be a select representation. Another limitation is that the conclusions of the study would naturally be restricted to British Columbia and may not be generalizable to any other area.

Chapter 2

LITERATURE REVIEW

2.1 OVERVIEW

The review of literature has been divided into three parts in this chapter. Section 2.2 consists exclusively of empirical studies that have been done on the involvement of teachers in curriculum development activities. Viewpoints expressed by individuals or societies like teachers' federations have already been considered in the previous chapter and therefore have been left out in favour of actual research articles and theses. Section 2.3 reports various teacher roles in local curriculum development and the final section examines the defects of questionnaires.

2.2 EMPIRICAL STUDIES

This section examines empirical studies that relate to the three basic research questions. These studies have provided ideas of what types of variables to consider, the instruments or procedures that might be useful and how the appropriate data might be collected. The limitations of similar research can often provide excellent guidelines, even though some of the conditions are quite different. Studies at both the foreign and national level were reviewed and are summarized in the following.

Curriculum development at the local level in Canada is by no means a recent concern for some provinces. Ontario, for example, established local curriculum committees as early as 1950. In that year, the use of a single textbook for each subject was discontinued and teachers were allowed to choose textbooks from an extensive list. A study[1] was completed in 1959 by the Canadian Teachers' Federation on the part played by Ontario teachers in curriculum revision. The study examined external and internal methods of curriculum modification. External methods referred to teacher involvement at the provincial and district level through membership on curriculum committees. Internal methods referred to teacher deviations from the existing curriculum guide at the classroom level. Teachers, principals, and administrators in Ontario were appropriately sampled and given a questionnaire which included items relating to the extent of locally-constructed curricula use, the extent of participation on revision committees and the degree of liberty taken with curriculum outlines. Results relating to these issues were as follows.

1. In small communities (less than 1000), only 10% of the schools were using locally-developed curricula, as compared to almost 40% in the large communities (30,000+). Since the larger schools were found in large communities, local revision was concentrated in the larger schools.
2. Mathematics and Social Studies were the subjects most often revised.
3. Most administrators felt that locally-developed curricula were better suited to local conditions.
4. The majority of teachers would accept curriculum change if they were allowed to take part in the

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[1]Canadian Teachers' Federation, Teacher Influence on Curriculum, Research Study No. 4 (Ottawa, Ontario: CTF, 1959).

planning.
5. Approximately 53% of the curriculum guides in use had been modified at either the local or classroom level.
6. Participation in local curriculum development was generally limited, yet only a few teachers felt that they required a stronger voice in curriculum matters.

This early study shows how a questionnaire provided details of teacher characteristics and involvement in local curriculum development. However, Ontario was the only province that decentralized curriculum decision-making so early and one must turn to foreign countries for other relevant studies.

As part of a study on the attitudes of Swiss teachers towards the planning of the curriculum, Santini[1] examined the self-perception of teachers in curriculum development. From interviews, he found out that they saw themselves as an important part of the curriculum development process. Virtually all teachers called for participation in curriculum development at the canton (corresponding to the American school district) level although only 14% of those interviewed had actually participated in the development of a curriculum. Some characteristics of teachers were that twice as many men as women participated and that large school communities had a greater ratio of teacher participation. Santini finished his article by noticing that "involvement with curriculum is not to be viewed as a 'job' entirely separated from other professional activities, but integrated into a teacher's duties."[2]

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[1]Bruno Santini, "Attitudes of Swiss Teachers towards the Study and Planning of the Curriculum," The Journal of Curriculum Studies, vol. 5 no. 2 (November, 1973), p.161.

[2]Ibid., p. 164.

The Swiss study showed that the curriculum reform movement, with its emphasis on curriculum development by practising teachers instead of subject specialists, has affected foreign countries as well as North America. England also, with her local teacher centres providing for curriculum development at the school level, offered many examples of teacher involvement. However, examination of studies from the United States was more profitable, since their educational system was closer to the Canadian one. Summaries of various ERIC reports and dissertations on issues relevant to the three research questions are reported in the following.

In a report to the American Educational Research Association Conference in 1970, Kardas[1] outlined some results of her study of teacher participation in curriculum planning and implementation. Although the study used elementary teachers, the instruments were suitable for secondary teachers also. Kardas found that there was a positive correlation between participation in curriculum planning activities and implementation of curriculum guides in the classroom. Teachers who were most likely to implement a curriculum at the district level were those who wrote the guides, wanted to receive professional credit for participation and preferred school personnel to direct the curriculum activities.

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[1]Barbara J. Kardas, Characteristics of Teacher Participation in Curriculum Planning and Reported Acts of Implementation, U. S. , Educational Resources Information Center, ERIC Document ED 037 382, March, 1970.

Another ERIC document[1] presented a set of guidelines to help school districts become more decentralized. In the beginning chapter, the authors listed a series of statements about decisions to be made at the local school level. Some of these statements reveal typical decentralized activities in curriculum decision-making. For example, schools in truly decentralized situations would be able to choose their own textbooks, initiate their own courses, hire their own curriculum specialists, and decide on their own inservice activities.

Beauchamp conducted a longitudinal study of a new curriculum system for an Illinois school district. Teachers were organized into three groups, a horizontal committee which handled curriculum matters at each grade level, a vertical committee which handled the curriculum of each subject field, and a curriculum council which coordinated the efforts of the other two committees and directed the implementation of the guides. The goal of Beauchamp's project was to observe the effect of various types of leadership on teacher attitudes and performance. Some of the instruments used to collect data were the Curriculum Attitude Inventory by Langenbach, the Teacher Self-Analysis Inventory, designed to measure teachers' perception of their performance, and the Principal's Teacher

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[1]W. W. Monahan and H. M. Johnson, Decentralized Decision Making Toward Educational Goals, U.S., Educational Resources Information Center, ERIC Document ED 078 586, May, 1973.

Analysis Inventory, designed for principals to use in evaluating teacher performance. The fifth study[1] in the series of ERIC documents analysed the scores on these three instruments with respect to various teacher characteristics including the grade level taught, sex, and extent of formal education. Generally, the project showed that the attitudes of teachers toward participation in the curriculum system gradually improved with time. This type of curriculum system seems to have been effective in this Illinois school district and gives an example of local curriculum development.

From questionnaires on Colorado teacher participation in curriculum committee work, McQuigg[2] reported the following major points.

1. Teachers and administrators agreed that teachers should be required to serve on curriculum committees;

2. A majority of teachers approved of a reduced teaching load for teachers serving on curriculum committees;

3. A majority of secondary school teachers approved of the use of a substitute teacher while the regular teacher is engaged in curriculum committee work;

4. A majority of teachers rejected the opinion that curriculum committee work is a part of every teacher's job and special provisions need not be involved.

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[1]George A. Beauchamp and Patricia C. Conran, Longitudinal Study in Curriculum Engineering--5, U.S., Educational Resources Information Center, ERIC Document ED 102 670, April, 1975.

[2]Robert B. McQuigg, "Participation in Curriculum Committees by Classroom Teachers in Selected Colorado School Systems," Unpublished doctoral dissertation, The University of Colorado, Boulder, Colorado, 1962, Dissertation Abstracts, Vol.XXIII, p. 3733.

McQuigg also found that "the time required to do curriculum committee work, a lack of credit received, and a lack of implementation of the committee's recommendations appeared to be the major obstacles to curriculum work for classroom teachers."[1] Many teachers also felt that curriculum committee work was an extra task added to their job rather than an integral part of it.

In a partly historical study, Heusner[2] determined in 1963 that the literature on teacher participation in curriculum development indicated strong support for the construction of guides at the local level. He then examined whether large-scale teacher involvement was of value in terms of the time and effort expended. Through interviews of teachers, principals, and curriculum specialists, Heusner found that teacher participation in curriculum development did not necessarily result in increased utilization of guides unless adequate recognition, time, and organization was evident. He outlined a curriculum model based on determining the degree of teacher readiness, identifying the role of all participants, developing the format of guides, and increasing communication between participants and other classroom teachers. He also pointed out the need for clarifying the function of curriculum guides and textbooks.

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[1]Ibid., p.3733.

[2]Henry C. Heusner, "A Study of the Utilization of Curriculum Guides as Related to Selected Factors in their Planning and Construction," Unpublished doctoral dissertation, Wayne State University, Detroit, Michigan, 1963, Dissertation Abstracts, Vol. XXV, p. 322.

A secondary purpose of Johansen's[1] study in 1965 was to investigate the relationship between teacher participation in local curriculum decision-making and curriculum implementation. He developed a questionnaire that measured teacher participation in curriculum development and teacher implementation of the curriculum guide. The researcher found significant positive coefficients of correlation between the two measures.

By means of a questionnaire based on the literature of cooperative curriculum development, Martin[2] analysed how teachers and curriculum leaders viewed the teacher's role in cooperative development. Specifically, teachers in ten Los Angeles County school districts gave their ideas of teacher roles. The three major conclusions reported were:

1. The roles of secondary and elementary teachers in cooperative curriculum development are not the same in that the secondary teacher should be regarded as an expert in his subject specialty.

2. Clerical assistance, the provision of a workroom, and release time are essential to curriculum development work.

3. Role expectations of teachers and curriculum specialists should be clearly determined, and should be frequently reviewed.

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[1]John H. Johansen, "An Investigation of the Relationships Between Teachers' Perceptions of Authoritative Influence in Local Curriculum Decision-Making and Curriculum Implementation," Unpublished doctoral dissertation, Northwestern University, Evanston, Illinois, 1965, Dissertation Abstracts, Vol. XXVI, p. 3127.

[2]Mary D. Martin, "The Teacher in Cooperative Curriculum Development," Unpublished doctoral dissertation, University of Southern California, 1965, Dissertation Abstracts, Vol. XXVI, p. 799.

In 1970, Burns[1] examined the current and prospective participation of classroom teachers in curriculum policy-making in the State of New Jersey. In his analysis of questionnaire returns, he found that significant differences among teachers existed on the following variables: sex, years of teaching experience, educational level, teaching level, and geographical area of employment. Specific findings included:

1. Male teachers appeared to be more involved in curriculum planning.

2. Teachers with the least experience did not feel free to make some decisions within the classroom.

3. Teachers with the greater amount of formal education appeared to believe they were more involved in curriculum policy formation and decision making than their less educated colleagues.

4. Most suburban teachers reported they enjoyed more academic freedom than urban and rural colleagues.

Radcliffe[2] conducted a study in 1972 to determine the change of teacher attitudes toward curriculum planning and use in an Illinois school district. The district tried a new approach to curriculum planning which involved the construction of a written guide for lesson planning and curriculum implementation. The researcher found that teachers generally had a positive attitude toward the curriculum system but that

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[1]Edward J.Burns, "The Emerging Role of the Teacher in Curriculum Policy Formation and Decision Making in the State of New Jersey," Unpublished doctoral dissertation, Fordham University, 1970, Dissertation Abstracts, Vol. XXXI, p. 3161.

[2]David H. Radcliffe, "A Study of the Effect of Curriculum Planning and Usage on Teacher Attitudes in the Danville Public Schools, Danville, Illinois," Unpublished doctoral dissertation, University of Illinois at Urbana-Champaign,1972, Dissertation Abstracts, Vol.XXXII, p. 539.

they had strong negative feelings to the planning and development of the guide. Also reported was that high school teachers tended to show the greatest amount of positive change in attitude towards curriculum planning and use.

In 1975, Oswalt[1] studied various aspects of teacher involvement in curriculum development. Specifically, he examined teachers' perceptions of their involvement in curriculum development, the relationship between these perceptions and selected personal variables, and teachers' evaluations of their participation in curriculum development activities. He collected some of the data with an instrument called the Curriculum Development Participation Survey and reported the following results.

1. A positive attitude toward teaching is related to a positive perception of involvement in curriculum development.

2. Young teachers and teachers with limited experience have particularily high motivation for personal involvement in curriculum development activity.

3. Teachers perceive curriculum development as their own legitimate responsibility and not the responsibility of experts from outside the school system.

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[1]Eugene T.Oswalt, "Perceptions and Evaluations of Involvement in Curriculum Development," Unpublished doctoral dissertation, Auburn University, 1975, Dissertation Abstracts, Vol.XXXVI, p. 3304.

Domanico[1] surveyed school districts in New Jersey in an effort to determine how district policy on curriculum development had changed in the years 1971-75. He found that the curriculum reform movement had caused school district policy changes in more than half of the districts in that these districts now had written administrative guidelines for curriculum development. Domanico further reported that procedures for curriculum development were also affected in the last five years, the most influential approach being the teacher committee. The researcher recommended that school board and administrative policy should be the primary guidelines for curriculum development.

There are a few Canadian reports on curriculum development projects in various provinces. For example, a study by Newton[2] was undertaken in 1967 to discover whether or not classroom teachers in Saskatoon were satisfied with their role in curriculum changes. A questionnaire was sent to teachers of grades 5-8 who were using a new mathematics textbook. The researcher found that few teachers seemed to be satisfied with their roles in the change process. They wanted to have more share in the early stages of planning although they saw the need

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[1]Edward M. Domanico, "An Examination of Procedural Options for Curriculum Development in Response to the Curriculum Reform Movement," Unpublished doctoral dissertation, Dissertation Abstracts, Vol.XXXVII, p. 109.

[2]E.E.Newton, "Teacher Reaction to Change," Unpublished Master of Education Thesis, University of Saskatchewan, Saskatoon, 1967, reported in The Canadian Administrator, vol. 6 no. 7, April, 1967, pp. 25-28.

to have other people from other fields assist in analysing a situation and in establishing the goals. Newton remarked that:

> "Time is the key to the whole question in the opinion of the teachers interviewed. They want to share in curriculum planning but they insist that it cannot be done properly on weekends and in the evenings. Several teachers suggested that there ought to be permanent curriculum committees in large school systems, and that teachers involved should be given at least one-half day a week for this work."[1]

Although this study dealt primarily with elementary teachers, it was the only study that dealt exclusively with mathematics teachers. The following study, wider in scope, analysed teachers of grades K-12 and in all subject fields.

Simpkins[2] analysed teacher participation in decision-making in fourteen urban schools in Alberta. Part of his study involved teacher perceptions of curriculum planning and adaptation. He found that teachers preferred those in higher official authority to play the major role in deciding the basic outline of the curriculum. Teachers themselves preferred to play the major role in determining the detailed content of the curriculum. Simpkins stressed that actual teacher participation must be studied, not just their aspirations.

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[1]E.E.Newton and I.E.Housego, "Teacher Reaction to Change: A Case Study," The Canadian Administrator, vol. 6 no. 7 (April, 1967), p. 27.

[2]William S. Simpkins, "The Distribution of Decision-Making Authority in the School," Unpublished doctoral dissertation, University of Alberta, 1968, reported in W.S.Simpkins and D.Friesen, "Teacher Participation in School Decision-Making," The Canadian Administrator, vol. 8 no. 4, (January, 1969), pp. 13-16.

Miller[1] reviewed the literature on teacher participation in curriculum development and determined that there had been little research on the role of the classroom teacher as the major developer of curricula. He therefore developed ten basic principles on local curriculum development which he used as a basis for a questionnaire and an interview schedule. The subjects were participants in Project Canada West, a project enabling Social Studies teachers to be the major developers of curriculum. His study led to the following conclusions.

The participants in Project Canada West

1. Implemented to a considerable extent the ten basic principles of curriculum development at the local and regional level.
2. Were slightly older, were better qualified academically, had more years of teaching experience and had a larger percentage of their number teaching at the secondary level than was true for teachers in Canada as a whole.
3. Believed that the effects of their involvement had been mainly beneficial in relation to their classroom activities and their professional growth as teachers.

Project Atlantic Canada (PAC) is a project in Social Studies similar to Project Canada West and currently underway in the Atlantic provinces. In a recent article, Anderson[2] reported the attitude changes in Newfoundland teachers who volunteered to initiate curriculum development. Anderson asked the following general question: "Do teachers display changes in attitudes

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[1]Thomas W. Miller, "An Analysis of Teacher Participation in Curriculum Development for Project Canada West," Unpublished doctoral dissertation, University of Saskatchewan, 1972.

[2]R.M.Anderson, "The Results of Teacher Initiative in Curriculum Development: Some Empirical Findings," Newfoundland Teachers' Association Journal, vol. 67 no. 1, (Winter 1975/76), p.59.

toward curriculum use and planning as a result of involvement in PAC?" He identified four groups of teachers;

1. Teachers who volunteered and subsequently participated.
2. Teachers who volunteered but were not chosen to participate.
3. Teachers who refused to become involved.
4. Teachers unaware of the project.

Each group was given the Curriculum Attitude Inventory (by Langenbach) in order to determine their attitudes toward curriculum planning. Analysis of variance and multiple comparison techniques revealed that the teacher participants in PAC had significantly more positive attitudes towards curriculum planning than the group that refused and also the group that volunteered but did not participate. The researcher therefore concluded that involvement in PAC apparently affected attitudes toward curriculum planning. As an ending note, the author claimed that Langenbach's inventory would be a useful tool for future investigations in this area.

Langenbach's[1] questionnaire was developed to discriminate between teachers who had various attitudes toward curriculum planning. The final fifty items of the questionnaire were chosen from a pool of statements about the curriculum and validated by two groups of teachers, one with positive attitudes toward curriculum planning and the other with negative attitudes. The instrument was then administered to a group of

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[1]Michael Langenbach, "Development of an Instrument to Measure Teachers' Attitudes Toward Curriculum Use and Planning," Journal of Educational Research, vol.66 no.1 (September, 1972), pp.35-38.

teachers to see if there were differences due to the following factors.

1. Participation in curriculum planning.
2. Grade level (elementary or secondary).
3. Years of teaching experience.

Langenbach found that there was a significant difference between the scores of teachers who had participation experiences and the scores of those who did not. However, he found that grade level and years of experience did not significantly affect the scores. The researcher concluded that although the reliability coefficient of his instrument was only .66, teachers could still be successfully differentiated as to their attitudes toward curriculum use and planning.

2.4 TEACHER ROLES in CURRICULUM DEVELOPMENT

Developing questions on involvement in local curriculum development required an understanding of possible teacher roles. Therefore, the following presents a few examples of the duties and roles of teachers in a decentralized curriculum development situation. First, teacher involvement through teacher centres is described. Then the teacher's role in curriculum development as viewed by a curriculum theorist is examined. After a review of teacher involvement in the United States, the Miller[1] principles on local curriculum development are presented.

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[1]Thomas W. Miller, "Ten Principles of Curriculum Development... For Classroom Teachers," Ontario Education, vol.5 (May, 1973), p.13.

In England, the increased involvement of teachers in curriculum development indirectly led to the creation of teacher centres[1] during the middle sixties. The centres are local facilities where self-improvement programs are organized and run by the teachers themselves. Basically, they are used for in-service training, curriculum development work, and as a place to socialize. What teachers do at these centres and how they construct their local curriculum guides provide good examples of involvement in curriculum development. By open discussion with teachers and an analysis of syllabuses (local curriculum guides), Taylor[2] found out that methods of planning and the content of syllabuses varied tremendously with subject field and individual teachers. An examination of the involvement of Science teachers showed that planning was generally a school departmental affair and involved the continuous refinement of a sequence of organized content. The syllabuses concentrated heavily on content and largely ignored teaching methods or evaluative procedures. Teachers were free to develop their own curriculum, the only external guide on subject matter being the nationwide system of school examinations.

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[1]Steven K. Bailey, "Teachers' Centres: A British First," Phi Delta Kappan, vol.53 no.3 (November, 1971), pp.146-149.

[2]Phillip H. Taylor, How Teachers Plan Their Courses, (England: National Foundation for Educational Research, 1970).

A contrast to the practical aspects of the British teacher centres is the standard curriculum theorist view on curriculum development. A typical teacher saddled with the duty of complete curriculum development would be actively involved in the following four basic procedures.[1]

> 1. Defining goals and fundamental objectives, based on a thorough knowledge of student characteristics and the local situation.
> 2. Designing and selecting the details of content, sequence, and instructional materials, culminating in the production of a written curriculum guide.
> 3. Implementing the curriculum guide in the classroom through instruction, using professional expertise to decide on appropriate teaching strategies.
> 4. Evaluating the whole curriculum and determining learner progress, laying the basis for revision and future planning.

This curriculum specialist approach could be carried out at the classroom, school or district level. At the district level, a committee would most likely be held responsible for the process.

A typical American example of teacher involvement in mathematics curriculum development at a district level could be described as follows. A full-time specialist in curriculum development, assuming overall responsibility for leadership, would form a curriculum council composed of district personnel, subject specialists and community volunteers.[2] Teachers on the council would have adequate training in curriculum development procedures and some release time from classroom duties. The

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[1]J.G.Saylor and W.M.Alexander, Planning Curriculum For Schools, (New York: Holt, Rinehart and Winston, Inc., 1974), p.27.

[2]S.A.Jackson, "The Curriculum Council: New Hope, New Promise," Educational Leadership, vol.29 no.8 (May, 1972), pp.690-691.

council itself would provide a workroom, materials, inservice workshops, and professional expertise for the mathematics teachers of the district.[1] The council would also develop and write the local curriculum guide, choose the textbooks and programs to follow, and supervise the implementation of the program.

The Canadian example of Project Canada West provides a final description of teacher roles in local curriculum development. Miller reported that the participants in Project Canada West implemented to a considerable extent ten basic principles of curriculum development at the local level. These principles were that:

> "1. The teachers participate in every phase of the planning;
>
> 2. The teachers work in an atmosphere of cooperation, permissiveness and equality;
>
> 3. The teachers have the essentials of curriculum development-- time, money and facilities;
>
> 4. The teachers select a limited program for local development and avoid elaborate, comprehensive programs;
>
> 5. The teachers give attention to specific goals and appropriate materials, content and teaching strategies;
>
> 6. The teachers employ the methods of professional researchers to study current literature, available materials and other curriculum projects, and thus acquire a research point of view;
>
> 7. The teachers utilize the services of educational consultants, university scholars, professional laymen

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[1]Harold E. Turner, "What is the Optimum District for Curriculum Development?" Peabody Journal of Education, vol.46 no.6 (May, 1969).

and other resource persons;

8. The teachers utilize a central, coordinating body to unify their scattered efforts, and to assist each other;

9. The teachers develop good public relations with their supervisors, other teachers and laymen;

10. The teachers conduct a program of continuous evaluation of their work."[1]

These principles were summarized by Miller from an extensive review of the literature on curriculum development and describe the conditions of effective local curriculum development.

2.4 QUESTIONNAIRE DEFECTS

Questionnaires are difficult to construct properly and are plagued by several defects. Kerlinger has stated:

> "Two of these defects are possible lack of response and the inability to check the responses given. These defects, especially the first, are serious enough to make the mail questionnaire worse than useless, except in highly sophisticated hands."[2]

A third defect is response set, which is defined as "a general tendency to agree or disagree with questionnaire items, regardless of their content."[3] These three defects are considered in the following.

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[1]Thomas W. Miller, The Classroom Teacher as Curriculum Developer for Project Canada West (Saskatchewan: Saskatchewan Teachers' Federation, 1973), p.12.

[2]Fred N. Kerlinger, Foundations of Behavioral Research (2d. ed.; New York: Hart, Rinehart and Winston, 1973), p.414.

[3]Ibid., p.43.

Opinion is divided on what constitutes a good return rate. The National Education Association Research Division claims that:

> "Until 90% of those queried have responded, the results often do not reflect accurately important characteristics of the entire group from which the sample is drawn."[1]

However, one percent is considered good for a national magazine poll.[2] In order to determine a reasonable return rate for a sample like secondary mathematics teachers, two studies were examined. In the first one, 64% of a sample of classroom mathematics teachers randomly selected from the National Council of Teachers of Mathematics membership list responded to a survey[3] on in-service education. In the second survey[4], about 60% of secondary mathematics teachers randomly selected from across the United States responded. These studies indicated that a return rate of around 60% could be expected for the current research.

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[1]National Education Association, Research Devision, "Increases in Scheduled Salaries 1965-66 to 1966-67, NEA Research Bulletin, no.44 (December, 1966), p.109.

[2]Dan Turner, "A Time to Care," The Canadian, (April 9, 1977), p.4.

[3]Alan Osbourne (chairman), "In-service Education: Views of Teachers," A Report to the Commission on the Education of Teachers of Mathematics, reported in Vector, vol.16 no.4 (June, 1975), p.24.

[4]George Gearhart, "What do Mathematics Teachers think about the High School Geometry Controversy?" The Mathematics Teacher, vol.68 no.6 (October, 1975), p.486.

The inability to check responses is a defect which is difficult to remedy. Follow-up studies using telephone surveys or personal interviews can be effective, and one can often check the consistency of responses by constructing matched items in the survey instrument. However, the investigator is usually at the mercy of the respondents and can at most assume that the survey instrument was truthfully and conscientiously filled out.

The final defect considered here, response set, is currently under much discussion and examination by social theorists. Robinson[1] indicates that there are two main types of individuals who indicate this bias toward taking tests. The first type are yea-sayers, who generally indicate a willingness to go along with others. The second type are individuals who try to make a good impression. An effective way of controlling response set is explained by Couch.

> "By using an equal number of positively and negatively scored items, the agreeing response set can be balanced out at its source."[2]

However, amidst all the theorizing about controlling response set, Rorer submits this caution.

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[1]J.P.Robinson et al, Measures of Political Attitudes (Ann Arbor, Michigan: Institute for Social Research, University of Michigan, September, 1968), p.12.

[2]A.Couch and K.Keniston, "Yeasayers and Naysayers: Agreeing Response Set as a Personality Variable," Journal of Abnormal and Social Psychology, vol.60 no.2 (1960), p.173.

> "Unless one has some kind of supplementary information, no such inferences (about an individual's response style) are possible on inventories, because the correctness of the answers is unknown and because there is no basis for assuming that the individual guessed at any of the answers."[1]

Often, written comments can indicate the response set of an individual, but comments are most useful for determining the reaction to a test as a whole and also to individual items.

2.5 SUMMARY

The foregoing described foreign and national studies of teacher involvement in local curriculum development. Many studies answered questions almost identical to the ones of the current research. However, the results and conclusions of the studies varied tremendously. The extent of teacher involvement in local curriculum development depended on where the study took place. Teacher attitudes toward participation in local curriculum development also varied tremendously from place to place. Variables which were significant in one study would often be insignificant in a similar study. Overall, the results seemed to be generalizable only to the particular place and group which the study involved.

The methods of investigation also did not seem to follow any standard procedure. One instrument, the Curriculum Attitude

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[1]L. G. Rorer, "The Great Response-Style Myth," Psychological Bulletin, vol.63 no.3 (March, 1965), p.151.

Inventory created by Langenbach, was used by several of the studies, but most investigators developed their own survey instruments. This was undoubtedly due to the variation in local situations and the differing goals of each project or study. Although the Langenbach instrument was acquired, it was not appropriate for the current research. A special questionnaire was needed for this study, and therefore specific problems affecting questionnaires were reviewed.

Questionnaire defects were considered in order to understand more fully the limitations and weaknesses of the mail questionnaire. Since this study used a questionnaire, many of these considerations were highly important and necessary for the methodology of this research.

Chapter 3

METHODOLOGY

3.1 ORGANIZATION of the CHAPTER

The population and sample used in the study are described in section 3.2. For reasons explained in Chapter two, this study required the development of a mail questionnaire. Development of this questionnaire is described in section 3.3. Sections 3.4 and 3.5 describe the procedures used to gather and organize the data and the method of analysis of the data respectively.

3.2 POPULATION

This study required data from teachers of mathematics in the public schools of British Columbia. Some data were obtained from the Educational Data Services branch of the Ministry of Education, but were mostly demographic and very general in nature. The British Columbia Teachers' Federation (BCTF) was then contacted in an attempt to obtain a population of mathematics teachers, but the membership list was not easily accessible and furthermore, did not distinguish teachers as to their subject area. The best available representation of mathematics teachers seemed therefore to be the members of the British Columbia Association of Mathematics Teachers (BCAMT).

The BCAMT is a subject specialist group supported by the BCTF and is dedicated to the improvement of mathematics education throughout the province. The organization accepts as members all persons interested in the teaching of school mathematics and consists of groups like university educators, elementary and secondary school teachers, and even educational company representatives. These concerned and involved people may not truly represent mathematics teachers in general. However, these people are the ones most likely to determine future trends, so the BCAMT was considered the best available group to study. A sample of 200 was randomly chosen from this population.

3.3 DEVELOPMENT of the QUESTIONNAIRE

The first step was to develop a preliminary questionnaire. The questions under investigation required that the questionnaire be in three parts, each part corresponding to one of the basic research questions. Items for the questionnaire were derived from the literature, informal talks with teachers and personal experience. The first part of the instrument, through a factual Yes/No design, determined the current involvement of secondary mathematics teachers in local curriculum development. The second part, a five-point Likert scale, determined the attitudes of teachers toward local curriculum development while the third part gathered personal data on the respondents. This preliminary questionnaire was subject to several revisions. These revisions were made on the basis of trials with individual teachers, fellow graduate students and approximately thirty mathematics teachers from an inservice workshop in Mission, B.C. Grammatical errors and unclear items were easily picked out in these preliminary trials but an examination of underlying constructs and factors required a formal pilot study.

On February 11,1977, the pilot questionnaire, consisting of 15 current involvement items, 25 attitude items and 10 basic data items, was sent to twenty-seven members of the BCAMT. This pilot questionnaire is attached as Appendix A. Some of the pilot subjects were chosen because the writer knew them personally, others because their known personalities would check

the validity of the questionnaire, and the rest were randomly chosen from the BCAMT membership list. No two subjects came from the same district, so each respondent was personally identified when his district number was reported in the basic data section of the questionnaire. A signed cover letter explaining the pilot and a stamped return envelope was enclosed with the questionnaire.

As the returns came in, they were individually identified and the data were coded and entered into a computer data file. All comments were transferred to one master questionnaire. No cut-off date was mentioned in the cover letter and by the middle of March 1977 all returns were judged to be in. Twenty-two questionnaires were returned, a return rate of about 75%. Table 1 shows the return distribution.

Table 1
Pilot Questionnaire Return Distribution

Time period	No. of returns
1st week	8
2nd week	9
3rd week	3
after 3rd week	2
total	22

This return rate was higher than the one expected on the final questionnaire because the participants knew that they were a small group and their response was to be used in developing the final questionnaire. Eight respondents commented directly on various items and some of these comments proved extremely helpful. The changes that resulted from the pilot are described below.

Part one was not altered to any great extent. Items 1,2,7,9, and 10 were made more specific to eliminate ambiguity. Item 13, which read "I have a lot of freedom in determining what I should teach in my mathematics classes" produced many comments and seemed to be more of an attitudinal item than a factual one. It was therefore deleted and a new item, "My school has a locally-constructed list of mathematics goals and objectives" was added. This refinement also equalized the number of items in each of the district, school and individual categories. The numerical range for each category was then identical, from a low of 5 to a possible high of 15.

Part two, the Likert scale on attitudes, was altered considerably. For scales of this type, important considerations are validity and reliability. A Likert scale in particular, assumes that all the items are evenly weighted and that each item measures to some degree the concept under investigation. Face validity of the pilot was established through discussions with the members of the writer's advisory committee. An estimate of the reliability of the Likert scale was computed for the pilot questionnaire by a computer program called Lertap[1] and changes to the scale were made from the results of the program's item-analysis routine. The Lertap analysis calculates the correlation coefficient of each item with the total test, thus determining if an item is representative of what the total test measures. The reliability coefficient, the Hoyt estimate of

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[1]The Educational Research and Statistics Centre (ERSC) of the Faculty of Education at UBC supports an item-analysis routine (LERTAP) which was created at the University of Colorado.

reliability, is calculated from these item correlation coefficients through an analysis of variance method. The reliability estimate obtained from the pilot study was .88 and the data for the item analysis are presented in Table 2.

Table 2
Pilot Questionnaire Item-Test Correlations

Rank Order	Item No.	Correlation with Test	
1	12	.749	
2	16	.745	
3	25	.731	
4	14	.689	
5	19	.685	
6	9	.605	
7	4	.595	items
8	21	.573	retained
9	5	.570	
10	15	.523	
11	18	.518	
12	11	.507	
13	7	.441	
14	1	.382	
15	22	.372	
16	13	.356	
17	23	.340	
18	8	.299	
19	20	.291	
20	6	.279	items
21	2	.271	deleted
22	3	.232	
23	24	.223	
24	10	.206	
25	17	.102	

The ten items which correlated lowest with the total in the item analysis were deleted. Two of these items underwent major rewording. Altogether, 25 original items were refined down to a final 20-item scale through 8 deletions, 3 additions and 2 rewordings.

Part three, like part one, was also modified only slightly. Items 4,7, and 8 underwent format changes to ease the responding effort. Instead of having to write information down, the respondents simply had to check off the appropriate information. A description of the final form follows.

The first part of the final questionnaire (the final questionnaire is attached as Appendix B) was designed to determine the current involvement of secondary mathematics teachers in local curriculum development. Involvement was divided into three categories, at the district level, at the school level, and at an individual level. Respondents could quite conceivably differ extensively on each category. Each item had three response modes; No, U (Uncertain), and Yes as in the following examples.

District level

No U Yes 1. My district has a local mathematics curriculum guide.
No U Yes 2. My district has a committee for curriculum development in secondary school mathematics.

School level

No U Yes 1. My school offers a locally-developed mathematics course.
No U Yes 2. My school has a locally-constructed list of mathematics goals and objectives.

Individual level

No U Yes 1. I have taught a locally-developed mathematics course.
No U Yes 2. I have had some release time this past year to work on a mathematics curriculum project.

The three response modes No, U, and Yes were weighted respectively by 1, 2, and 3 and the appropriate items were

totalled to give a measure of involvement at the district, school and individual levels.

The second part of the questionnaire was designed to measure the attitudes of teachers toward involvement in local curriculum development. In a Likert scale, five categories of response, Strongly Disagree (SD), Disagree (D), Undecided (U), Agree (A), and Strongly Agree (SA) were weighted respectively from 1 to 5 as in the following examples.

1. Teachers should be involved in developing local core curriculum. SD D U A SA

2. I would volunteer to serve on a school mathematics curriculum committee. SD D U A SA

3. Individual school districts should outline their owm core mathematics curriculum. SD D U A SA

The items were weighted so that a high total on the scale would indicate a favourable attitude toward personal involvement in local curriculum development and a favourable attitude toward the decentralization of the curriculum development process.

The third part of the questionnaire consisted of ten items which gathered the following data from the respondents.

1. Years of age
2. Sex
3. School district
4. Formal college education
5. Years of teaching experience
6. Current teaching level
7. Courses taught in the past
8. School size
9. Teachers on staff
10. Department head or not?

These variables were chosen either because they proved significant in other reported studies or for their possible relevance to the local situation. The items of the questionnaire were carefully spaced out on each page, each response requiring at most a circle, check mark, or numeral. The questionnaire itself had a total of fourty-five items and was four pages long.

3.4 PROCEDURES

This section describes the sampling techniques, efforts with the cover letter and return envelope, mailing procedure, and data tabulation that were used in the survey.

The BCTF maintains a mailing list of the BCAMT membership but the BCAMT executive controls outside access to this list. Permission to use the list was therefore obtained from the president of the BCAMT. The actual list was a printout from the computer at the BCTF building. The information on the computer printout included the name, address, school district number, and teaching or interest level for each member. Members who were not actually teaching in a school district were specially categorized. It was therefore possible to isolate members who indicated a secondary teaching or interest level and who were actually teaching in a school district. This group of approximately 350 people formed the population of the study.

A sample of 200 was randomly chosen from the above-defined population. The computer list had been conveniently arranged in increasing order by district number, and the names within each district were also alphabetically ordered. Ignoring the subjects who were chosen for the pilot study, every second available name on the list was chosen. On return to the beginning of the list, every fourth available name was then chosen until 200 names were obtained. This established a stratified random sample with proportional representation as to school district.

An envelope containing a cover letter, the questionnaire and a stamped return envelope was mailed to the home address of each person in the sample. The cover letter, obviously critical in introducing the questionnaire, contained a brief description of the research, its purpose and mentioned the permission of the BCAMT president to conduct the survey. An attempt to arouse the respondent's interest was made and each letter was personally signed. A cut-off date for returns was not mentioned because minimum pressure to respond was desired. The return envelope was stamped and addressed to Dr. Ian Beattie of the Faculty of Education, UBC. The use of the UBC computing centre mailing label system was used and greatly appreciated.

The questionnaire was mailed on March 23, 1977. As returns came in they were numbered, the date and place of mailing noted, and the data transferred to computer coding forms. The information was keypunched on to standard 80 column computer cards and was organized as follows.

Table 3
Organization of Data on Computer Cards

card columns	information recorded
1-15	weighted response to items of I Current Situation
17-18	total of columns 1 to 5, a measure of district involvement
20-21	total of columns 6 to 10, a measure of school involvement
23-24	total of columns 11 to 15, a measure of individual involvement
26-27	total of columns 1 to 15, a measure total involvement in local curriculum development.
31-50	weighted item response to II Attitudes
52-54	total of columns 31 to 50, a measure of attitudes toward local curriculum development
61-62	age of respondent
63	sex (1=male 2=female)
64-65	school district number
66	formal college education (1= less than 4 years, 2= 4 years, 3= 5 years, 4= some postgraduate courses, 5= 6 years or more)
67-68	years of teaching experience
69	teaching level (1= Junior, 2= Senior, 3= both)
70-71	an index of educational diversity (range of 0-20)
72	school enrollment (1= less than 500, 2= 500-1000, 3= more than 1000)
73-74	number of teachers on staff
75	head of department or not? (1=no, 2=yes)
78-80	identification number

All comments were transferred to one master questionnaire. Items that were commented on, but left blank were treated individually and coded as appropriate for parts I and II. Items that seemed to have been deliberately ignored were coded as missing data and were indicated with a blank.

3.5 Method of Analysis

This section describes the analyses that were performed on the data in order to interpret the returns and to answer the three research questions. Both descriptive and inferential statistics were used; the descriptive techniques to report the characteristics of the sample, and the inferential techniques to generalize to the population.

The questionnaire response was described by tabulating the return distribution and presenting some of the comments that subjects wrote on the questionnaire. As returns came in, the basic data variables that were related to each other, such as years of age and years of teaching experience, were compared for reasonableness. The district measure of current involvement was also compared for each district. The reliability and validity of the Likert scale was determined, the reliability through the Lertap item-analysis routine described earlier and the validity through a procedure where various judges examined the items for face-validity. As a check on the polarity of the items, judges also indicated how they thought a teacher who favoured involvement in local curriculum development and favoured decentralization of the curriculum development process would respond. This validation procedure is attached as Appendix C.

In order to answer question one on the extent of involvement of secondary mathematics teachers in local curriculum development, each of items 1-15 was considered in turn. The percentages of response to the categories of each item were tabulated and the mean and standard deviation for each item were calculated. The item results were then tabulated in groups of five to correspond to each factor investigated, that is, by district, school and individual. A histogram showing response to each of these groups of five items was drawn and a test of normality was performed for each distribution. A computer program called S:FIT[1] was used to test whether each observed distribution could be approximated by a normal curve. The program was designed to perform a chi-square test based on the frequency of scores in any partitioning of the data. The program indicated poor fits by large chi-square values and gave a probability that the fit was good. A test for significance of the correlation coefficients between the factors of district, school and individual involvement was planned if the distributions were accepted as normal. A standard table[2] was used for testing the significance of the obtained correlation coefficient against the hypothesis that the population correlation is zero.

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[1]R. H. Hall, UBC FIT: Test for Goodness of Fit (Vancouver: University of British Columbia, Computing Centre, 1972), pp.1-7.

[2]Henry E. Garret, Statistics in Psychology and Education (New York: David McKay Co., 1955), p.201.

The analysis for question two also involved tabulating the percentages of response to the categories of each item. The mean, standard deviation and range of the Likert scale measure of attitude toward local curriculum development were calculated, a histogram drawn and a goodness of fit for normality performed. The above test of normality was used here also.

To report the characteristics of teachers with respect to involvement in local curriculum development, the teachers were divided into two groups on the basis of their scores on the individual involvement factor of the current situation part of the questionnaire. The means and standard deviations of relevant basic data variables for high scorers and low scorers were presented. In similar manner, high and low scorers on the Likert attitude scale were compared on the basic data variables. In addition, the following specific hypotheses were tested.

1. With respect to attitudes as measured by the 20-item Likert scale, there is no difference between males and females.

2. With respect to attitudes as measured by the 20-item Likert scale, there is no difference between teachers with normal college education (5 years or less) and teachers with graduate training.

3. With respect to attitudes as measured by the 20-item Likert scale, there is no difference between teachers at the junior secondary level and teachers at the senior secondary level.

4. With respect to attitudes as measured by the 20-item Likert scale, there is no difference between mathematics teachers in small schools (less than 500) and teachers in large schools (more than 1000).

5. With respect to attitudes as measured by the 20-item Likert scale, there is no difference between teachers who are heads of mathematics departments and teachers who are not.

6. The regression of attitude as measured by the 20-item Likert scale on the basic data variables of age, years of teaching experience, educational diversity and number of teachers on staff is not significant.

Hypotheses one through five were tested by means of the t-test routine in a computer package called UBC TRP.[1] The routine tests the hypothesis that two samples come from populations with the same mean on a certain variable. Using correlation arrays, the routine first performs F-tests to test the assumption of homogeneity of variance of the two samples and uses an appropriate formula if the variances are unequal. Other assumptions are that the samples have been randomly selected from the population and that the population is normally distributed with respect to the criterion of interest.

Hypothesis six was tested by means of the stepwise regression routine of UBC TRP. This routine performs the forward stepwise regression of a dependent variable on a number of independent variables. All the independent variables are tested for significant contributions to the regression equation and the variable with the greatest significance is entered into the equation first. The remaining variables are tested for significance while taking into account the variable already in the equation. At each subsequent step, tests are performed to determine the significance of variables already in the equation and the variables potential for the equation. The assumptions

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[1]Teresa Tenisci and Chinh Le, Preliminary Draft of UBC TRP: Triangular Regression Package (Vancouver: University of British Columbia, Computing Centre, 1976), p.107.

are that the dependent scores are normally distributed and possess equal variances at each value of the independent variables, and that the dependent variable itself is normally distributed. However, the tests performed are reasonably resistant to violation of the assumptions.[1]

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[1]Fred N.Kerlinger and Elazar J.Pedhazur, Multiple Regression in Behavioral Research (New York: Holt, Rinehart and Winston, 1973), p.47.

Chapter 4

ANALYSIS

4.1 ORGANIZATION of the CHAPTER

This chapter reports the results obtained by the questionnaire and the analyses that were performed on the data. Section 4.2 presents the return rate and various comments that were made about the questionnaire. Section 4.3 establishes the reliability and face validity of the final questionnaire. Sections 4.4 to 4.6 analyse each of the basic research questions respectively.

4.2 QUESTIONNAIRE RESPONSE

The return distribution of the final questionnaire is presented in Table 4. The dates were taken from the postal cancelling mark on the return envelopes.

Table 4
Final Questionnaire Return Distribution

Time Period	No. of Returns
1st week	49
2nd week	50
3rd week	7
after 3rd week	8
total	114

Since 200 questionnaires were sent out, the return rate was 57%.

A number of teachers wrote additional comments. Some of these comments are presented in Table 5.

Table 5
Comments toward the Whole Questionnaire

1. I believe the act of curriculum development is better for the teacher and his involvement and commitment than for the concrete results that expert curriculum developers can achieve.
2. A great deal of energy can be expended on developing your own curriculum without any improvement on a provincial course. In the meantime the students may have suffered from your experimenting.
3. Of course it is the teacher's job to develop and change curriculum, but only after the teacher has taught the course several years and has a knowledge of curriculum.
4. I am following a locally- <u>constructed</u> curriculum guide in mathematics. There may be a little problem here with definitions. I understand locally-<u>developed</u> to refer to the provincially approved courses.
5. I would like to be given the time to develop my own curriculum with consideration for the provincial mathematics programs.
6. Many of the items of the questionnaire presuppose a surfeit of time, which would be nice to have. Time is unfortunately seldom available after the regular teaching and extracurricular activities are attended to by conscientious mathematics teachers.
7. Who has the time to develop their own curriculum, stay married, raise a family, own a house and keep your sanity?

These comments reflect opposing views on curriculum development, some ambiguity in definitions and the fact that availability of time is an important consideration.

One particular item caused quite a reaction. This was item 14, which read; "Covering the provincial core material is more important than determining the needs of students." Table 6 presents some representative comments that this item produced.

Table 6
Comments toward Item 14

1. Two-fold question! Teachers should develop curriculum guides and then implement them.
2. Both can be done at the same time.
3. Loaded question!
4. Who says the provincial core curriculum does not consider the needs of the students.
5. If the guide is good, yes!
6. Every teacher should be able to diagnose student weaknesses and to teach students accordingly.
7. Give teachers some credit for intelligence!
8. I do not see any conflict between the two.
9. In fact, the core curriculum does meet the needs of students.
10. This is a poorly devised question!

Again these comments indicate a range of viewpoints but some comments express the view that the core curriculum does in fact meet the needs of students. Certainly, the item proved very effective in tapping underlying feelings which might not have otherwise surfaced.

4.3 RELIABILITY and VALIDITY

In this study, no follow-up procedure to verify the responses of subjects was planned. It was assumed that teachers would answer the questions truthfully and conscientiously and there were no immediate indications of inconsistency on the basic data section.

Although it was impractical to check responses to the school or individual factors of the current situation measure, it was possible to check the district factor responses. Since the district number for each subject was recorded, the district score of individuals from the same district were compared. Table 7 shows representative data for the district factor.

Table 7
District Involvement for Respondents from the Same District

District no.	N	Mean	S.D.	Range
1	2	5.0	0.0	5-5
9	2	7.5	1.5	6-9
12	2	10.0	3.0	7-13
22	4	7.5	2.7	5-11
23	8	8.9	2.2	7-14
36	4	7.0	1.9	5-10
37	4	10.0	0.8	9-11
38	5	11.2	1.3	9-13
39	12	8.8	2.3	5-13
41	3	6.3	1.3	5-8
43	3	7.3	0.5	7-8

As can be seen in the above data, some teachers from the same school districts expressed divergent views on items which should have been answered identically. However, since no follow-up was conducted, the responses had to be accepted as reported.

The Lertap item analysis results for the 20-item Likert scale are presented in rank order in Table 8.

Table 8
Final Questionnaire Item-Test Correlations

		Item-test Correlations	
Rank Order	Item No.	Final	Pilot
1	15	.750	.731
2	12	.735	.605
3	19	.667	new item
4	18	.613	.745
5	13	.589	.685
6	3	.584	new item
7	5	.580	.518
8	9	.522	.523
9	2	.487	.573
10	14	.482	new item
11	11	.429	.595
12	8	.403	.570
13	4	.399	.441
14	7	.375	.749
15	17	.374	.689
16	10	.347	.206
17	1	.320	.232
18	16	.301	.507
19	20	.100	.382
20	6	.064	.372

Comparing the final coefficients with the pilot coefficients showed that the items were generally as effective in the final as in the pilot questionnaire. The new items did not weaken the scale and the reworded items helped slightly. The effectiveness of three items, 6(.064), 7(.375) and 17(.374) dropped substantially from their pilot effectiveness, (.372), (.749) and (.689) respectively and all the textbook items (4,7,16,17) dropped in their effectiveness. The Hoyt estimate of reliability was .86, comparable to the .88 obtained in the pilot.

The validation procedure outlined in Chapter three was followed to determine the face validity and polarity of the items in the Likert scale. Table 9 presents the response of the panel of judges to the items.

Table 9
Responses of the Panel of Judges

Item	SD	D	U	A	SA	POL
1	5	2	0	0	0	-
2	0	0	0	3	4	+
3	0	0	1	1	5	+
4	2	1	0	3	1	+*
5	0	0	0	2	5	+
6	2	2	1	1	1	-*
7	0	0	1	2	4	+
8	3	4	0	0	0	-
9	1	1	1	2	2	+*
10	4	2	1	0	0	-
11	0	0	1	3	3	+
12	6	1	0	0	0	-
13	5	2	0	0	0	-
14	6	1	0	0	0	-
15	6	1	0	0	0	-
16	2	1	2	2	0	+*
17	4	3	0	0	0	-
18	0	0	0	4	3	+
19	4	3	0	0	0	-
20	0	3	2	2	0	-*

* identifies ambiguous polarity.
SD Strongly Disagree
D Disagree
U Undecided
A Agree
SA Strongly Agree
POL Polarity assigned to the item

With the exception of five items, judges clearly agreed in their perception of how teachers who favour involvement and decentralization would respond to these questions. In four of these items, the judges tended to agree with the polarity assigned to the item.

4.4 ANALYSIS for QUESTION ONE

The first basic research question of this study was as follows.

> 1. To what extent are secondary mathematics teachers currently participating in local curriculum development?

This question was answered by dividing participation into district, school and individual levels. Each level had five items measuring the participation in local curriculum development. The descriptive statistics of the items for each level were tabulated and a histogram for each of the district, school, and individual levels was drawn.

The involvement of teachers in curriculum development as a group at the district level helps to indicate the extent of local curriculum development. Table 10 presents the item by item statistics for the five items of the district factor.

Table 10
District Involvement in
Curriculum Development

Item	No %	U %	Yes %	Mean	S.D.
1. My school district has a coordinator for secondary school mathematics.	73	9	18	1.46	.79
2. My district has a curriculum resource centre useful to secondary mathematics teachers.	54	18	28	1.74	.87
3. My district holds inservice mathematics workshops.	47	6	47	2.01	.97
4. My district has a local mathematics curriculum guide.	73	6	21	1.48	.82
5. My district has a committee for curriculum development in secondary school mathematics.	61	15	24	1.62	.85

Table 10 shows that most teachers have neither a district mathematics coordinator nor a suitable resource centre. Although approximately half of the teachers reported that their district offers mathematics workshops, most are not under any local guidelines which might have evolved from workshops or curriculum committees. In item 3, the percentage of respondents indicating YES (47%) actually represents 25 out of 43 school districts.

Table 11 presents the data on teacher involvement in curriculum development activities at a school level.

Table 11
School Involvement in
Curriculum Development

Item	No %	U %	Yes %	Mean	S.D.
6. My school offers a locally-developed mathematics course.	53	2	45	1.92	.99
7. My school has a special workroom set aside for the development of classroom materials.	85	0	15	1.30	.72
8. My school has a locally-constructed list of mathematics goals and objectives.	49	5	46	1.97	.98
9. The mathematics teachers in my school are free to develop their own course outlines.	26	7	67	2.40	.88
10. The mathematics teachers in my school have developed an outline for mathematics courses.	29	4	67	2.38	.91

Items 6 and 8 show that about half of the teachers come from schools which offer a locally-developed mathematics course or have a locally- constructed list of mathematics goals. Item 7 shows that a great number of teachers do not have the benefit of a special school workroom. However, most teachers consider themselves free to develop their own course outlines and moreover, many teach in a school where teachers have developed outlines for mathematics courses.

Perhaps the best indication of secondary mathematics teacher involvement in local curriculum development is the extent of personal involvement. Table 12 presents the individual involvement of mathematics teachers in local curriculum development.

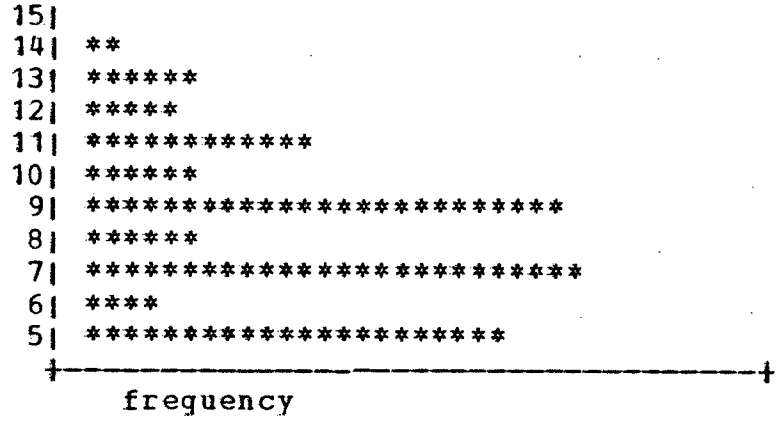
Table 12
Individual Involvement in
Curriculum Development

Item	No %	U %	Yes %	Mean	S.D.
11. I have taught a locally-developed mathematics course.	60	1	39	1.80	.98
12. I have taken part in the planning of a district or school curriculum guide in mathematics.	59	0	41	1.83	.99
13. I am currently following a locally-developed curriculum guide in mathematics.	61	3	36	1.75	.96
14. I have taken a course on curriculum development.	76	2	22	1.46	.83
15. I have had some release time this past year to work on a mathematics curriculum project.	90	0	10	1.21	.62

Items 11, 12, and 13 show that approximately three out of every five teachers have not taught a locally-developed course, have not taken part in the planning of a district or school curriculum guide in mathematics, and currently do not follow a locally-developed curriculum guide in mathematics. Also three-quarters of the teachers have never taken a course on curriculum development and nine out of every ten teachers have not received any release time this past year to work on a mathematics project.

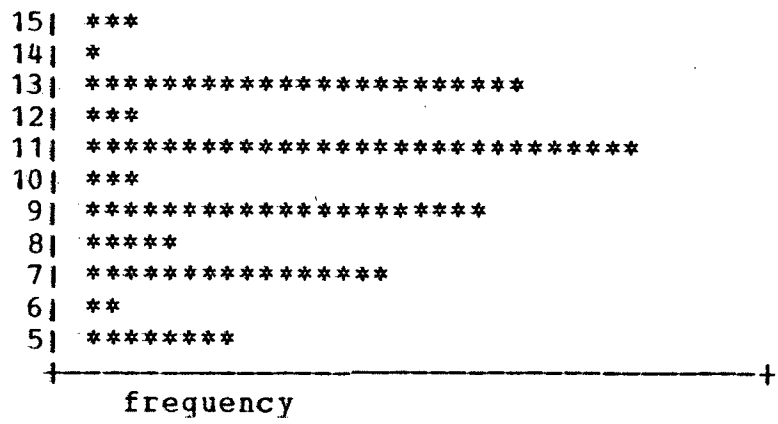
Teacher involvement in local curriculum development as measured by the first section of the questionnaire was revealed by histograms for each of the district, school and individual levels. The fcllowing three figures reveal this information.

Figure 1
Histogram for District
Curriculum Development



Mean	8.31
S.D.	2.47
Range	5-14
Skewness	0.37
Kurtosis	-.70
Chi-square	59.4
Chi-prob[1]	0.0

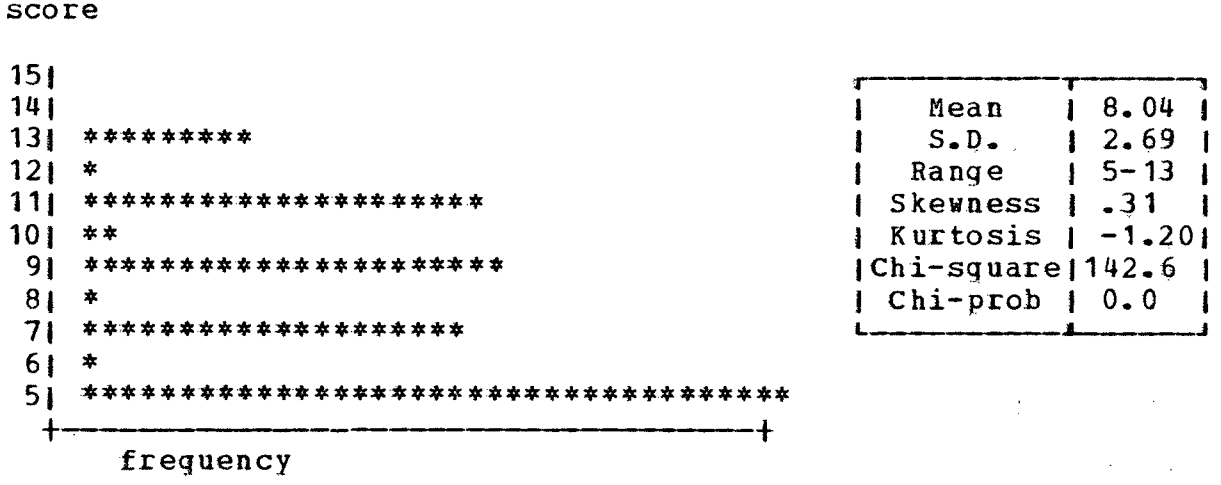
Figure 2
Histogram for School
Curriculum Development



Mean	9.96
S.D.	2.59
Range	5-15
Skewness	-.22
Kurtosis	-.80
Chi-square	83.1
Chi-prob	0.0

[1]The Chi-prob value indicates the probability that the observed distribution is normal.

Figure 3
Histogram for Individual
Curriculum Development



Figures 1 and 3 show distributions that are skewed positively. This means that most of the respondents reported little involvement in typical curriculum development activities at the district and individual levels as measured by the two scales. Figure 2 shows a distribution that is skewed negatively, which indicates that most teachers were involved with curriculum development activities at the school level. The test for normality on each of the District, School and Individual factors revealed that the distributions could not be accepted as normal. Therefore, a test for significance of the correlation coefficients between the factors was not performed, since the test required the assumption that paired observations had come from a bivariate normal population.[1]

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[1]G.V.Glass and J.C.Stanley, Statistical Methods in Education and Psychology (2d ed., Englewood Cliffs, New Jersey, 1970), p.308.

4.5 ANALYSIS for QUESTION TWO

The second basic research question of this study was as follows.

> 2. What are the attitudes of secondary mathematics teachers toward curriculum development at the local level?

Table 13 reveals the descriptive statistics of the items of the Likert scale which was specially developed to measure teacher attitudes toward local curriculum development.

Table 13
Attitudes of Teachers toward Local Curriculum Development

Item	SD %	D %	U %	A %	SA %	Mean	S.D.	Corr	Pol
1	4	4	7	43	42	1.85	1.0	.320	-
2	1	2	15	44	38	4.16	0.8	.487	+
3	2	6	9	41	41	4.14	0.9	.584	+
4	3	17	25	40	15	3.48	1.0	.399	+
5	3	25	27	32	14	3.30	1.1	.580	+
6	5	39	39	13	4	3.29	0.9	.064	-
7	10	14	17	40	19	3.46	1.2	.375	+
8	15	50	21	10	4	3.61	1.0	.403	-
9	3	10	18	49	21	3.76	1.0	.522	+
10	4	11	15	47	24	2.25	1.1	.347	-
11	7	29	17	40	7	3.11	1.1	.429	+
12	6	26	33	28	6	2.98	1.0	.735	-
13	20	38	18	20	4	3.51	1.1	.589	-
14	29	44	18	7	2	3.91	1.0	.482	-
15	18	54	15	11	1	3.78	0.9	.750	-
16	2	7	11	60	21	3.91	0.9	.301	+
17	13	53	11	15	8	3.48	1.1	.374	-
18	3	21	26	40	10	3.33	1.0	.613	+
19	10	50	18	19	4	3.43	1.0	.667	-
20	6	12	12	63	6	2.49	1.0	.100	-

An examination of specific items revealed that most teachers found the current provincial guide useful, supported the idea of

a core mathematics curriculum standardized across the province, and felt that there should be some province-wide program to ensure that the provincial core was being covered. However, most teachers felt that the provincial core was not necessarily more important than determining the needs of students.

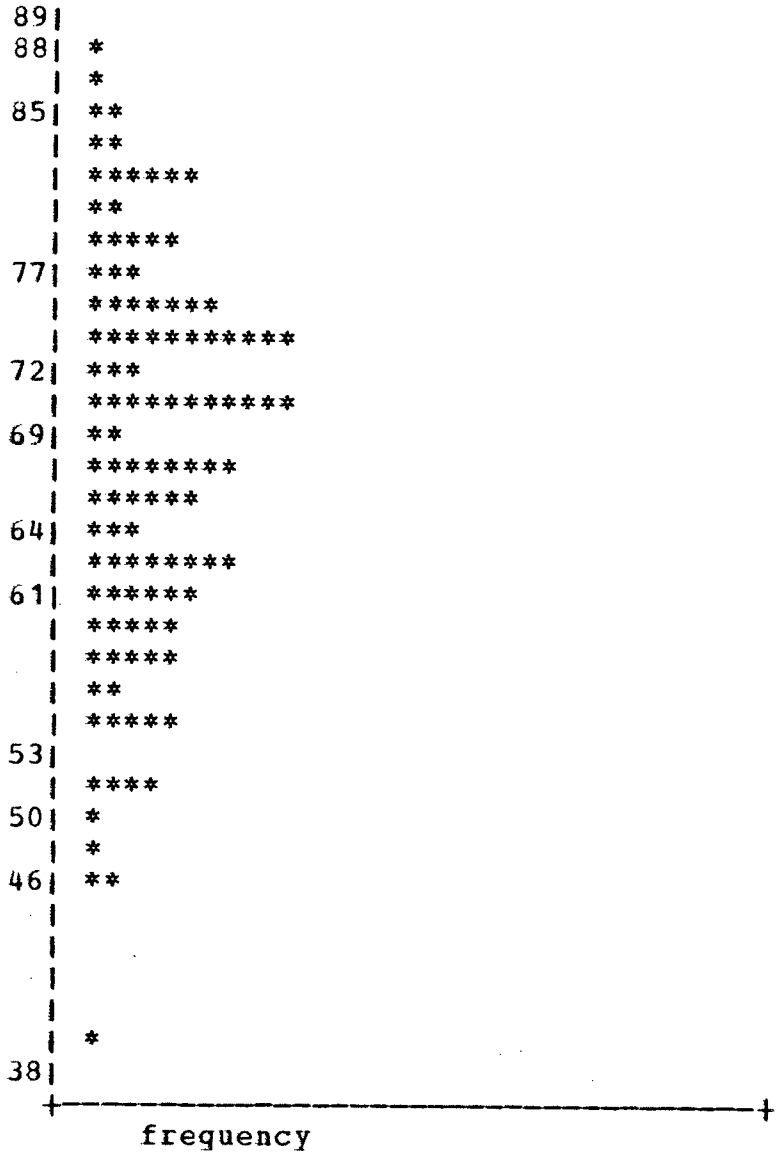
Teachers were undecided as to whether individual school districts should outline their own core mathematics curriculum although most disagreed with statements that local curriculum development was not needed for a universal subject like mathematics and that mathematics curriculum committees at the district level were unnecessary. Teachers also expressed a desire to be more involved in curriculum planning at a district level.

Teachers were undecided as to whether they would rather follow the provincial mathematics program or develop their own curriculum. However, a great majority felt that teachers should be involved in developing local core curriculum and many volunteered to serve on a school mathematics curriculum committee. They disagreed with the statement that school curriculum committees were generally a waste of time if a good provincial curriculum guide existed. They also disagreed with the statement that a teacher's job was to implement the curriculum guide, not to develop it, although they were generally undecided about the point-blank statement; I would like to develop my own curriculum.

The items which examined textbook issues generally did not distinguish between teachers with high and low attitudes toward local curriculum development. However, some description of teacher attitudes toward textbook techniques was possible. In general, most teachers were in favour of a multitext approach for a mathematics course. They agreed with the statement that mathematics teachers should use a curriculum guide more than the textbook in lesson planning and preferred not to use only one standard text. In addition, the great majority expressed a desire to be able to choose their mathematics textbooks from an approved list.

Figure 4 reveals the distribution of the attitude scores achieved by teachers on the 20-item Likert scale.

Figure 4
Histogram for Attitudes toward
Local Curriculum Development



Mean	67.2
S.D.	10.66
Range	26-88
Skewness	-.65
Kurtosis	1.17
Chi-square	5.38
Chi-prob	0.50

Figure 4 shows that secondary mathematics teachers have a wide range of attitudes toward local curriculum development. The extent of skewness of the distribution seems to have been the result of two extreme scores (26 and 39) at the low end of the scale and is not pronounced in the main body of scores. The test

for normality performed on the above distribution revealed that there was a 50% probability that the distribution of attitude scores was normal. The statistical tests used in answering question three were not extremely sensitive to violation of the assumption of normality, so the distribution was considered normal and the statistical tests of the following section were performed.

4.6 ANALYSIS for QUESTION THREE

The third basic research question of this study was as follows.

> 3. What are the characteristics of teachers with respect to involvement in local curriculum development and attitudes toward local curriculum development?

To answer this question, the teachers were divided into two groups, those who scored below the median on the individual involvement factor of the current situation scale, and those who scored above. Table 14 reveals the means and standard deviations of these two groups with respect to the other variables of the study. Similarily, Table 15 also reveals the characteristics of low and high scorers on the Likert scale of attitudes.

Table 14
Low and High Scorers on the
Individual Involvement Factor

	Low Scorers (5-7)		High Scorers (9-15)	
	Mean	S.D.	Mean	S.D.
D	8.3	2.5	8.3	2.5
S	8.8	2.4	11.1	2.2
In	5.7	1.0	10.5	1.5
ATT	63.0	10.4	71.9	9.0
AGE	36.8	10.0	37.7	9.2
SEX	1.2	0.4	1.04	0.2
EDUC	3.5	0.9	4.1	0.9
YREX	11.9	8.5	12.2	7.7
LEV	1.7	0.9	2.1	0.9
DIV	6.4	3.3	8.3	3.1
SIZE	2.1	0.7	2.3	0.6
TEAC	7.2	2.5	8.1	2.7
HEAD	1.2	0.4	1.3	0.5

D district involvement
S school involvement
IN individual involvement
ATT Likert Attitudes
AGE years of age
SEX 1=male 2=female
EDUC formal college education
YREX teaching experience
LEV junior or senior secondary
DIV educational diversity
SIZE size of school
TEAC no. of teachers on staff
HEAD head of department

Table 15
Low and High Scorers on the
Likert Attitude Scale

	Low Scorers(30-68)		High Scorers(69-90)	
	Mean	S.D.	Mean	S.D.
D	8.2	2.3	8.4	2.6
S	9.6	2.4	10.4	2.6
IN	7.1	2.3	9.0	2.7
ATT	59.5	6.4	75.8	5.0
AGE	37.0	9.4	37.3	9.9
SEX	1.1	0.3	1.1	0.4
EDUC	3.7	0.9	3.9	0.9
YREX	12.2	8.3	11.8	8.0
LEV	2.0	0.9	1.8	0.9
DIV	6.9	2.5	7.4	3.7
SIZE	2.3	0.7	2.1	0.6
TEAC	8.1	2.7	7.2	2.5
HEAD	1.3	0.4	1.3	0.4

Table 14 shows that low scorers on the Individual Involvement factor also scored low on the School Involvement factor and on the Attitude scale. Also, high scorers on Individual Involvement generally have more education and have taught a wider selection of mathematics courses as measured by the Educational Diversity index. However, caution must be used in making any inferences since statistical assumptions of normality have not been verified for the variables considered and no statistical tests were run.

Table 15 shows that attitudes as measured by the Likert scale and Involvement as measured by the Current Situation scale were somewhat related. Respondents with low attitude scores generally had low scores for individual involvement in local curriculum development. Again, caution must be used in interpreting these measures statistically.

The six hypotheses were considered in turn as follows. A table of the results of the statistical test is given, a decision to retain or reject the hypothesis is made, and the result is discussed briefly.

Hypothesis one

> With respect to attitudes as measured by the 20-item Likert scale, there is no difference between males and females.

Table 16 presents the information for the hypothesis.

Table 16
T-test for diffences in Sex

	N	Mean	S.D.	T-value	D.F.	Tprob
Males	95	67.8	10.1	1.534	114	0.124
Females	15	63.6	13.0			

Since the probability of obtaining a t-value of 1.534 by chance is greater than .05, the hypothesis is retained. The test indicates that there is no significant difference in attitudes toward local curriculum development as measured by the 20-item Likert scale between male mathematics teachers and female mathematics teachers.

Hypothesis two

> With respect to attitudes as measured by the 20-item Likert scale, there is no difference between teachers with the normal college education (5 years or less) and teachers with graduate training.

Table 17 presents the information for the hypothesis.

Table 17
T-test for differences in Formal College Education

	N	Mean	S.D.	T-value	D.F.	Tprob
5 years or less	55	67.6	9.4	0.2998	113	0.758
graduate training	55	67.0	11.8			

Since the probability of obtaining a t-value of 0.2998 by chance is greater than .05, the hypothesis is retained. The test indicates that there is no significant difference in attitudes toward local curriculum development as measured by the 20-item Likert scale between teachers with the normal college education and teachers with graduate training.

Hypothesis three

> With respect to attitudes as measured by the 20-item Likert scale, there is no difference between teachers at the junior secondary level and teachers at the senior secondary level.

Table 18 presents the information for the hypothesis.

Table 18
T-test for differences in Teaching Level

	N	Mean	S.D.	T-value	D.F.	Tprob
junior secondary	47	69.9	9.3	2.748	78	0.007
senior secondary	28	63.2	12.5			

Since the probability of obtaining a t-value of 2.748 by chance is less than .05, the hypothesis is rejected. The test indicates that there is a significant difference in attitudes toward local curriculum development as measured by the 20-item Likert scale between teachers at the junior and senior teaching levels.

Hypothesis four

With respect to attitudes as measured by the 20-item Likert scale, there is no difference between teachers in small schools (less than 500) and teachers in large schools (more than 1000).

Table 19 presents the information for the hypothesis.

Table 19
T-test for differences in School Size

	N	Mean	S.D.	T-value	D.F.	Tprob
small schools	15	66.1	9.6	1.236	55	0.220
large schools	38	62.6	10.0			

Since the probability of obtaining a t-value of 1.236 by chance is greater than .05, the hypothesis is retained. The test indicates that there is no significant difference in attitudes toward local curriculum development as measured by the 20-item Likert scale between teachers in small schools and teachers in large schools.

Hypothesis five

With respect to attitudes as measured by the 20-item Likert scale, there is no difference between teachers who are heads of mathematics departments and teachers who are not.

Table 20 presents the information for the hypothesis.

Table 20
T-test for differences in Teacher Position

	N	Mean	S.D.	T-value	D.F.	Tprob
non-heads	81	67.4	9.8	0.1016	113	0.883
heads	29	67.1	12.,			

Since the probability of obtaining a t-value of 0.1016 by chance is greater than .05, the hypothesis is retained. The test indicates that there is no significant difference in attitudes toward local curriculum development as measured by the 20-item Likert scale between heads and non-heads of mathematics departments.

Hypothesis six

> The regression of attitude as measured by the 20-item Likert scale on the basic data variables of age, years of teaching experience, educational diversity and numbers of teachers on staff is not significant.

Table 21 presents the final results of the stepwise regression.

Table 21
Regression of Attitude on Age, Teaching Experience, Educational Diversity and Teachers on Staff

Significant for equation $R^2 = 0.037$

Variable	coefficient	F-Ratio	F-Prob
TEAC	-0.784	-4.204	0.040
constant	73.231	565.0	0.0

Potential for equation

Variable	Par. Corr.	F-Ratio	F-Prob
AGE	0.0310	0.105	0.742
YREX	0.0378	0.156	0.695
DIV	0.0393	0.169	0.684

Since the probability of obtaining an F-Ratio of 4.204 is less than .05 the hypothesis is rejected. This means that the relation between the attitude score as measured by the Likert scale and number of teachers on staff could probably not have occurred by chance. However, the R^2 coefficient, which expresses

the magnitude of the relation, is only 0.037. This indicates that approximately 4% of the variance of attitude score is accounted for by the number of teachers on staff. Therefore, although the regression is statistically significant, the magnitude of the relation is actually trivial.[1] Age, years of teaching experience and educational diversity also do not have any significant relationship to attitudes as measured by the Likert scale. Overall, the regression analysis indicates that the variance of attitude scores can not be meaningfully described by variances in any of the four basic data variables considered.

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[1]Fred N. Kerlinger and E. J. Pedhazur, Multiple Regression in Behavioral Research (New York: Holt, Rinehart and Winston, 1973), p.72.

Chapter 5

SUMMARY, CONCLUSIONS and RECOMMENDATIONS

5.1 SUMMARY

The views of professional groups on curriculum decentralization and local curriculum development differ greatly and are often not clear. One group in particular, the teachers of secondary school mathematics in British Columbia, does not seem to have a definite policy on local curriculum development. The primary purpose of this study was to determine the current involvement of secondary mathematics teachers in and their attitudes toward local curriculum development. A secondary purpose of the study was to examine the characteristics of teachers who participate in local curriculum development activities and who have various attitudes toward local curriculum development. Specifically, the study attempted to answer the following research questions.

1. To what extent are secondary mathematics teachers currently participating in local curriculum development?

2. What are the attitudes of secondary mathematics teachers toward curriculum development at the local level?

3. What are the characteristics of teachers with respect to involvement in local curriculum development and attitudes toward local curriculum development?

A special three-part questionnaire was constructed to answer these questions. The first part attempted to determine the current participation of mathematics teachers in local curriculum development by asking factual Yes/No type statements about curriculum development activities at the district, school and individual levels. The second part of the questionnaire determined attitudes toward local curriculum development through a 20-item Likert scale. The third part gathered personal and factual data from the respondents.

Items for the questionnaire were derived from reports on local curriculum development activities, informal talks with teachers and personal experience. A review of the literature also revealed personal variables that other studies had found influential. After a lengthy process of refinement, including a pilot study, the final questionnaire was sent to a random sample of teachers selected from the British Columbia Association of Mathematics Teachers.

In the analysis, the first question was answered by tabulating the responses to each Yes/No item and drawing histograms of involvement at the district, school and individual levels of participation in local curriculum development. The second question was answered by describing the results of the 20-item Likert scale which was designed to measure high and low attitudes toward local curriculum development. The third question was partly answered by first describing the personal characteristics of high and low scorers on both the individual involvement measure and on the Likert scale. Then t-tests were performed to determine whether or not sex, formal college

education, current teaching level, school size or being a department head had any significant effect on attitudes toward local curriculum development as measured by the Likert scale. Finally, the regression of attitude on years of age, years of teaching experience, educational diversity and the number of mathematics teachers on the school staff was tested for significance and meaningfulness.

5.2 CONCLUSIONS

Although mail questionnaires have many defects, survey techniques were appropriate for the current study because the data could not be obtained in any other practical way. The return rate, reliability and validity of the final questionnaire also supported its use. The return rate was comparable to the approximate 60% return rate that other similar studies obtained and the Hoyt estimate of reliability indicated a reasonable internal consistency for the Likert part of the questionnaire. Responses of the panel of judges permitted a conclusion that the scale was a valid attitudinal measure. From comments written by the respondents, lack of time seemed to be the major obstacle for participating in and developing local curricula. This concern of teachers over the lack of time for curriculum development activities compares to similar findings by Newton(p.23). Other comments indicated some drastically opposing views on curriculum development and some ambiguity in the definition of terms like locally-constructed and locally-developed curricula. Most comments in general indicated that the questionnaire was being completed conscientiously.

In answer to question one, the general indications were that most districts, schools and individuals were not involved in typical local curriculum development activities. At the district level, support services for curriculum development were limited. Most districts did not have a secondary mathematics coordinator or an appropriate curriculum resource centre. Only a few districts had a local curriculum guide or a committee for curriculum development in secondary school mathematics and only half of the districts offered inservice workshops.

School support for curriculum development was also weak. Most teachers came from schools which neither offered a locally-developed mathematics course nor had a locally-constructed list of mathematics goals. Furthermore, most schools did not provide workrooms for the development of classroom materials and few teachers had obtained release time in the past year to work on curriculum projects. However, some opportunity for school level curriculum development was evident, since teachers considered themselves free to develop school mathematics outlines and many had developed and implemented these outlines.

At an individual level, most teachers had not taught a locally-developed course, had not planned one, and were not currently following a local guide. This was not surprising since most teachers had neither taken a course in curriculum development nor obtained the release time to plan a course. Written responses indicated the importance of time as a factor for involvement in local curriculum development.

The final analysis for question one, a comparison of the three levels of current involvement in local curriculum development, was not performed. The distribution of scores for the district, school, and individual factors prevented an examination of the correlation coefficients between these factors. A meaningful comparison of these findings to the results of other studies was also impractical since no other study examined a similar population of secondary mathematics teachers on their involvement in local curriculum development.

In answer to question two, the attitudes of secondary mathematics teachers generally were favourable to local curriculum development activities as measured by the Likert scale. An examination of specific items revealed that mathematics teachers generally supported a provincial core curriculum and the idea of a province-wide program to ensure its coverage. In addition, most felt that the provincial core was not necessarily incompatible with the individual needs of students. Teachers were generally undecided as to whether districts should develop their own core, although most expressed a desire to be more involved in curriculum planning at all levels and indicated their willingness to serve on district or school curriculum committees. Teachers also expressed their desire for more local choice by indicating acceptance of the multi-text approach and expressing a desire to choose textbooks from an approved list. The finding that teachers supported a core curriculum and desired more opportunity to participate in curriculum development activities was similar to results discovered by Newton(p.23) and Simpkins(p.24).

In answer to question three, low and high scorers on both the Individual Involvement factor and the Likert Attitude scale were amazingly similar on most of the variables considered. However, there was some indication that Individual Involvement and Likert Attitude scores were related. Low scorers on the Individual Involvement factor also scored low on the Likert Attitude scale and vice-versa. Also, high scorers on the Individual Involvement factor generally had more education and had more diverse teaching experience.

Regarding attitudes as measured by the 20-item Likert scale, the study found no significant differences between male and female secondary mathematics teachers, between those with graduate education and those without, between teachers in small schools and large schools, and between teachers who were or were not department heads. Also, age, years of teaching experience and educational diversity did not have any significant relationship to attitudes. However, junior secondary mathematics teachers had significantly higher scores on the attitude scale than senior secondary teachers and the number of mathematics teachers on the school staff was also related significantly to attitudes although the magnitude of the relationship was actually trivial.

In summary, the mail questionaire, with a return rate of 57%, a reliability estimate of .86 and reasonable face validity, revealed that in general there was a lack of support for curriculum development at the district, school and individual levels. However, the attitudes of teachers were generally favourable to local curriculum development activities as

measured by the 20-item Likert scale. Teachers supported the provincial core curriculum yet also indicated a desire to be more involved in developing local curriculum. Although individual involvement in local curriculum development seemed to be somewhat related to attitudes, the only characteristic of teachers that seemed to have a definite effect on attitudes was teaching level. Junior secondary mathematics teachers had significantly higher scores on the attitude scale than senior secondary mathematics teachers. Finally, the variance of attitude scores could not be meaningfully described by any of the four basic data variables considered. Attitudes toward curriculum development were apparently determined by factors other than those investigated by this study.

5.3 RECOMMENDATIONS

Based on the findings and conclusions of this study, the following recommendations can be made if teacher involvement in local curriculum development is seen to be desirable.

1. School districts should give more leadership in local curriculum development.

District support of curriculum development was generally limited and many districts could appoint a coordinator for secondary mathematics, set up a resource centre or start inservice workshops. A district committee for curriculum development could then be formed to develop local guidelines.

2. Schools should support local curriculum development by providing facilities and reasonable release time.

Very few respondents reported that their schools had a special workroom set aside for teacher use and even fewer respondents reported receiving any release time to work on curriculum projects. Support of this kind would allow teachers as school groups to be more productive in curriculum development activities. Teachers in the same school already have the advantages of seeing each other regularly, sharing materials and helping each other immediately.

3. Teachers should develop more expertise in curriculum development procedures.

Curriculum development is a complex process and reguires much knowledge, experience and ability. This study indicates that many teachers may be unfamiliar with curriculum theory and also have limited experience with locally-developed courses. Individual improvement can often occur through professional development activities and graduate work.

4. Some form of provincial learning assessment program should be used.

Indications are that secondary mathematics teachers are in favour of some province-wide program to ensure that core material is being covered, which supports a government assessment program.

5. Teachers should be allowed to choose their mathematics textbooks from an approved list.

Over eighty percent of the respondents agreed with this

statement. A small provincial committee could construct such a list based on teacher suggestions and a careful examination of available textbooks.

6. Support for local curriculum development activities should be directed to mathematics teachers at the junior high school level.

This recommendation follows from the result that junior high school teachers expressed significantly greater interest in local curriculum development activities as measured by the Likert scale. Teachers at this level may see more need to develop local curriculum because of the greater range in student ability and more variation in local situation.

7. The attitudes of teachers in other subject fields should be studied in order to determine their positions on local curriculum development.

Indications are that the views of teachers vary greatly within and across subject field. The attitudes of English, Social Studies, Science, Industrial Education, Mathematics and other subject field teachers could then be determined and compared.

8. The cause of attitude differences in secondary mathematics teachers should be further examined.

Since only 4% of the variance in attitudes was explained in the study, further examination of underlying causes of attitudes toward local curriculum development is necessary. This may be a very difficult yet rewarding task.

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APPENDICES

APPENDIX A

PILOT QUESTIONNAIRE

I CURRENT SITUATION

Please circle one of 'No', 'U', (Uncertain), or 'Yes' for the following statements.

No U Yes 1. My school district has a mathematics coordinator.

No U Yes 2. My district has a curriculum resource centre.

No U Yes 3. My district holds inservice mathematics workshops.

No U Yes 4. My district has a local mathematics curriculum guide.

No U Yes 5. My district has a committee for curriculum development in secondary school mathematics.

No U Yes 6. My school offers a locally-developed mathematics course.

No U Yes 7. My school has a resource centre or a special workroom set aside for teacher use.

No U Yes 8. The mathematics teachers in my school have regular meetings to discuss curriculum matters.

No U Yes 9. The mathematics teachers in my school decide cooperatively on course outlines.

No U Yes 10. I have taught or helped to set up a locally-developed course.

No U Yes 11. I have taken part in the planning of a district or school curriculum guide in mathematics.

No U Yes 12. I am currently following a locally-constructed curriculum outline in mathematics.

No U Yes 13. I have a lot of freedom in determining what I should teach in my mathematics classes.

No U Yes 14. I have taken a course on curriculum development.

No U Yes 15. I have had some release time this past year to work on a mathematics curriculum project.

II ATTITUDES

Please circle one of SD (Strongly Disagree)
D (Disagree)
U (Undecided)
A (Agree)
SA (Strongly Agree)
for each of the following statements.

1. I find the provincial mathematics curriculum guide useful. SD D U A SA

2. A provincial revision committee should be continuously working on mathematics revision. SD D U A SA

3. The mathematics curriculum should be standardized across the province rather than diversified. SD D U A SA

4. Individual school districts should outline their own core mathematics curriculum. SD D U A SA

5. Mathematics curriculum committees at the district level are unnecessary. SD D U A SA

6. The content of a mathematics course should be determined at the school level. SD D U A SA

7. Mathematics teachers should use a curriculum guide more than the textbook in lesson planning. SD D U A SA

8. My district lacks the resources, materials and personnel for local curriculum development. SD D U A SA

9. I would rather use existing mathematics programs than develop my own curriculum. SD D U A SA

10. I would like to see a return to a provincial system of examinations at the grade 12 level. SD D U A SA

11. I would like to choose my mathematics textbooks from an approved list. SD D U A SA

12. I am in favour of a multitext approach. SD D U A SA

13. I am not professionally qualified to evaluate mathematics textbooks. SD D U A SA

14. I would prefer to use only one standard textbook for a mathematics course. SD D U A SA

15. I would volunteer to serve on a school curriculum committee. SD D U A SA

16. I would like to be more involved in curriculum planning. SD D U A SA

17. Teachers should expect limited help and little release time for their efforts in local curriculum development. SD D U A SA

18. I would like to develop my own curriculum. SD D U A SA

19. A teacher's job is to implement the curriculum guide, not to develop it. SD D U A SA

20. I would attend summer school for a course on curriculum development. SD D U A SA

21. Curriculum planning by teachers contributes to their professional status. SD D U A SA

22. Curriculum theory does not help much in the classroom situation. SD D U A SA

23. Consultants and other outside "helpers" do not understand teachers' real problems. SD D U A SA

24. Teachers should expect few rewards for their efforts in local curriculum development. SD D U A SA

25. Local curriculum development is not needed for a universal subject like Mathematics. SD D U A SA

III BASIC DATA

Please fill in or check the appropriate box.

1. Years of age ☐

2. Sex F ☐ M ☐

3. School district number ☐

4. Formal education ☐

5. Years of teaching experience ☐

6. Teaching level

   Junior secondary ☐ Senior secondary ☐

7. Mathematics grades that I have taught in the past. ☐

8. Approximate school enrollment ☐

9. Approximate number of teachers on staff who teach at least one mathematics course. ☐

10. I am a mathematics department head. No ☐ Yes ☐

APPENDIX B

COVER LETTER
and
FINAL QUESTIONNAIRE

March, 1977.

Dear BCAMT member,

The purpose of the enclosed questionnaire is to obtain information on the involvement and attitudes of mathematics teachers in and toward local curriculum development. The attitudes of teachers toward the various duties and responsibilities of their profession are extremely important amid changing methods of curriculum revision and course development.

The writer is a graduate student in Mathematics Education and has the permission of the president of the BCAMT to conduct this survey. Your name has been randomly selected from the BCAMT membership list and your identity will remain strictly confidential. The questionnaire should take approximately ten minutes to complete.

I believe that mathematics teachers should have more opportunity to express their opinions on matters which might drastically affect their profession. Your response will help indicate the attitudes that mathematics teachers as a group hold toward curriculum decentralization and local curriculum development. The results of this study will be submitted to the VECTOR for possible publication.

Your cooperation is truly appreciated.

Victor Steblin

I CURRENT SITUATION

For the following statements, please circle one of No, U(uncertain), or Yes.

No U Yes 1. My school district has a coordinator for secondary school mathematics.

No U Yes 2. My district has a curriculum resource centre useful to secondary mathematics teachers.

No U Yes 3. My district holds inservice mathematics workshops.

No U Yes 4. My district has a local mathematics curriculum guide.

No U Yes 5. My district has a committee for curriculum development in secondary school mathematics.

No U Yes 6. My school offers a locally-developed mathematics course.

No U Yes 7. My school has a special workroom set aside for the development of classroom materials.

No U Yes 8. My school has a locally-constructed list of mathematics goals and objectives.

No U Yes 9. The mathematics teachers in my school are free to develop their own course outlines.

No U Yes 10. The mathematics teachers in my school have developed an outline for mathematics courses.

No U Yes 11. I have taught a locally-developed mathematics course.

No U Yes 12. I have taken part in the planning of a district or school curriculum guide in mathematics.

No U Yes 13. I am currently following a locally-developed curriculum guide in mathematics.

No U Yes 14. I have taken a course on curriculum development.

No U Yes 15. I have had some release time this past year to work on a mathematics curriculum project.

II ATTITUDES

For each of the following statements, please circle one of
SD (Strongly Disagree)
D (Disagree)
U (Undecided)
A (Agree)
SA (Strongly Agree)

1. I support the idea of a core mathematics curriculum standardized across the province. SD D U A SA

2. Curriculum planning by teachers contributes to their professional status. SD D U A SA

3. Teachers should be involved in developing local core curriculum. SD D U A SA

4. Mathematics teachers should use a curriculum guide more than the textbook in lesson planning. SD D U A SA

5. I would like to develop my own curriculum. SD D U A SA

6. Curriculum theory does not help much in the classroom situation. SD D U A SA

7. I am in favour of a multitext approach for a mathematics course. SD D U A SA

8. Mathematics curriculum committees at the district level are unnecessary. SD D U A SA

9. I would volunteer to serve on a school mathematics curriculum committee. SD D U A SA

10. There should be some province-wide program to ensure that core material is being covered. SD D U A SA

11. Individual school districts should outline their own core mathematics curriculum. SD D U A SA

12. I would rather follow the provincial mathematics program than develop my own curriculum. SD D U A SA

13. A teacher's job is to implement the curriculum guide, not to develop it. SD D U A SA

14. Covering the provincial core is more important than determining the needs of students. SD D U A SA

15. Local curriculum development is not needed for a universal subject like Mathematics. SD D U A SA

16. I would like to choose my mathematics textbooks from an approved list. SD D U A SA

17. I would prefer to use only one standard textbook for a mathematics course. SD D U A SA

18. I would like to be more involved in curriculum planning at a district level. SD D U A SA

19. School curriculum committees are generally a waste of time if a good provincial curriculum guide exists. SD D U A SA

20. I find the provincial mathematics curriculum guide useful. SD D U A SA

III BASIC DATA

Please fill in or check the appropriate box.

1. Years of age ☐☐ 2. Sex M ☐ F ☐

3. School district number ☐☐

4. Formal college education

☐ less than 4 years ☐ 4 years ☐ 5 years ☐ some grad courses ☐ 6 years or more

5. Years of teaching experience ☐☐

6. Current teaching level

Junior secondary ☐ Senior secondary ☐

7. Mathematics courses which I have taught.
(Please check any applicable combinations)

grade	elem	8	9	10	11	12
general						
regular						
advanced						
other						

8. Approximate school enrollment

☐ less than 500 ☐ 500 to 1000 ☐ more than 1000

9. Approximate number of teachers on staff who teach at least one mathematics course ☐☐

10. I am a mathematics department head. No ☐ Yes ☐

APPENDIX C

VALIDATION PROCEDURE

VALIDATION PROCEDURE

The following 20-item Likert scale attempts to measure the attitude of secondary mathematics teachers toward local curriculum development at the district or school level. The scale will hopefully be able to distinguish between two basic types of teachers, which are described as follows.

Decentralists
- -who are against the standardization of the mathematics curriculum.
- -who would like to develop their own materials and curriculum for classroom use.
- -who think of curriculum development activities as beneficial to teaching effectiveness and professional development.

Centralists
- -who would like to see more emphasis on a province-wide core curriculum.
- -who are more traditional in their views of the role of teaching.
- -who generally think that local curriculum development would hinder the uniformity and effectiveness of mathematics teaching.

The following Likert scale assumes that each of the individual items helps to distinguish between the two types of teachers. Furthermore, each item is assumed to be roughly equal in weight. To help validate these assumptions, I would like you to do the following for each item.

1. Circle the response that you think a Decentralist would make.

2. If you think the item is not evenly weighted with the others, give an integer value from 1 to 9 (5 is the normal weight) for what you think the weight should be.