

DESIGNING AND EVALUATING
AN INSERVICE MODEL
FOR
MATHEMATICS EDUCATION
IN
THE PRIMARY SCHOOL

by

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ABSTRACT

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The study presents a review of in-service models and a search for an effective in-service model for mathematics education in the primary school.

The study considers the need to improve the teaching of mathematics in the primary school; the major reports that have made recommendations for the improvement of primary mathematics teaching and the opinions and findings of mathematics educators. The study examines the state of the art of in-service models and examines those models previously used. The study notes the failings of the in-service models past and present and examines elements within these models which have proven to be beneficial albeit in part. Throughout the study particular attention is given to recent studies concerned with implementing and sustaining change.

The model designed for the in-service of the primary mathematics teacher, MINC (Mathematics In-service Network Course) is based on an examination of models past and present. Components and provisions that have met with success in these models were included in the design.

The in-service model developed and described in this study includes four major components input from course leaders and teachers, reflection, feedback and the opportunity for teachers to work with others from the same school and neighbouring schools (networking).

A major section of the study examines the responses of participants to an evaluation questionnaire given at the completion of the first in-service course, MINC 1 and the second, MINC 2.

Data collected from the responses of participants to the questionnaire were analysed to see if there were differences in responses from teachers based on such factors as sex, the MINC network, the level to which participants had studied mathematics, the year level they taught and expressed confidence in teaching mathematics.

In conclusion, the study reflects on the evaluation of the in-service course and addresses considerations for future in-service courses concerned with mathematics education for primary teachers.

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CHAPTER 1

BACKGROUND TO THE STUDY

The Nature of the Study

This study is concerned with improving the quality of mathematics education in primary schools through the development and evaluation of an in-service model for practicing teachers.

The term 'in-service', referred to in this study, shall mean a course of study for practising teachers that aims to change professional practices, beliefs and understanding which will result in the improvement of student learning. (Neil, 1984.) In-service investigated in this study, is directly concerned with teacher professional development designed to improve teaching practice in schools which ultimately benefits the children.

Throughout this study, the terms in-service, professional development, staff development and instructional supervision are synonymous.

In-service programs for teachers differ greatly in context and format, but most programs aim to bring about changes in teacher beliefs and attitudes, teacher instructional practices and student learning outcomes. (Griffin, 1983.)

Questions raised at the commencement of this study are:

1. *Is there a need to change the practice of teaching in primary mathematics?*
2. *What are these changes, if any, and how best can they be brought about?*
3. *How can changes that are brought about be sustained?*

The Need for Change in Content and Practice of Teachers in Primary Mathematics.

A recent major work into the teaching of mathematics has been the Report of the Committee of Inquiry to consider the teaching of mathematics in England and Wales, under the Chairmanship of Dr. W. Cockcroft, (The Cockcroft Report, 1982). A thorough investigation of the teaching and learning of mathematics was undertaken by the members of this committee.

The report appeared to contain no new information in respect of primary mathematics. However, it did re-affirm and give endorsement to new directions and approaches to primary mathematics that were recommended by reports published during the 1960's and 1970's. (Curriculum Bulletin No. 1, 'Mathematics in Primary Schools, Schools Council, 1965; the Plowden Report,

'Children and Their Primary Schools, Central Advisory Council for Education, England, 1967; Nuffield Mathematics Project, 1967-1973.)

What did result from the Cockcroft Report was a sudden growth of enthusiasm and support for developing good teaching practice in mathematics education. Another outcome was the developing awareness of the importance and influence of new technology, such as calculators and computers, on the curriculum and the way it is taught.

The Committee's Report emphasized the essential need to establish amongst students a confidence in the use of mathematics. The report stressed that the mathematics curriculum in the primary school should not only equip children with the mathematical understanding and numerical skills which will be powerful tools in later life but should also enrich children's linguistic and aesthetic experience. Further, the report suggests that children be provided with a means of exploring their environment and should be helped to develop their powers of logical thought. Practical work was seen by Cockcroft as essential in attempting to accomplish these aims. He also pointed out that each pupil needed to be made aware that mathematics provides a powerful means of communication.

Although the report acknowledged that some schools were putting these aims into practice, it was not generally the case. This was evidenced by the widespread attitudes of children and adults

towards mathematics, indicating an inability to see the relevance of the mathematics learned and the inducement of feelings of anxiety, fear and even guilt when the subject of mathematics was broached. (D.E.S., 1982a.)

The Cockcroft Report has had far reaching effects beyond the United Kingdom and has influenced curriculum development at a national level in Australia. The Queensland Mathematics Curriculum (1987) reflects many of the Cockcroft recommendations. All other States in Australia are at present in the process of mathematics curriculum review and renewal.

Since the Cockcroft Report (D.E.S., 1982a) a series of discussion papers entitled Curriculum Matters have been written in the United Kingdom by Her Majesty's Inspectorate. The third volume in this series of papers, 'Mathematics from 5-16' (D.E.S., 1985b) endorses the Cockcroft Report. The third volume expands on some sections of the initial report identifying in detail the aims, objectives and criteria of mathematics teachers. The third discussion paper also lists content, classroom approaches, assessment and implementation strategies. Her Majesty's Inspectors, in Primary Education in England (D.E.S., 1978) and in Education 5-9, an Illustrative Survey of 80 First Schools in England (1982b) indicated that 'good primary practice' had not yet taken hold in primary schools or even in first schools.

From these reports it is evident that changes need to be brought about that would help develop 'good primary practice' in the teaching of mathematics. (D.E.S., 1982b.)

Teachers devote much time to work with numbers and the practice of the four rules and competence in this narrow field, but few have sufficient opportunity for learning how to apply the skills they acquire to the solving of problems....Too few schools make good use of the opportunities for the development and extension of mathematical understanding which arise in children's play, in their interests and in the work in other parts of the curriculum. (The H.M.I. Survey, D.E.S., 1982b, para.4.9.)

Shuard (1986) suggests that the curriculum of primary mathematics needs to change in a number of ways and that current mathematics curriculum does not take sufficient account of how children learn mathematics, nor does it take sufficient account of changes in technology which aid the teaching and learning of mathematics. Even more importantly, Shuard points out, it does not take sufficient account of the need to prepare children to live in a continually changing world and to face the challenge of change.

Shuard (1986) considers that:

...there are a number of major issues that will need to be tackled in curriculum development in primary mathematics in the next few years. These issues can only be addressed through the enthusiasm and hard work of primary teachers; it remains true that 'curriculum development is teacher development'. (p.137.)

There has been an abundance of research and literature produced since the Cockcroft Report (1982) which indicates that change

needs to occur in primary mathematics curriculum and practice. The question as to why so little change has taken place is pertinent at this time. Primary teachers appear to have great difficulty in changing what and how they teach. Many teachers resist change strongly and when change does occur, these changes appear difficult to sustain (Biggs, 1983). This resistance and reluctance to change appears to be caused by a complexity of issues. A root cause may well be attributed to the fact that many primary teachers have negative attitudes towards mathematics stemming from their own school experience. (Shuard, 1986.) In many instances it is not a requirement for those admitted to teacher-training institutions to have studied mathematics to year 12. Many of those admitted to teacher-training institutions have scant mathematical knowledge and even display a fear, or dislike, of mathematics (Cockcroft, 1982). Yet all primary teachers are required to teach mathematics. These teachers, more often than not, were taught mathematics formally without the use of concrete materials, practical activities, or discussion and this is reflected in their teaching. A poor attitude towards mathematics on the part of a teacher can be easily transferred to the pupils (Biggs, 1983).

Biggs noted that teachers with little confidence and a poor attitude towards mathematics have no great difficulty in adapting informal methods in other curriculum areas but are unable to develop the same teaching strategies when it comes to mathematics.

Ways to Bring About Change

How can change be brought about in the teaching of primary mathematics?

The only consensus that appears to exist about staff development is that what we have now is ineffective and a waste of time. The general feeling is that most staff development programs have benefitted neither the teachers nor students. (McLaughlin and Marsh, 1978, p.70.)

Barth (1981) puts it even more directly: 'By and large staff development activities we employ insult the capable and leave untouched the incompetent.' (p.147). Notwithstanding the comment of Barth, McLaughlin and Marsh (1978), the only practical way to tackle these problems would seem to be through in-servicing.

Traditionally staff development has focussed on initiating change in beliefs, attitudes and perceptions of teachers. (Guskey, 1986.) From these changes it could be assumed that specific changes would be made to classroom behaviours and practices which would in turn lead to improved student learning. This traditional model of professional development has evolved largely from the work of early change theorists such as Lewin (1935) whose ideas were derived from psychotherapeutic models.

Current research into teacher change indicates that the assumption of this model may be inaccurate for the staff development of experienced teachers, (Guskey, 1986).

A new model that re-examines the process of teacher change under special conditions is needed if staff development programs are to become more effective, (Guskey, 1985). The most significant changes in teacher attitudes and beliefs come after they begin using a new practice successfully and see changes in student learning.

Change educators generally agree that the three major outcomes of effective staff development are changes in teacher beliefs and attitudes, teachers' instructional practices and student learning outcomes, (Griffin, 1983). This being so, then the sequence in which these changes occur has important implications for staff development.

Ethnographic studies show that 'new ideas and principles about teaching are believed to be true by teachers only when they give rise to actions that work' (Bolster, 1983, p.298).

This would indicate that teachers seldom become committed to a new program or innovation until they have seen that the new practices work well in their classrooms with their students.

This is further supported by Crandall (1983) who noted that teachers become committed to new programs and practices after they had actively engaged in using them in their classrooms. This view is endorsed by Guskey (1979, 1982, 1984) in the study of the separate effects of in-service training, use of instructional practices and the improvement of student learning on teacher beliefs and attitudes.

Barriers to change may be created if the program or innovation requires that a teacher radically changes his/her teaching procedures, (Doyle and Ponder, 1977). Research indicates that to be successful, staff development must clearly illustrate how the new procedures can be implemented without too much disruption or extra work, (Sparks, 1983). One possible conclusion is that the success of in-service training will depend on how teachers perceive the magnitude of the task and that change may be a slow and difficult process. Stallings (1980) found that by providing teachers with regular feed-back on student involvement during and after class sessions, new instructional practices were accepted and facilitated.

Evidence of student confidence or self-worth can also be instrumental in the facilitating of new instructional procedures, (Dolan, 1980, Guskey, 1985) and that it is critical that change efforts include the opportunity for giving teachers regular feed-back on learning outcomes.

New programs which have proved successful are those which provide opportunities for teachers to meet regularly to discuss their experiences in an atmosphere of collegiality and experimentation, (Little, 1982). Holly (1982) found that what teachers liked best about in-service workshops was the opportunity to share perspectives and to seek solutions to common problems. They like to share ideas with other teachers having few opportunities to meet professionally with staff from other schools and finding themselves working in isolation.

Although individual teachers are targeted for change, the power of control exercised by the principal should not be underestimated. Cox (1983) found that principals who were active in successful school improvement had made it clear to all instructional staff that the successful implementation of the innovation was a top priority. Successful implementation occurred when there was a clear communication from the principal to teachers about the importance of the innovation to be adopted. Principals committed to the innovation were more likely to make available required resources and materials.

Little (1982) stressed that school principals by virtue of rank are in a unique position to establish and maintain important norms of collegiality and experimentation. Principals are able to promote and foster the critical practices of talk about practices, observation of practice, joint preparation of materials and teaching each other about teaching. Little (1982) recommended that principals initiate within the school, programs of staff development in which outside consultants work with the school's staff in developing and implementing critical practices that are conducive to professional growth.

Little (1982) described two types of group (staff) norms or expectations which prevail in schools that are favourably disposed towards staff development: norms (shared expectations) for shared work (collegiality) and norms for the analysis and evaluation of practice (experimentation or continuous improvement). Collegiality refers to the existence in a school

of staff expectations for extensive sharing of work involving a reliance on one-another's skills providing the opportunity for the learning from each other. Experimentation or continuous improvement refers to group expectations that teachers will, as a matter of routine, evaluate strategies in order to continually improve classroom practice.

Little (1982) identified four dominant practices as constituting specific and measurable interactive teacher behaviours fundamental to the creation and maintenance of the two norms of collegiality and experimentation. These were:

1. Shared talk about specific classroom practices, leading to the development of shared language which aids communication and itself encourages talk.
2. Mutual observation. Teachers engaging in regular observation of one-another's classrooms.
3. Joint preparation of curriculum and materials, so sharing the burden of program development and improving teachers' understanding of their work as a result of interaction, making possible greater improvements in teacher attainment.
4. Teaching each other. Teachers and administrators teaching and informing each other about teaching strategies which enhance the range and repertoire of strategies available to individual teachers.

This approach may well provide a way of sustaining change once innovation is initiated.

To be successful in sustaining change, provision of follow-up and continued support is crucial. Cogan (1975) argues that teachers need to know that assistance and help is readily available if problems or unexpected difficulties arise and that occasional failures are tolerable. There are a number of ways in which this support can be provided. Joyce and Showers (1980) suggest using 'coaching', a term that refers to hands-on classroom assistance, provided by advisers, consultants or peers. New programs found to be successful provide opportunities for staff to meet regularly over a period of time after initial in-service, preferably in an atmosphere of collegiality and experimentation.

Cockcroft (1985) noted that 'What we are certain of is that only by in-service work will the message of change be carried through to the pupils in our schools.' (p.30.)

While many would agree with this statement it is also true that much that has gone on in the past in the name of in-service has had little effect; much that has been developed has been based on the psychotherapeutic model and has involved withdrawing teachers on an ad hoc basis to attend a centrally-based course with scant regard for the schools from which teachers come. (Guskey, 1986.)

The Cockcroft Report (1982) draws attention to the time of the in-service, which may prove crucial to its success. Submissions received by the Cockcroft Committee strongly argued for courses to be held during school hours rather than after school when teachers are fatigued at the end of a school day. The running of in-service courses after school, it is pointed out in the report, may also effect the quality of preparation for the next day's work. Although it would appear to be a good thing to operate in-service courses during school hours, the cost of supplying relief staff could make this mode of operation prohibitive.

Whatever model is chosen, a major factor will undoubtedly be the quality and leadership characteristics of those responsible for running the in-service in determining success or failure of the in-service.

Crandall (1983) notes that those purveying new practices must be seen as credible by those responsible for the implementation; these people must be articulate, charismatic and must emphasize the practicality of new practices. Whether it is someone from within the system or an external consultant, it is essential that this person stress how these new practices can be practically and efficiently used.

The writer through examining the literature came to the conclusion that to be successful in implementing and sustaining change in classroom practice, the in-service model has to

include within its design the following components and provisions:

- . presentation of a clearly defined set of aims and objectives reflecting current research and development;
- . a major emphasis on practical activities that can be translated to the classroom;
- . demonstration and modelling;
- . active involvement of course participants in the design of activities;
- . credibility and professional recognition by teachers of the in-service course leaders;
- . opportunity for in-service participants to develop collegiality through working together in school groups and with other schools (Networking);
- . mandatory attendance of the school Principal;
- . structured and open-ended feedback (reflection);
- . support within the classroom;
- . support after the in-service from course leaders;

- . continued group meetings after the in-service;

- . provision of a range of activities that change student learning outcomes which will influence teacher beliefs and attitudes;

- . a sufficient period of time, i.e. ten weeks;

- . a recognition or reward for participating in the course;

- . provision of resources to enable the in-service to be held during school hours.

It is the contention of the writer that, if the components and provisions listed are included in the new model, change is likely to occur and be sustained.

Summary

The views expressed thus far would suggest that the in-service model chosen must clearly define how and why new procedures are to be implemented. These procedures need to be based on the results of sound research.

Improvement to student learning outcomes must be visible and measurable with ample opportunity being available for reflection and feedback within an atmosphere of collegiality.

Inclusion of the school Principal in the in-service program would appear to be a major factor in determining how successful the program will be.

To develop and maintain an atmosphere of collegiality it would seem that this could be achieved by a group of teachers from a school working with groups of teachers from other schools.

It appears necessary to design an extended course over many weeks, providing the time necessary to encourage and develop collegiality amongst participants. Sufficient time is also necessary to enable participants to try-out activities, to reflect and to receive feedback. For the duration of the in-service, provision of support staff needs to be considered. This support staff provision may also need to be provided for some time after the completion of the in-service.

The credibility of those leading the in-service should be recognized by those participants in the in-service, not only for their theoretical expertise, but also their teaching ability. (Crandall, 1983.)

It is recognised that in-service courses run during school hours are to be preferred to those run after school, but financial constraints may make this course of action difficult.

Above all, it should be recognised that change to the practice of teaching mathematics in the primary school may be a difficult and gradual process.

This investigation will be carried out by the design of an in-service model for Primary Mathematics teachers, the development of a questionnaire to be completed by participants undertaking the in-service at the end of the course, and the evaluation of the in-service model by observation and descriptive analysis.

CHAPTER 2

REVIEW OF LITERATURE

Introduction

In-service teacher education currently can be associated with a wide range of titles: in-service development, in-service training, curriculum innovation and implementation, organizational renewal, staff development, personnel education, continuing teacher education and professional development. All of the aforementioned terms arise within various areas of research that focus upon the job-related activities of teachers. (Neil, 1984, op.cit.)

In-service education is about improving practice in schools in order that children may benefit. The ultimate aim is for the improvement of student learning and student learning outcomes through change in professional practices, beliefs, attitudes and understanding.

In-service Education: an Historical Look

A review of the literature clearly indicates that the change process is extremely complex. The view put forward by numerous writers is that much of what occurs in the name of professional development leaves much to be desired, having little or no

effect on the practice of teaching. This view is endorsed by McLaughlin and Marsh (1978), Smyth (1980), and Barth (1981). It would be reasonable to assume that steady progress has been achieved in professional development over the years based on advances in our knowledge and understanding, yet the literature clearly illustrates that staff development is characterized primarily by disorder, conflict and criticism (Guskey, 1986).

Most major works on the topic of staff development have emphasized the failings of these efforts. Corey (1957) stressed the need for professional development amongst school personnel but concluded that much of what occurs in the name of in-service education is uninspiring and ineffective. Davies (1967) in his testimony before the Senate Subcommittee on Education (U.S.A.) stated that, 'In-service education is the slum of American Education, disadvantaged, poverty stricken, neglected, psychologically isolated; riddled with exploitation, broken promises and conflict.' (Cited, Rubin, 1971, p.38.)

The need for high quality staff development is emphasized by Bloom (1976), McDonald and Elias (1976), Medley (1977), and Brophy (1979), but relatively few such programs have been forthcoming. Howey and Vaughan (1983) are particularly critical of current staff development, describing it as:

...potentially well supported in terms of resources but fragmented, not frequently engaged in on a continuing basis by practitioners, not regarded very highly as it is practiced and rarely assessed in terms of teacher behaviour and student learning outcomes. (p.97.)

This view is supported by the reports of Harris, Bessent and McIntyre (1969), Wagstaff and McCullough (1973), Laurence (1974), Howey and Joyce (1978), McLaughlin and Marsh (1978), Rubin (1978), Flanders (1980), and Wood and Thompson (1980).

Failure and ineffectiveness of staff development is attributable to a variety of factors but Guskey (1986) believes that the majority of programs fail because they do not take into account two critical factors. These factors are: what motivates teachers to engage in staff development; and the process by which change in teachers typically takes place.

Guskey argues that most teachers engage in staff development because they want to be better teachers so increasing in competence and obtaining greater professional satisfaction.

McLaughlin and Marsh (1978) state that the primary motivation for teachers to take on extra work and other personal costs involved in attempting change is the belief that they will become better teachers and that their students will benefit.

Again, this view is supported by Harootunian and Yargar (1980) in their study of teachers' perceptions of success. It was found in this study that regardless of teaching level, most teachers define their success in terms of their pupils' behaviours and activities rather than in terms of themselves or other criteria. Lortie (1975) found the same to be true in a study of teachers in five school towns, where teachers believed

that in-service courses would provide them with concrete and practical ideas that could be transmitted to the workforce directly; courses which neglected the classroom context seldom had much impact on teaching practice or student learning.

This may indicate that teachers themselves should be involved in the course design and planning sessions to ensure that a program is aligned with their stated needs. Hood and Blackwell (1980), Dawson (1981) and Gerson and Guskey (1985) agree that teachers' experience and expertise are valuable resources that should not be ignored. Jones and Hayes (1980) do not support these views and reflect that the inclusion of teachers in the planning and development of new programs may make certain programs more palatable but that they seldom result in significant attitude change or strong commitment from the majority of teachers.

Doyle and Ponder (1977) report that if an effective change strategy is ever to be devised it must be constructed on a more thorough understanding of the naturally existing mechanisms which operate in school environments. They emphasize that statements of how change should occur are not very useful in interpreting how classroom teachers actually respond to influences which impinge upon their established habits and practices.

It is contended by Doyle and Ponder (1977) that the practicality ethic is a key link in the knowledge utilization chain in schools. Teachers in the normal course of events receive a

variety of messages intended to modify and improve their performance. Personal observations would support that teachers talk about these messages and that the term 'practical' is used frequently and consistently to label statements about classroom practice. Doyle and Ponder (1977) state that the term 'practical' used by teachers to label statements about classroom practice represents an evaluative process which is an essential ingredient in the initial decision that teachers make regarding the implementation of a proposed change in classroom procedure. Messages which are seen as practical will be incorporated, at least tentatively, into teachers' plans.

Vandenbergh (1984), in defining practicality ethic, posits the view that teachers come to the conclusion that a change proposal is practical on the basis of the three main criteria. These are instrumentality, congruence and cost. Vanderbergh describes the criterion instrumentality as how well the principles, objectives and outcomes of the change proposal are translated and how specific and clear procedural content is communicated. Congruence refers to how well the change proposal fits in with the school and the way a teacher normally operates in the classroom. This criteria also relates to how compatible the proposal is to a teacher's self image and preferred way of relating to students and how credible the teacher perceives the credentials of the person presenting the recommendations. The third criterion described by Vandenbergh is cost. Cost is defined as the level of reward a teacher receives for implementing the change proposal whether in terms of money,

recognition, student enthusiasm or visible learning outcomes. Vandenberghe includes in the definition of this criterion, how easily the change proposal can be broken down into smaller units for trialling and how much time and effort is required to implement the change.

Fullan (1982) gives support to the views put forward by Vandenberghe. Fullan describes three main criteria that determine whether a change proposal is practical:

1. *Does the change potentially address a need? Will the students be interested? Will they learn?*
2. *How clear is the change in terms of what the teacher will have to do?*
3. *How will it affect the teacher personally in terms of time, energy, new skill, sense of excitement and confidence and interference with existing priorities? (p.113.)*

This infers that a staff development program, to be effective, must offer teachers practical ideas that can be efficiently used to directly enhance desired learning outcomes in students.

Doyle and Ponder (1977-78) note that recommendations and proposals perceived as practical by teachers are ones that are most likely to be implemented in the classroom. Those recommendations and proposals perceived by teachers to be impracticable will have little chance of implementation.

Brophy and Good (1974) found that teachers tend to make judgements rapidly with minimal experience or evidence. This

would indicate that teachers will judge the merits of an innovation very soon after exposure to it.

Crandall (1983) sees the credibility of those delivery change messages and the practicality of change programs as perceived by teachers being crucial to successful implementation. If, as according to Good and Brophy, teachers form judgements rapidly on the merits of an innovation then it would appear to be vital that an in-service course be initiated by charismatic, highly competent leaders. These leaders should be able to translate changes being put forward into practical ideas that are quickly and easily put into practice within the classroom.

In searching for change strategies that will be effective it is important to discover more about the recipients of the proposed program. Change strategies and professional development activities contain inherent assumptions about these recipients of change but these are not always clearly defined.

Doyle and Ponder (1977-1978) describe three images of the teacher which are represented in the change literature. These are the 'rational adapter, the stone-age obstructionist and the pragmatic skeptic.'

The rational adapter appears to be the most common image of the teacher in the innovation literature. Most strategists in the change process tend to use highly formalized rationale models of how school change should proceed. These models emphasize the

intellectual processes which ought to determine the direction and course of school change. The teachers in this category are thought to systematically follow a set of problem-solving steps involving problem identification, data search, deliberation, implementation and evaluation. Strategies based on this model stress the central importance of information in stimulating and effecting educational change. These strategies are easily identified by a centrally-based in-service course that uses experts and workshops. This model relies on change being brought about by recipients being given information and the assumption that teachers will immediately try out the latest idea. This model, according to Doyle and Ponder, tends to have little or no effect on change: teachers, they contend, do not on the whole conform to this model of rational behaviour and use a variety of normative and pragmatic criteria in selecting classroom strategies and procedures.

The stone-age obstructionist model described by Doyle and Ponder (1977-78) seeks ways to neutralize or bypass the teacher regarded as an obstacle to educational change. This model assumes that many teachers will deliberately set out to be obstructive to any envisaged change. The programmed instruction movement and various national curriculum projects of the 1960's attempted to produce teacher-proof materials and curricula designed to change educational practice. Teachers, however, tend to adapt rather than adopt new procedures into their current repertoires and teaching armoury. This method, used for implementing change, does not work.

Doyle and Ponder (1977-78) note that although few in number, there are descriptive studies that suggest teachers react to change proposals with what might best be called pragmatic skepticism. This pragmatic image of the teacher incorporates at least three interrelated dimensions.

Firstly, teachers tend to describe their work in individualistic terms which emphasize the uniqueness of each classroom and the central role of personal preference in the choice of teaching methods. Secondly, teachers consistently express a concern for the immediate contingencies and consequences, being interested in and responsive to immediate student reaction rather than evidence of long-term goal accomplishment. Thirdly, teachers are more concerned with the concrete and procedural rather than the abstract and general. The pragmatic skeptic image emphasizes the role of the school and its surroundings in shaping the way teachers think about and conduct their work.

The implications are that only after teachers have themselves tried an innovation in the actual classroom setting will any full understanding result. This understanding will be greatly enhanced if the change proposal can be described in procedural terms that depict classroom contingencies. Without a degree of understanding communicated by procedural specifications, teacher judgement concerning the practicality of a change proposal may not be achieved.

Chester (1971) maintains that translating increased knowledge or new intentions into behavioural implications relevant for the classroom is a highly developed skill that most teachers do not possess. To assume that a statement of general abstract program values and objectives will be translated into new and appropriate behaviour patterns may be a barrier to change. Teachers need to have a degree of congruence with the innovation and their own situations in order to implement change. If the change procedure fails to fit in with the way a teacher normally operates in the classroom, these procedures will be deemed impractical and viewed as a disruptive influence, especially if adverse student reaction results (Lortie, 1975).

The perception by the teacher of the proposer or person advocating the change is yet another aspect of congruence. Credibility of the proposers of change will also be influenced by the setting in which the innovation was tried such as buildings, type of community and the personality of the students (Doyle and Ponder, 1977-78).

Teachers, according to Doyle and Ponder (1977-78), are especially responsive to social factors such as recognition and student enthusiasm. A criterion of practicality cost is described by Doyle and Ponder as a ratio between the amount of return and the amount of investment. It refers primarily to the ease with which a procedure can be implemented and the potential return for adopting an innovation. Many educational innovations involve major structural reorganizations incurring high cost.

Cost and reward, referred to by Doyle and Ponder, are not solely matters of monetary remuneration.

Stephens' (1974) study found that teachers would adopt innovations even despite moderate personal skepticism, if the reward structure of the school was made contingent upon innovativeness.

Doyle and Ponder (1977-78) point out that costs appear to rise as an implementation program progresses which seems to play an important role in the gradual decline which tends to characterize the latter stages of innovation projects.

The reward factor and related costs appear to have a major bearing on the successful implementation of new teaching practices. The recognition of these factors and the taking into account of teacher behaviour and how teachers make decisions will determine the degree of success that change agents achieve. (Fullan, 1982, Vandenberghe, 1984.)

Identification of criteria for effective in-service education was summarized by Freiberg and Townsend (1982) in a review of literature relevant to in-service education and the analysis of practical experience with in-service programs. Five criteria for effective in-service education were identified by Freiberg and Townsend (1982). These were:

1. Techniques which are consistent with fundamental principles of effective teaching and learning. (i.e. needs-based content, field-based instruction, demonstrations, active learning, practice skills and feedback.)
2. Utilization of a systematic model of program development, implementation and evaluation.
3. A collaborative decision-making process with a concept of parity among representatives of teachers and others who are involved with the in-service program.
4. Cognizance needs to be given to the needs of the student, teacher and school system, organizational context and support systems.
5. Extrinsic and intrinsic rewards need to be built into the model.

Fuller (1969) conducted research into in-service education that gives support to the five criteria listed. The Fuller Concerns-Based Model delineates six development categories of concern that teachers may experience while interacting with their teaching environment. These include concerns about role, adequacy, being liked or liking, teaching, pupil needs and educational improvement. The Fuller model is based on individualized in-service where the teacher selects a single

mode or a combination of modes designed to meet unique needs and concerns as the teacher perceives them. An effective in-service education program of this type incorporates teacher concerns through a self selection process that requires active involvement in the planning and implementation of the program.

Freiberg and Townsend (1982), however, point out that an in-service education program that focusses on teacher needs exclusively is limited in scope. It must recognize the needs of parents, students, community and school system to be effective.

Contemporary Models for In-service

Smyth and Henry (1984) describe a model based upon a process of co-operation, consultation, observation and feedback between and among teachers about each other's teaching. This model is known as the Clinical Supervision Model (Goldhammer, 1969; Cogan, 1973.) This model was first developed at Harvard University in the 1950's. It is a process in which teachers work together as trusted colleagues to analyse and improve each other's teaching through systematic cycles of observation, analysis and discussion of data collected about each other's teaching. The process impinges on participants having a mutual desire to establish a shared framework of meaning so that if improvement occurs it will be through understanding and enlightenment. In this model participants are able to exercise real control over their working environment by working collaboratively together and learning about themselves as teachers and persons.

The model devised and described by Smyth and Henry is based on the Clinical Supervision Model. It is a teacher-centred approach that seeks to enable the teacher to become an active and conscious agent in the determination of his/her practice rather than a regurgitator of other people's ideas and practices.

The Clinical Supervision Model emphasizes the need of reflection and analysis of teaching by teachers and appears to make good sense but is not in common use.

The in-service model devised by Smyth and Henry (1984) provided what they believed to be a balance between theory, reflection and practice, which also incorporated focussed feedback from course leaders. This focussed feedback was designed to inform teachers of how they were progressing by systematically analysing their teaching. Methods used to help teachers incorporate clinical supervision into their teaching included workshops, practical in-school experiences, visits by course leaders to schools to observe teachers using clinical supervision and reports by teachers to their teaching colleagues within their schools. Smyth and Henry refer to this model as the 'Follow Through Model'.

The support role of principals in encouraging teachers to try out new ideas had, according to Smyth and Henry, been a major contributing factor to the successful implementation of the 'Follow Through Model' alongside the degree of co-operation

exhibited by the participants. Some difficulties were apparent concerning the component involving the direct observation of teachers within the classroom and descriptive feedback to colleagues. Teachers may have felt that they were being checked up on and this could cause them to be resentful. In their description of the model, Smyth and Henry acknowledged that the observation and feedback process on-site by outside course leaders was not always well received and may have been responsible for some of the participating schools withdrawing from the program. The experiences of Smyth and Henry led them to the realization that schools have very real power over what occurs within them and in many ways are beyond the reach of outside influence.

Models of In-service Education

Systems Model

Southworth (1984) in reviewing recent literature concerning staff development models found that these models are grouped into three broad categories. The first of these categories described by Southworth is the Systems Model.

The Systems Model regards the school as a functioning system, abstracted from the individuals who live, move and have their being within it. Roles and functions are devised based almost exclusively on the perceived needs of the organization since this model is derived from organizational theory (Elliot,

1983). The systems model is well-known and has a certain appeal because of the precise way in which it appears to operate.

In the Systems Model, ends are identified, and the means devised to achieve them. Roles and responsibilities are prescribed to achieve these ends. Once put into operation the system is monitored and regulated so that any shortcomings are diagnosed and rectified. On the surface this model appears to be straightforward and efficient. In this model the responsibility for identifying the organization's needs and for the allocation of resources rests with the management. Little attention is given to the needs and perceptions of individual teachers and requires them to develop abilities consistent with the organization's needs as identified by management.

The Systems Model looks on teachers as semi-professionals who are allowed to teach in our schools, provided that they are guided by management. (Olsen, 1982.) The consequence of the systems model is that it regards staff development only as a matter of rectifying perceived deficiencies in performance so that it is not a development model at all, merely a deficit model. The whole developmental process is really a remedial activity focussing on the negative and is concerned with plugging the gaps. Evidence of this can be seen in the self-evaluation schedules since the late 1970's and which many local Education Authorities in the U.K. have instructed schools to adopt and utilize. (Open University, 1982.)

The systems model tends to emphasize skills which remedy the deficiency rather than developing any fuller understanding as to the nature of the deficiency. Opportunity to examine the problem becomes limited. Southworth (1984) summarizes this model as one which devotes attention to the needs of the organization and one which ignores the teacher's individual perceptions, thoughts and feelings, seemingly so objective that it denies the subjective qualities of the teacher who works within the organization. The model, Southworth notes, is only really concerned with staff compliance and not staff development.

Laissez-Faire Approach

By contrast with the Systems Model, Southworth (1984, p.8) describes the Laissez-Faire Approach as a very loose and open approach to professional development, so loose in fact that it is regarded as an approach rather than a model. Lyons (1976) describes this approach as one in which schools frequently ignore the development of their staff because in these schools there is an assumption that development is either wholly the responsibility of the individual teacher or is no more than attending in-service courses. The model is characterized by the belief of principals that teachers develop merely by working in the vicinity of colleagues, who are considered to be good examples.

Southworth (1984, p.8) notes that although many teachers may have benefitted from working alongside skilled colleagues, this approach leaves much to chance and relies heavily on development by contagion.

Advantages with the approach compared with the systems model, is that it does not subvert either teacher's individual interests or autonomy, but again, Southworth comments, it appears to be another form of the gap-filling exercise with the onus on the individual teacher to decide where the deficiencies are. The approach does allow scope for interested teachers to develop in teams working with colleagues with scope and freedom. (Southworth, 1984, p.9.)

The Laissez-Faire approach allows scope for individual initiatives but the lack of both positive policy and a structure in the school to support developmental initiatives fails to make this form of professional development attractive. (Southworth, 1984, p.9.)

The Pragmatic Expedient Model

The third model described by Southworth (1984) is the Pragmatic Expedient Model and is similar to the Laissez-Faire approach. It is a model that is broad-based and is discovered in various forms, relying upon the need and wish of teachers to advance their career prospects and chances of promotion. These career minded teachers have generally attended courses, fostered

specialist interests and commitments and worked hard and often dedicatedly at introducing innovations. These teachers are referred to by Southworth as the 'extended professionals.' Career advancement, writes Southworth, for many teachers is synonymous with staff development. (p.9.)

As not all teachers can, or do, seek promotion it is inappropriate to regard staff development as being largely concerned with career advancement, Southworth (1984) reports. Staff development seen as a means for career advancement will not benefit all teachers. This approach tends to focus on extra professional issues rather than fundamental ones. The focus of attention in teaching drifts away from the fundamental nature of the activity, teaching and learning, to preparing teachers to take on extra tasks in the form of duties and responsibilities. This is a quantitative notion of staff development and can be related to the systems model. Southworth (1984) states that:

The focus on extra professional issues tends to restrict the organization's ability to enable teachers to examine their professional task and this is at odds with the hypothesis which not only wants to begin with an examination of teaching and learning but also seeks to sustain that focus. (p.10.)

Other forms of the pragmatic expedient model are those which regard staff development as a means of overcoming difficulties as they appear or are likely to occur in the foreseeable future. This approach is favoured by systems particularly with regard to accountability and public image. Open University (1982) notes that unless teachers 'develop' then 'a stricter

contractual accountability than hitherto might well be enforced.' (pp.8-9.)

What emerges from the three staff development models described is a view that they are based on external forces rather than principles. The concept of staff development reflected in these models is that they are shaped and effected by the way teachers and administrators perceive their purpose and usefulness.

Summary

From a review of the literature, it is apparent that professional development is a most complex issue. No clear picture emerges of a model that is guaranteed to succeed. Indeed, the literature on this subject indicates that little success has been met with, so far, in establishing sustained teacher change and practice. (Corey, 1957., Davies, 1967., McLaughlin & Marsh, 1978., Smyth, 1980., Barth, 1981., Howey & Vaughan, 1983., Guskey, 1986.)

Even when it appears that change has been accepted and put into practice, evidence shows that this acceptance and implementation may only be sustained for a limited period and may fade completely.

It would seem that, in order to implement a strategy for effective change, a new model is required; a model that uses components from existing models of staff development that have

proved to be beneficial in part, together with the inclusion of new approaches that have been suggested in recent years and which have yet to be tried.

An effective in-service model for mathematics education in the primary school must take into account the two critical factors; what motivates teachers to engage in staff development, and the process by which change in teachers typically takes place.

CHAPTER 3

THE MATHEMATICS IN-SERVICE NETWORK COURSE (MINC): AN INSERVICE MODEL DESIGNED FOR MATHEMATICS EDUCATION FOR TEACHERS IN THE PRIMARY SCHOOL

Introduction

The aim of the Mathematics Inservice Network Course (MINC) is to firstly improve the quality of mathematics education and teaching in the primary school and secondly to improve the attitudes of teachers and students towards mathematics in the primary school.

The in-service model is based on the notion that professional development can best take place in the school, within the teacher's classroom, and that teachers working with teachers is a most effective way of changing teacher beliefs and attitudes: the beneficiaries being the children.

The in-service (MINC) is undertaken during school time and provides relief teachers funded through the Schools Commission program, Basic Learning in Primary Schools (B.L.I.P.S.).

The in-service cohort consists of sixteen schools that are selected from interested schools. Selection criteria is based on the needs of the school, teachers and pupils. Each school

selected is required to send two teachers from the early childhood area of the school (kindergarten-year 2), one teacher from the middle primary area (year 3-4) and one teacher from the upper primary area (year 5-6). The attendance of the Principal at the in-service is mandatory. All participants must demonstrate a willingness and desire to attend and must not be directed to attend by administrators.

The MINC program is run over a period of eleven weeks, commencing with one full-day in the first week and continuing for ten consecutive weeks at the rate of a half-day per week.

Professional support and leadership is provided by two mathematics consultants for the duration of the course and by selected professional development leaders on the first day of the course.

The sixteen schools selected come together as a group on the first day of the in-service. For all half-day sessions the sixteen schools are divided into four networks of four schools grouped geographically.

The in-service sessions include input from course leaders on theory, demonstration and modelling. Activities are designed by teachers in the half-day sessions that will be trialled in schools in the week following the session. These activities are designed by teachers in specific areas of the school. For example, all the early childhood teachers are grouped together

and design activities specifically for the children they teach. Following implementation of the activity in the classroom, teachers reflect and evaluate the activity at the next in-service half-day.

Activities designed by teachers that have proved highly successful are documented and distributed to other networks and to the Mathematics Curriculum and Teaching Program (M.C.T.P.), a Schools Commission national project that has established a bank of exemplary mathematics teaching materials which are accessed by teachers and education systems throughout Australia. M.C.T.P. was established in 1985 and focusses on the professional development of individual teachers as they seek to help their students in classrooms day-to-day.

A certificate is provided to the participants on successful completion of the MINC course.

A Description of MINC

On the first full-day of the in-service, the staff of the sixteen schools participating are made aware of current developments and research in primary mathematics education. The participants of the course are taken through the major recommendations of the Cockcroft Report (1982) by course leaders who are selected on the basis of professional credibility, expertise and ability to lead.

During the day, group activities and workshops which involve participants are held that focus on problem-solving, the use of concrete material and alternative ways of presenting mathematics to children in the classroom. The development of positive attitudes by children and teachers towards mathematics is stressed. On returning to their schools, teachers are asked to give the children that they teach an attitude test in mathematics. Results of this test are the focus for time set aside for reflection during the first half-day session in the following week.

Each of the ten half-day sessions have a designated topic which are listed as follows:

1. Application and integration
2. Estimation
3. Active investigation/collaborative group work
4. Concrete materials
5. Problem-solving
6. Technology - calculators
7. Technology - computers
8. Resources - non-concrete
9. Mathematics outdoors
10. Evaluation of in-service

Each of these topics have emphasized as an integral part, the important issues of language and communication, how children learn, individual differences of children, student interests and

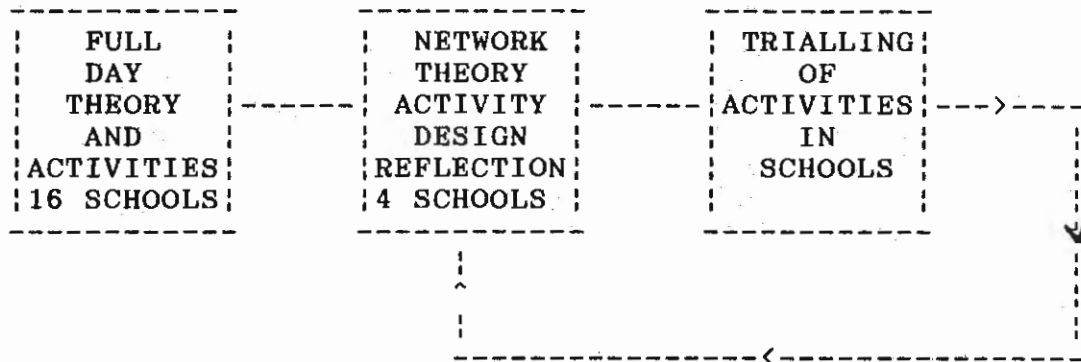
motivation, provision of non-threatening learning situations, disadvantaged groups (socio-economic, ethnic and gender), and alternative methods of assessment.

Readings and support materials are provided for participants on each related topic and issues that have been listed.

After in-put from course leaders, teachers design activities, taking into account this input, which are put into practice before the following half-day session. These activities are trialled in the classroom, then reflected upon in the next session before a new topic is introduced.

Support from course leaders is available between sessions within the schools.

Diagrammatically the in-service model looks like this:



Evaluation Procedure

An independent evaluation of the MINC was undertaken by a researcher employed for this purpose by the Evaluation Unit of the ACT Schools Authority in 1986.

The elements of the evaluation were:

1. Measures Taken Over All Course Participants and Their Classes:

- . End of Course Questionnaire (Appendix 1) (identical to the questionnaire distributed at the end of the 1985 MINC 1 course and 1986 MINC 2 course)

2. Continuation of Networks.

The evaluator attended several post-MINC network meetings for 1985 and 1986 MINC groups to assess the continuing life and usefulness of networks to participants.

In order to develop appropriate evaluation measures of the strengths and weaknesses of MINC, the course co-ordinators/leaders and the evaluator co-operated to develop an appropriate questionnaire. This being: an end of course questionnaire, Teachers' Opinions About MINC

End of Course Questionnaire

The Questionnaire: Teachers Opinions About MINC (see Appendix 1) administered in 1985 and 1986 was the same for both groups.

The questions were divided into seven sections:

- PART 1 Background information of teachers
- PART 2 Pre-MINC experience
- PART 3 Post-MINC experience
- PART 4 Networking
- PART 5 Exemplary lessons/activities
- PART 6 Role of course co-ordinator
- PART 7 Degree of success of MINC for you
- PART 8 Comments

Where opinions were sought, responses were recorded as 'strongly agree', 'agree', 'disagree', 'strongly disagree', and 'do not know'.

The questionnaires were filled out at the last session of the course.

The data analysed from teacher responses was recorded as percentages of the total sample surveyed under the headings 'Strongly Agree/Agree', 'Disagree/Strongly Disagree', and 'Don't Know/Not Given'.

The analysis of questionnaires for 1985 and 1986 MINC 1 and 2, appears in the next chapter.

CHAPTER 4

RESULTS

Analysis of Questionnaire

MINC 1 and 2 each contained four Networks comprising either four or five participating schools. Each Network was given a title that reflected the local geographic location where the schools were situated. The four Network titles for MINC 1 and 2 were: Northside 1, Northside 2, Southside 1 and Southside 2. The geographic locations were situated in the Australian Capital Territory. The Teachers Opinions About MINC questionnaire appears at Appendix 1.

The questions were divided into seven sections:

- PART 1: Background information
- 2: Pre-MINC experience
 - 3: Post-MINC experience
 4. Networking
 5. Exemplary lessons
 6. Role of course co-ordinators
 7. Degree of success of MINC for you
 8. Comments

Teachers were asked to complete the questionnaire at the end of the course.

PART 1: Background information

Participants in the evaluation came from the four MINC Networks in MINC 1 (55) and MINC 2 (81).

| MINC 1 | | MINC 2 | |
|--------------|------|--------------|------|
| Northside 1: | n=17 | Northside 1: | n=21 |
| Northside 2: | n=13 | Northside 2: | n=20 |
| Southside 1: | n=11 | Southside:1: | n=25 |
| Southside 2: | n= 8 | Southside:2: | n-14 |

Six teachers did not identify the network that they were associated with in MINC 1 and one teacher did not identify the network in MINC 2.

Teachers participating in MINC 1 and 2 came from all year levels of the primary school. Seventy-eight per cent of the teachers in MINC 1 were female and twenty-two per cent were male. In MINC 2 seventy per cent were female and twenty-seven per cent were male. Two teachers in MINC 2 did not identify their sex. Ninety-six per cent of teachers in MINC 1 said that it was their decision to participate in MINC and eighty-six per cent in MINC 2.

Teachers were asked to state the number of years that they had been teaching. In both MINC 1 and 2 participants were experienced teachers as indicated in the following table.

| MINC 1 | | MINC 2 | |
|---------------------|----|---------------------|----|
| (n=55) | | (n=81) | |
| Years of experience | % | Years of experience | % |
| less than 10 years | 26 | less than 10 years | 18 |
| 10-20 years | 51 | 10-20 years | 44 |
| more than 20 years | 23 | more than 20 years | 34 |
| not given | 0 | not given | 4 |

Teachers were asked to state the highest level at which they had studied mathematics. Most had studied mathematics at high school level or at teachers' college. Only a small proportion had studied mathematics at tertiary level, as the table shows.

| MINC 1 | | MINC 2 | |
|-------------------------------|----|-------------------------------|----|
| Level of study in mathematics | % | Level of study in mathematics | % |
| Tertiary | 16 | Tertiary | 12 |
| Teachers' College | 46 | Teachers' College | 43 |
| High School | 38 | High school | 45 |

PART 2: Pre-MINC experience

Teachers indicated on a five point scale their level of agreement with six statements that related to their attitude towards, and experience of, teaching mathematics before their involvement in the MINC program.

The following abbreviations are used in all tables:

| | |
|----------------------|------|
| Strongly Agree | = SA |
| Agree | = A |
| Disagree | = D |
| Strongly Disagree | = SD |
| Don't Know/Not Given | = DK |

MINC 1

| Before participating in MINC | SA/A % | D/SD % | DK % |
|--|-----------|-----------|---------|
| 1. <i>I was confident teaching mathematics</i> | 84 | 12 | 4 |
| 2. <i>I did not enjoy teaching mathematics</i> | 18 | 78 | 4 |
| 3. <i>I regularly integrated mathematics into other subject areas</i> | 62 | 34 | 4 |
| 4. <i>I did not regularly teach mathematics using 'real life situations'</i> | 36 | 60 | 4 |
| 5. <i>My students enjoyed mathematics</i> | 76 | 11 | 13 |
| 6. <i>I mainly used one resource for mathematics</i> | 20 | 78 | 2 |

MINC 2

| Before participating in MINC | SA/A % | D/SD % | DK % |
|--|-----------|-----------|---------|
| 1. <i>I was confident teaching mathematics</i> | 88 | 12 | - |
| 2. <i>I did not enjoy teaching mathematics</i> | 15 | 85 | - |
| 3. <i>I regularly integrated mathematics into other subject areas</i> | 62 | 37 | 1 |
| 4. <i>I did not regularly teach mathematics using 'real life situations'</i> | 37 | 60 | 3 |
| 5. <i>My students enjoyed mathematics</i> | 76 | 14 | 10 |
| 6. <i>I mainly used one resource for mathematics</i> | 21 | 75 | 4 |

The responses to the statements made by participants of MINC 1 and 2 showed that they were generally confident in their teaching of mathematics prior to the MINC program.

Most teachers appeared to enjoy teaching mathematics and said that they regularly integrated mathematics into other subject areas. Three-quarters of the teachers in MINC 1 and 2 said that their students enjoyed mathematics and almost the same number indicated that they used more than one resource.

The data was analysed to see if there were any differences in responses from teachers according to sex, MINC network, level to which the teacher had studied mathematics, year level taught and the teachers' expressed confidence about mathematics. The results indicated the following:

1. *Confidence in teaching mathematics*

Most teachers said that they were confident about teaching mathematics before participating in MINC.

There were no substantial differences in responses made by teachers from the different year levels within a school, but junior-primary teachers in MINC 1 showed a slightly lower level of confidence.

No substantial differences were evident between the responses of male and female teachers in MINC 1. In MINC 2 all male teachers said that they had been confident prior to MINC compared with seventy-four per cent of female teachers.

There was no substantial difference between teachers involved in the different networks. Networks in MINC 1 and MINC 2 showed an overall percentage of eighty-four, although Southside 2 teachers said that they had all been confident.

For both MINC 1 and 2, there was a slight decline in confidence about the teaching of mathematics depending on the level of mathematics studied.

All teachers in MINC 1 and 2 who had studied mathematics at tertiary level had been confident about teaching mathematics. Seventy-eight per cent of teachers who had studied mathematics at teachers' college said they were confident about teaching mathematics and seventy-two per cent of teachers who had studied mathematics at high school level said they were confident about teaching mathematics.

A general level of confidence was indicated by most teachers and therefore little variation could be established.

2. *Enjoyment of teaching mathematics*

Teachers in MINC 1 and 2 mostly agreed that they enjoyed teaching mathematics. There were some variations when the different groups were looked at. All male teachers in MINC 2 said that they enjoyed teaching mathematics

compared with eighty-one per cent female. In MINC 1 there were no particular differences in responses of male and female teachers. Although no differences were evident from teacher responses from different networks a higher percentage of teachers from MINC 1, Northside 2, indicated that they did not enjoy teaching mathematics (thirty-one per cent of the teachers).

The lower the level of mathematics studied, the more teachers tended to agree that they did not enjoy teaching mathematics prior to the MINC program. All teachers who had studied mathematics to tertiary level in MINC 1 and 2 disagreed with the statement that they did not enjoy teaching mathematics. This compared with eighty per cent of those who had studied mathematics at teachers' college and seventy per cent who had studied mathematics to high school level.

3. *Regularly integrated mathematics into other subject areas*

In both MINC 1 and MINC 2, sixty-two per cent of teachers said that before participating in MINC they had regularly integrated mathematics into other subject areas.

Significant variations in response were observed when the responses were examined according to teachers' expressed confidence in the teaching of mathematics.

Teachers who said that they were confident about teaching mathematics were more likely to integrate mathematics than

those who were less confident. This trend was far more obvious in MINC 2.

Differences were also visible amongst the four networks for MINC 1 and 2, as the following table shows:

*Before participating in MINC
I regularly integrated mathematics
into other subject areas*

| | MINC 1 | | MINC 2 | |
|---------------------|-----------|-----------|---------------------|-----------|
| | SA/A % | D/SD % | SA/A % | D/SD % |
| Northside 1: (n=17) | 59 | 41 | Northside 1: (n=21) | 52 48 |
| Northside 2: (n=13) | 69 | 31 | Northside 2: (n=20) | 75 25 |
| Southside 1: (n=11) | 70 | 30 | Southside 1: (n=25) | 75 25 |
| Southside 2: (n= 8) | 38 | 62 | Southside 2: (n=14) | 43 57 |

In MINC 1 the majority of teachers in Southside 2 had not regularly integrated mathematics in other subject areas before the MINC program, which varied with the other networks. In MINC 2 Northside 1 and Southside 2 showed a lower percentage than the other two networks.

In MINC 1 and 2 responses were analysed in terms of level of mathematics studied by individual teachers. MINC 1 teachers who had studied mathematics at teachers' college were more likely to integrate mathematics into other subject areas indicating that this may have been as a result of the training that they had received. In MINC 2 no such correlation was evident and indicated the opposite as the following table shows.

*Before participating in MINC,
I regularly integrated mathematics
into other subject areas*

MINC 1

| | | SA/A | D/SD |
|-------------------------------|--------|------|------|
| | | % | % |
| Level of mathematics studied: | | | |
| Tertiary | (n= 9) | 44 | 56 |
| Teachers' College | (n=25) | 84 | 16 |
| High School | (n=20) | 47 | 53 |

MINC 2

| | | SA/A | D/SD |
|-------------------------------|--------|------|------|
| | | % | % |
| Level of mathematics studied: | | | |
| Tertiary | (n=10) | 70 | 30 |
| Teachers' College | (n=34) | 53 | 47 |
| High School | (n=36) | 69 | 31 |

The level of mathematics studied appears to make little difference to the extent of mathematics integration.

4. *Regularly teach mathematics using 'real life situations'*

Sixty per cent of teachers participating in MINC 1 and 2 indicated that they taught mathematics using real life situations before taking part in the MINC program. There was a considerable difference between teachers according to the level of mathematics studied. Most teachers who had studied mathematics at tertiary level were more likely to use real life situations, while only half of the other teachers were likely to do so. This was less evident in MINC 2.

In MINC 1 there was a correlation between the year level taught and the use of real life situations in the teaching

of mathematics. Teachers of senior-primary level were more likely to use real life situations. This was also evident in MINC 2 but to a lesser degree, as the following tables show.

*Before participating in MINC,
I did not regularly teach mathematics
using 'real life situations'*

| MINC 1 | | | | MINC 2 | | | |
|--------------------|------|------|----|--------------------|------|------|----|
| | SA/D | D/SD | DK | | SA/A | D/SD | DK |
| | % | % | % | | % | % | % |
| Year level taught: | | | | Year level taught: | | | |
| K-Year 1 (n=15) | 47 | 53 | - | K-Year 1 (n=25) | 40 | 60 | - |
| Years 2-4 (n=18) | 39 | 55 | 6 | Years 2-4 (n=21) | 43 | 57 | - |
| Years 5-6 (n=18) | 10 | 90 | - | Years 5-6 (n=22) | 27 | 73 | - |

5. *Student enjoyment of mathematics*

In both MINC 1 and 2 more than three-quarters of the teachers said that before participating in MINC their students enjoyed mathematics.

There were differences among the four networks of both MINC 1 and 2 as seen in the following table.

*Before participating in MINC
my students enjoyed mathematics*

| MINC 1 | | | | MINC 2 | | | |
|---------------------|------|------|----|---------------------|------|------|----|
| | SA/A | D/SD | DK | | SA/A | D/SD | DK |
| | % | % | % | | % | % | % |
| Northside 1: (n=17) | 58 | 24 | 18 | Northside 1: (n=19) | 58 | 26 | 16 |
| Northside 2: (n=13) | 77 | 15 | 8 | Northside 2: (n=19) | 90 | 10 | - |
| Southside 1: (n=11) | 82 | - | 18 | Southside 1: (n=25) | 92 | 8 | - |
| Southside 2: (n= 8) | 100 | - | - | Southside 2: (n=13) | 85 | 15 | - |

Responses from teachers in MINC 1, Northside 1 and MINC 2 Northside 1 showed that they were least likely to agree that their students enjoyed mathematics before taking part in the MINC program. No apparent differences were evident between male and female teachers.

The higher level of mathematics studied by teachers, the more likely they were to agree that their students enjoyed mathematics.

Differences were not large. In MINC 1 those teachers who had studied mathematics to high school level were less sure that their students enjoyed mathematics as other teachers. Sixty-five per cent of teachers agreed, fifteen per cent disagreed and twenty per cent were not sure. This compared with seventy-six per cent who agreed, fifteen per cent disagreed and nine per cent did not know in MINC 2. There were no apparent differences among teachers from different year levels.

There were considerable differences based on the confidence of teachers about teaching mathematics.

In both MINC 1 and 2, the more confident teachers professed to be, the more likely were they to agree that their students enjoyed mathematics. This is shown in the following table.

*Before participating in MINC,
my students enjoyed mathematics*

| MINC 1 | | SA/A | D/SD | DK |
|--------|--|------|------|----|
| | | % | % | % |
| | Very confident teaching mathematics (n=17) | 100 | - | - |
| | Confident teaching mathematics (n=29) | 79 | 15 | 6 |
| | Not confident teaching mathematics (n= 7) | 29 | 57 | 14 |

| MINC 2 | | SA/A | D/SD | DK |
|--------|--|------|------|----|
| | | % | % | % |
| | Very confident teaching mathematics (n=17) | 100 | - | - |
| | Confident teaching mathematics (n=29) | 79 | 15 | 6 |
| | Not confident teaching mathematics (n= 7) | 29 | 57 | 14 |

6. *Use of resources for mathematics*

Teachers were asked whether or not they used mainly one resource for teaching mathematics. In MINC 1, one-fifth agreed that they did use mainly one resource and in MINC 2 one-quarter agreed. In MINC 1 teachers who had not studied mathematics beyond high school level tended to use one resource, but this was not evidenced in MINC 2. There was no difference in responses between male and female teachers or between teachers from different year levels.

Summary of Part 2

Teachers from both MINC 1 and 2 were mostly experienced teachers who enjoyed teaching mathematics and were confident about teaching mathematics. Most said that they integrated mathematics into other subject areas and used a variety of resources. This was particularly true of teachers who had studied mathematics at tertiary level in MINC 1, but was not reflected by teachers in MINC 2.

Teachers from MINC 1 and 2 mostly agreed that their students enjoyed mathematics.

Teachers who expressed confidence in, and enjoyment of, teaching mathematics prior to the program indicated a high level of agreement with items about their students' enjoyment of mathematics. Very few participants lacked confidence and perceived ability in teaching mathematics. These less confident teachers were less likely to integrate mathematics and usually did not enjoy teaching mathematics. Most of the less confident teachers did not believe that their students enjoyed mathematics.

It may be important to consider involving a larger number of teachers in MINC who are not confident in the teaching of mathematics to find out if the program increases their ability and confidence in the teaching of mathematics.

No significant differences were apparent between the responses of male and female teachers or the year level taught. There were differences in the responses of teachers according to each network.

PART 3: Post-MINC experience

Teachers participating in MINC 1 and 2 were asked to respond to statements to find out the effect that the program had on their teaching of mathematics. Teachers were required to respond to thirteen items. The thirteen items are listed in the table that

follows with the percentage of teachers who agreed and disagreed. Some of the statements tapped issues that had already been looked at in the pre-MINC section. Results were analysed to see if there had been any change in teachers' attitudes and practices as a result of participating in MINC.

| MINC 1 | SA/A % | D/SD % | DK % |
|--|-----------|-----------|---------|
| <i>As a result of participating in MINC</i> | | | |
| <i>My attitude towards teaching mathematics has become more positive</i> | 86 | 7 | 7 |
| <i>I now regularly integrate mathematics into other subject areas</i> | 65 | 22 | 13 |
| <i>I regularly teach mathematics using real life situations</i> | 75 | 10 | 15 |
| <i>My students have shown enjoyment in trialling MINC lessons</i> | 91 | 2 | 7 |
| <i>My students have shown greater enjoyment of mathematics</i> | 75 | 12 | 13 |
| <i>I am a better teacher of mathematics</i> | 78 | 9 | 13 |
| <i>I make better use of multiple resources</i> | 71 | 18 | 11 |
| <i>I am more likely to analyse mathematics resources before using them</i> | 86 | 5 | 9 |
| <i>I can better identify sections of mathematics which can present learning difficulties</i> | 60 | 31 | 9 |
| <i>I can more effectively rewrite aspects of my mathematics curriculum to improve these sections</i> | 69 | 20 | 11 |
| <i>I more readily identify learning difficulties of students in mathematics</i> | 50 | 35 | 15 |
| <i>I am aware of strategies to use with students having learning difficulties in mathematics</i> | 62 | 31 | 7 |
| <i>I now successfully use new strategies for students with learning difficulties</i> | 50 | 35 | 15 |

MINC 2

| | SA/A % | D/SD % | DK % |
|--|-----------|-----------|---------|
| <i>As a result of participating in MINC</i> | | | |
| <i>My attitude towards teaching mathematics has become more positive</i> | 86 | 10 | 4 |
| <i>I now regularly integrate mathematics into other subject areas</i> | 82 | 12 | 6 |
| <i>I regularly teach mathematics using real life situations</i> | 89 | 10 | 1 |
| <i>My students have shown enjoyment in trialling MINC lessons</i> | 99 | - | 1 |
| <i>My students have shown greater enjoyment of mathematics</i> | 77 | 11 | 12 |
| <i>I am a better teacher of mathematics</i> | 77 | 11 | 12 |
| <i>I make better use of multiple resources</i> | 87 | 11 | 3 |
| <i>I am more likely to analyse mathematics resources before using them</i> | 85 | 12 | 3 |
| <i>I can better identify sections of mathematics which can present learning difficulties</i> | 63 | 25 | 12 |
| <i>I can more effectively rewrite aspects of my mathematics curriculum to improve these sections</i> | 65 | 18 | 17 |
| <i>I more readily identify learning difficulties of students in mathematics</i> | 53 | 28 | 19 |
| <i>I am aware of strategies to use with students having learning difficulties in mathematics</i> | 73 | 16 | 11 |
| <i>I now successfully use new strategies for students with learning difficulties</i> | 62 | 21 | 17 |

The above responses indicate that participation in the MINC program had been a very worthwhile and valuable experience for most teachers.

A discussion of teachers' responses to these items follows. Each item is preceded by the statement: 'As a result of participating in MINC':

Item 1: My attitude towards teaching mathematics has become more positive

Most teachers in MINC 1 and 2 agreed with this statement. Of the thirty-six teachers who had agreed or disagreed that they had been confident teaching mathematics prior to MINC 1, only one teacher indicated that her attitude towards teaching mathematics had not become more positive as a result of the program. All teachers in MINC 2 who had not been confident about teaching mathematics agreed with the statement. Those teachers who disagreed with this statement had indicated that they were confident about teaching mathematics prior to the program. Teachers who disagreed with the statement may have felt that they already had a positive approach to mathematics.

Item 2: I now regularly integrate mathematics into other subject areas

Nearly all teachers agreed that as a result of the MINC program they integrated mathematics into other subject areas. Sixty per cent of teachers in MINC 1 who said that they did not integrate mathematics prior to the program and seventy per cent of teachers in MINC 2, now agreed that integration occurred.

In MINC 2, Southside 1, only sixty-five per cent agreed with this statement compared with ninety per cent who agreed in Northside 1 and 2 and Southside 2. In MINC 1 over a third of the teachers' responded negatively or did not respond.

This lack of response or negative response in MINC 1 and 2 to the statement could well be because such a practice was already employed and had not been adopted as a result of participating in the program.

Item 3: I regularly teach mathematics using real life situations

Most teachers agreed that as a result of participating in MINC they regularly teach mathematics using real life situations. Before MINC thirty-six per cent of teachers (n=16) in MINC 1 and thirty-seven per cent of teachers (n=30) in MINC 2 said that they did not teach mathematics using real life situations. All but two of the teachers in MINC 1 and all but one teacher in MINC 2 said that as a result of MINC they now use real life situations when teaching mathematics.

Item 4: My students have shown enjoyment in trialling MINC lessons

Nearly all teachers said that their students had enjoyed trialling MINC lessons.

Only one teacher responded 'I do not know' in MINC 2 and two teachers in MINC 1. One teacher from MINC 1 disagreed with this statement.

Item 5: My students have shown a greater enjoyment of mathematics

Three-quarters of teachers in MINC 1 and 2 agreed with this statement. Those teachers who did not agree with the statement

or did not know may have been those teachers who felt that their students enjoyed mathematics before the MINC program.

All teachers in MINC 1 and 2 who said that their students did not enjoy mathematics before the program now said they did.

Item 6: I am a better teacher of mathematics

Over seventy-five per cent of teachers in both MINC 1 and 2 said that they were better teachers of mathematics as a result of participating in MINC.

All teachers in MINC 1 and 2 who disagreed with this statement had said that before their involvement in MINC they were confident teachers of mathematics. All teachers in MINC 1 and 2 who said that they were not confident in teaching mathematics prior to MINC agreed that as a result of participating in MINC they were now better teachers.

Item 7: I make better use of multiple resources

Most teachers, seventy-one per cent in MINC 1 and eighty-seven per cent in MINC 2, agreed that they did make better use of multiple resources. The MINC 2 teachers showed a much stronger response to this item than MINC 1, although teachers in MINC 1 responded positively to this statement.

There was a difference according to the network in which the teachers were involved as can be seen from the following table.

*As a result of participating in MINC
I make better use of multiple resources*

| MINC 1 | | | | MINC 2 | | | |
|---------------------|------|------|----|---------------------|------|------|----|
| | SA/A | D/SD | DK | | SA/A | D/SD | DK |
| | % | % | % | | % | % | % |
| Northside 1: (n=16) | 81 | 19 | - | Northside 1: (n=21) | 90 | 5 | 5 |
| Northside 2: (n=12) | 92 | 8 | - | Northside 2: (n=20) | 90 | 10 | - |
| Southside 1: (n=11) | 64 | 18 | 18 | Southside 1: (n=25) | 72 | 24 | 4 |
| Southside 2: (n= 7) | 43 | 57 | - | Southside 2: (n=14) | 100 | - | - |

Item 8: I am more likely to analyse mathematics resources before using them

Nearly all teachers in MINC 1 and 2 (eighty-six per cent) said that as a result of MINC they were more likely to analyse mathematics resources before using them. Southside 1 was not in such strong agreement (sixty-eight per cent) which may have been as a result of their stated level of confidence prior to MINC.

Item 9: I can better identify sections of mathematics which can present learning difficulties

Over sixty per cent of teachers in MINC 1 and 2 agreed with this statement. There were differences in responses of each of the four networks in MINC 1 and 2. Southside 1 in MINC 2 and Southside 2 in MINC 1 did not respond as positively to this statement as other networks. This is evident from the table below.

*As a result of participating in MINC
I can better identify sections of mathematics
which can present learning difficulties*

| MINC 1 | | | | MINC 2 | | | |
|---------------------|------|------|----|---------------------|------|------|----|
| | SA/A | D/SD | DK | | SA/A | D/SD | DK |
| | % | % | % | | % | % | % |
| Northside 1: (n=16) | 69 | 25 | 6 | Northside 1: (n=19) | 74 | 21 | 5 |
| Northside 2: (n=13) | 85 | 15 | - | Northside 2: (n=20) | 80 | 10 | 10 |
| Southside 1: (n=10) | 50 | 50 | - | Southside 1: (n=25) | 44 | 40 | 16 |
| Southside 2: (n= 7) | 29 | 71 | - | Southside 2: (n=14) | 72 | 21 | 7 |

There was less agreement that MINC had helped in these respects than had been observed with other items.

Item 10: I can more effectively rewrite aspects of my mathematics curriculum to improve these sections

Thirty-eight teachers in MINC 1 (sixty-nine per cent) and sixty-five teachers in MINC 2 (eighty per cent) agreed with this statement. There was evidence to suggest that MINC had helped teachers who had not been confident about teaching mathematics. All except one teacher in MINC 2 said that as a result of participating in MINC they could more effectively rewrite aspects of their mathematics curriculum to improve sections that could present learning difficulties. This was reflected in responses to this item from teachers of MINC 1. As with other items differences in responses occurred among the networks as illustrated by the table below.

I can more effectively rewrite aspects of my mathematics curriculum to improve these sections

| MINC 1 | | | | MINC 2 | | | |
|---------------------|------|------|----|---------------------|------|------|----|
| | SA/A | D/SD | DK | | SA/A | D/SD | DK |
| | % | % | % | | % | % | % |
| Northside 1: (n=17) | 75 | 19 | 6 | Northside 1: (n=18) | 72 | 17 | 11 |
| Northside 2: (n=13) | 92 | 8 | - | Northside 2: (n=20) | 80 | - | 20 |
| Southside 1: (n=10) | 70 | 30 | - | Southside 1: (n=25) | 52 | 36 | 12 |
| Southside 2: (n= 7) | 57 | 43 | - | Southside 2: (n=14) | 85 | 15 | - |

Item 11: I more readily identify learning difficulties of students in mathematics

Over half the participants of MINC 1 and 2 agreed with this statement. The responses given by teachers were analysed and differences between networks were clearly evident as the following table shows.

I can more readily identify learning difficulties of students in mathematics

| MINC 1 | | | | MINC 2 | | | |
|---------------------|------|------|----|---------------------|------|------|----|
| | SA/A | D/SD | DK | | SA/A | D/SD | DK |
| | % | % | % | | % | % | % |
| Northside 1: (n=17) | 65 | 29 | 6 | Northside 1: (n=18) | 72 | 22 | 6 |
| Northside 2: (n=13) | 92 | 8 | - | Northside 2: (n=20) | 60 | 15 | 25 |
| Southside 1: (n=10) | 50 | 50 | - | Southside 1: (n=25) | 44 | 36 | 20 |
| Southside 2: (n= 7) | 43 | 57 | - | Southside 2: (n=14) | 43 | 50 | 7 |

In MINC 1 and 2 Northside Networks were considerably more positive than Southside Networks.

There was evidence to suggest that MINC helped teachers who had not been confident about teaching mathematics in MINC 2 but in MINC 1 the more confident teachers were likely to agree with this item, that they could identify learning difficulties of students in mathematics as a result of MINC.

Item 12: I am aware of strategies to use with students having learning difficulties in mathematics

Responses of teachers to this item from the MINC 1 and 2 showed substantial differences. Differences were also apparent among the networks with whom teachers were associated.

The following table illustrates the differences between networks and MINC 1 and 2.

I am aware of strategies to use with students having learning difficulties in mathematics

| | MINC 1 | | | | MINC 2 | | |
|---------------------|-----------|-----------|---------|---------------------|-----------|-----------|---------|
| | SA/A % | D/SD % | DK % | | SA/A % | D/SD % | DK % |
| Northside 1: (n=17) | 65 | 29 | 6 | Northside 1: (n=20) | 90 | 5 | 5 |
| Northside 2: (n=13) | 92 | 8 | - | Northside 2: (n=18) | 78 | 17 | 5 |
| Southside 1: (n=10) | 50 | 50 | - | Southside 1: (n=24) | 63 | 29 | 8 |
| Southside 2: (n= 7) | 43 | 57 | - | Southside 2: (n=14) | 79 | 14 | 7 |

MINC 1, Northside 2, was most positive in their responses to this item as was Northside 1 in MINC 2. Teachers from other networks were less sure that MINC had helped to increase their awareness of strategies to use with students having learning

difficulties in mathematics. All male teachers except one in MINC 1 said that they were aware of strategies to use compared with just over half of the female teachers. In MINC 2 no apparent differences were evident in the responses of male and female teachers to this item.

Item 13: I now successfully use new strategies for students with learning difficulties in mathematics

The responses to this item from teachers in MINC 2 showed an improvement on those received from teachers in MINC 1. Compared with the previous item (12), responses to this statement showed a gap between being aware of strategies and successfully using these strategies with students having learning difficulties (sixty-two per cent and fifty per cent in MINC 1 and seventy-three per cent and sixty-two per cent in MINC 2). The following table illustrates the differences between networks and MINC 1 and 2.

I now successfully use new strategies for students with learning difficulties in mathematics

| MINC 1 | | | | MINC 2 | | | |
|---------------------|------|------|----|---------------------|------|------|----|
| | SA/A | D/SD | DK | | SA/A | D/SD | DK |
| | % | % | % | | % | % | % |
| Northside 1: (n=17) | 65 | 23 | 12 | Northside 1: (n=18) | 67 | 16 | 17 |
| Northside 2: (n=13) | 62 | 15 | 23 | Northside 2: (n=19) | 78 | 11 | 11 |
| Southside 1: (n=10) | 40 | 60 | - | Southside 1: (n=23) | 52 | 35 | 13 |
| Southside 2: (n= 7) | 29 | 71 | - | Southside 2: (n=14) | 71 | 29 | - |

As with previous items, considerable differences in responses are evident between Southside 1 and 2 in MINC 1 and Southside 1 in MINC 2. Teachers from Northside networks in MINC 1 and Northside 2 and Southside 2 in MINC 2 were more likely to use new strategies for students with learning difficulties. The majority of teachers in MINC 1 Southside networks did not.

Summary of Part 3

These items were designed to see the effects of the MINC program on teachers and their teaching of mathematics.

The MINC program was generally regarded by teachers as a valuable experience. Teachers were mostly very positive about the course and their gains from it.

Most participating teachers considered that their attitude towards mathematics teaching had become more positive and were practicing more innovative techniques as a result of MINC.

Participants generally agreed that as a result of MINC they now made better use of multiple resources and were more likely to analyse resources before using them.

The majority of teachers considered themselves to be better teachers through their participation in the program.

Teachers said that their involvement in MINC had positive effects for students and their students had enjoyed trialling the MINC lessons. A majority of participants considered that their students showed increased enjoyment of mathematics by trialling the lessons.

There were many teachers who considered that the MINC program has helped them to rewrite mathematics curriculum to help overcome children's learning difficulties in mathematics and to

identify these problems. Many participants said that MINC had increased their awareness of strategies to use with students having learning difficulties but only half said that they use new strategies successfully.

The Southside 1 teachers in MINC 2 and Southside 1 and 2 in MINC 1 were consistently less positive than other networks. Teachers from Southside 1 in MINC 2 and Southside 1 and 2 teachers in MINC 1 were generally confident about teaching mathematics prior to MINC. This degree of confidence exhibited by teachers prior to MINC may have resulted in less enthusiastic responses being given to the items.

Teachers who had not been confident about mathematics prior to MINC responded very positively to most items.

Teachers in MINC were more strongly in agreement with statements that, as a result of participating in MINC, they regularly integrated mathematics into other subject areas and taught using real life situations. MINC 2 teachers also agreed more strongly than MINC 1 that they made better use of multiple resources and considered that MINC had made them more aware of strategies to use with students having learning difficulties in mathematics.

PART 4: Networking

Teachers taking part in MINC 1 and 2 were surveyed to find out what they thought of networking, when meetings should be held for post-MINC networks and whether they intended continuing with

networks after MINC. Results of the responses for MINC 1 and MINC 2 are listed below.

*The following statements relate to
your views on networking*

| MINC 1 | SA/A % | D/SD % | DK % |
|--|-----------|-----------|---------|
| Networking has been a positive aspect of MINC | 95 | 5 | - |
| I intend to make the post-MINC network operate effectively in 1986 | 82 | 4 | 14 |
| I am not interested in having the post-MINC network continue in 1986 | 7 | 84 | 9 |
| Network meetings should be after school hours | 49 | 35 | 16 |
| The network should meet regularly, say 2 or 3 times per term | 75 | 13 | 12 |

*The following statements relate to
your views on networking*

| MINC 2 | SA/A % | D/SD % | DK % |
|--|-----------|-----------|---------|
| Networking has been a positive aspect of MINC | 94 | 5 | 1 |
| I intend to make the post-MINC network operate effectively in 1986 | 67 | 15 | 18 |
| I am not interested in having the post-MINC network continue in 1986 | 14 | 70 | 16 |
| Network meetings should be after school hours | 45 | 48 | 7 |
| The network should meet regularly, say 2 or 3 times per term | 65 | 19 | 16 |

Nearly all teachers agreed that networking had been a most positive aspect of MINC.

Most participants of MINC 1 and MINC 2 indicated interest in the continuation of networks after MINC. Opinions were evenly divided over whether post-MINC network meetings should be held after school hours. Seventy-five per cent of MINC 1 participants and sixty-five per cent of MINC 2 agreed that networks should meet regularly two or three times a term. The responses from teachers in MINC 1 and MINC 2 that disagreed or said that they did not know whether they intended making the post-MINC network operate effectively were similar in proportion to those responses that indicated they were not interested in having the post-MINC network continue.

The strongest response came from teachers who before MINC had not been confident teaching mathematics. All teachers (n=15) who had indicated such lack of confidence before being involved in the program agreed that they intended making the post-MINC network operate effectively and they were interested in having the post-MINC network continue.

Networking for both MINC 1 and MINC 2 was seen to have been valuable, but commitment to its continuation, although positive, was a little less strong.

PART 5: Exemplary Lessons

Teachers participating in MINC 1 and 2 were surveyed to find out their views on the value of exemplary lessons. Teachers were

asked to respond to three statements. Teachers responses are given in the table below.

The following statements relate to your views on exemplary lessons

MINC 1

| | SA/A % | D/SD % | DK % |
|---|-----------|-----------|---------|
| The process of exemplary lesson writing during MINC is a sound one | 73 | 18 | 9 |
| The exemplary lessons produced by our network should not be available to the MCTP | 7 | 85 | 8 |
| I look forward to trialling lessons from the MCTP ¹ data bank | 89 | 2 | 9 |

¹ MCTP = Mathematics Curriculum and Teaching Program

MINC 2

| | SA/A % | D/SD % | DK % |
|---|-----------|-----------|---------|
| The process of exemplary lesson writing during MINC is a sound one | 79 | 10 | 11 |
| The exemplary lessons produced by our network should not be available to the MCTP | 11 | 86 | 3 |
| I look forward to trialling lessons from the MCTP data bank | 91 | 4 | 5 |

Most teachers agreed in MINC 1 and MINC 2 that the process of exemplary lesson writing during MINC is a sound one.

By contrast, Southside 1 teachers in MINC 2 did not respond to this statement in the same way as other networks. Only forty-eight per cent of Southside 1, MINC 2, agreed, thirty per cent disagreed and twenty-two per cent did not know.

Southside 1, MINC 2 teachers when asked to respond to the statement that exemplary lessons produced by the network should not be available to MCTP (Mathematics Curriculum and Teaching Program) did not reflect the views given by other networks. Although sixty-eight per cent were amenable to the idea, twenty-four per cent were not and eight per cent did not know.

In MINC 1 the majority of teachers had agreed with the value of being involved with the production and use of exemplary lessons. There was no particular difference in responses from the four networks. In MINC 2 responses did differ between the four networks. Teachers in three of the MINC 2 networks were extremely positive while the teachers in the fourth network were less in accord.

PART 6: The Role of Course Co-ordinators

Statements were designed to find out teachers' opinions about the presentation of the MINC program and the role of the course co-ordinators. Teachers' responses to these statements appear below.

Responses from teachers in MINC 1 are based on the responses given by all participants. The responses to each item in MINC 2 have been listed according to Network. The differences among the four networks in MINC 2 necessitated separate data

analysis. The following abbreviations have been used to represent networks in the MINC 2 figure listed.

- N1 = Northside 1 Network (n=21)
- N2 = Northside 2 Network (n=20)
- S1 = Southside 1 Network (n=25)
- S2 = Southside 2 Network (n=14)

The following statements relate to the presentation of the MINC program and the role of the course co-ordinators.

| MINC 1 | SA/A % | D/SD % | DK % |
|---|-----------|-----------|---------|
| The sequence of topics in MINC was appropriate | 80 | 11 | 9 |
| There was not sufficient variety in the presentation of MINC | 32 | 64 | 4 |
| The course co-ordinators were a major influence in the successful operation of MINC | 82 | 13 | 5 |
| There were not sufficient teaching notes issued during the MINC course | 42 | 54 | 4 |
| I have found the teaching notes supplied to be very helpful | 82 | 12 | 6 |
| I have found the materials supplied to be highly appropriate to my teaching situation | 64 | 27 | 9 |
| The emphasis on exemplary lesson writing was appropriate | 60 | 29 | 11 |
| Access to the course co-ordinators outside the MINC afternoons has been sufficient | 60 | 5 | 35 |
| Help for me in school from the course co-ordinators has been sufficient | 56 | 11 | 33 |

| MINC 2 | | SA/A | D/SD | DK |
|---|----|------|------|----|
| | | % | % | % |
| The sequence of topics in MINC was appropriate | N1 | 100 | - | - |
| | N2 | 100 | - | - |
| | S1 | 80 | 16 | 4 |
| | S2 | 100 | - | - |
| There was not sufficient variety in the presentation of MINC | N1 | - | 100 | - |
| | N2 | 5 | 95 | - |
| | S1 | 32 | 68 | - |
| | S2 | 14 | 86 | - |
| The course co-ordinators were a major influence in the successful operation of MINC | N1 | 95 | 5 | - |
| | N2 | 100 | - | - |
| | S1 | 88 | 8 | 4 |
| | S2 | 100 | - | - |
| There were not sufficient teaching notes issued during the MINC course | N1 | 5 | 95 | - |
| | N2 | 5 | 95 | - |
| | S1 | 20 | 60 | 20 |
| | S2 | 29 | 71 | - |
| I have found the teaching notes supplied very helpful | N1 | 100 | - | - |
| | N2 | 100 | - | - |
| | S1 | 76 | 20 | 4 |
| | S2 | 100 | - | - |
| I have found the materials supplied to be highly appropriate to my teaching situation | N1 | 90 | 5 | 5 |
| | N2 | 95 | - | 5 |
| | S1 | 56 | 36 | 8 |
| | S2 | 86 | 14 | - |
| The emphasis on exemplary lesson writing was appropriate | N1 | 95 | 5 | - |
| | N2 | 95 | - | 5 |
| | S1 | 44 | 44 | 12 |
| | S2 | 93 | 7 | - |
| Access to the course co-ordinators outside the MINC afternoons has been sufficient | N1 | 81 | - | 19 |
| | N2 | 100 | - | - |
| | S1 | 48 | 16 | 36 |
| | S2 | 57 | 7 | 36 |
| Help for me in school from the course co-ordinators has been sufficient | N1 | 80 | 5 | 15 |
| | N2 | 95 | - | 5 |
| | S1 | 57 | 8 | 35 |
| | S2 | 71 | - | 29 |

Most respondents were very positive in their responses concerning the role of the course co-ordinator and the way in which he/she had conducted the MINC program.

The Southside 1, in MINC 2, was generally favourable but included a greater proportion of negative responses than did other networks. This is seen in responses to teaching notes, the appropriateness of materials supplied and the writing of exemplary lessons. Fewer than half the teachers in Southside 1, MINC 2, had considered the emphasis on exemplary lesson writing to be appropriate whereas nearly all the teachers in the other three networks in MINC 2 had thought that it was.

Teachers in the two Northside networks in MINC 2 had considered that they had sufficient access to their course co-ordinator outside MINC afternoons, whereas there was a much lower level of agreement from the two Southside networks.

In MINC 1 there had been some variation in response according to the level of mathematics studied and the confidence of teachers. Responses showed that in MINC 1, the lower level of mathematics teachers had themselves studied, the less likely were they to agree that the materials supplied were appropriate to their teaching situation or that the emphasis on exemplary lesson writing was appropriate. They were also least likely to agree with the statement that help in school time from course co-ordinators had been sufficient. This was not evident in MINC 2. In MINC 2 there were no significant differences in the responses given by these teachers than by the more confident and/or qualified mathematics teachers.

The numbers of less confident teachers in MINC 2 were small. Most teachers were very experienced in MINC 2.

Summary of Part 6

It would appear that most teachers had been very satisfied with the role taken by the course co-ordinators. Southside Network 1 in MINC 2 appear less satisfied. Some participants in MINC 1 and MINC 2 felt that there was a need for more variety in the presentation of MINC but most were happy with the program.

It appeared that there was a weakness in the program relating to the way the MINC 1 program helped the less able mathematics teachers. Co-ordinators were made aware of this at the end of MINC 1 and may have compensated for this fact in MINC 2 as no significant differences in responses were evident between the confident and less confident teachers. In MINC 1 teachers who were less qualified in mathematics or less confident in their teaching of mathematics prior to MINC appeared not to be as happy in terms of provision of teaching notes, materials and the ability to cope with exemplary lesson writing.

PART 7: Degree of Success of MINC for you

The participants were asked to rate the success of MINC by responding to the following item.

Overall how successful was the course for you?

As the table below illustrates, most participants had found MINC 1 and 2 to be successful.

| | MINC 1 | | | |
|--------|-----------------|------------|-----------------------|----------------|
| | Very Successful | Successful | Moderately Successful | Not Successful |
| | % | % | % | % |
| (n=55) | 35 | 32 | 30 | 3 |

The responses from participants in the four different networks were as follows:

| | MINC 1 | | | |
|-----------------------|-----------------|------------|-----------------------|----------------|
| | Very Successful | Successful | Moderately Successful | Not Successful |
| | % | % | % | % |
| Northside 1 (n=17) | 53 | 24 | 18 | 5 |
| Northside 2 (n=13) | 39 | 31 | 30 | - |
| Southside 1 (n=11) | 18 | 36 | 36 | 10 |
| Southside 2 (n=7) | 14 | 57 | 29 | - |

| | MINC 2 | | | | |
|--------|-----------------|------------|-----------------------|----------------|-----------|
| | Very Successful | Successful | Moderately Successful | Not Successful | Not Given |
| | % | % | % | % | % |
| (n=81) | 33 | 32 | 26 | 4 | 5 |

The responses from participants in the four different networks were as follows:

| | MINC 1 | | | |
|-----------------------|-----------------|------------|-----------------------|----------------|
| | Very Successful | Successful | Moderately Successful | Not Successful |
| | % | % | % | % |
| Northside 1 (n=20) | 45 | 45 | 10 | - |
| Northside 2 (n=20) | 60 | 40 | - | - |
| Southside 1 (n=22) | 5 | 14 | 63 | 18 |
| Southside 2 (n=14) | 29 | 43 | 28 | - |

The only teachers to say that the program had not been successful in MINC 2 were Southside 1. Two teachers in MINC 1, one from Northside 1 and one from Southside 1, found the course not successful. There was a tendency for teachers in MINC 1 with higher mathematical qualifications to have found the course more successful than those with a more limited mathematical background.

In MINC 2 all teachers who had not been confident about teaching mathematics prior to MINC agreed that the program had either been very successful or successful. They apparently had considered that they had gained from their participation.

Unlike MINC 1, MINC 2 teachers showed little difference in responses when these were analysed according to the mathematics qualifications of the respondents.

Best aspects of MINC for you.

Teachers were asked to say what they considered to have been the best aspects of MINC and were invited to nominate up to three points. A wide variety of items were listed and the following are aspects most often discussed.

Sharing ideas/discussion/meeting others
Use of new materials/activities/books/resources
Concrete materials (e.g. MAB, Unifix)
New outlook on mathematics/maths is fun
Practical varied approach/use of real life situations
Trialling lessons/exemplary lessons
Re-appraisal of teaching methods/improved teaching
Role of co-ordinators/course leaders

By far the most important aspect of MINC, mentioned by nearly three-quarters of all respondents, was the opportunity of meeting others, sharing ideas and discussion with other teachers. The following two quotations typify many received when teachers were asked what had been the best aspects of MINC:

Networking with other schools - interchange with other staff on all aspects of professional interest.

Interaction of other teachers from other schools, sharing ideas, teaching strategies, etc.

The next most important aspect related to the use of materials and resources. Approximately twenty-eight per cent of teachers commented on benefits gained from the use of new materials, activities, books and/or resources. Many appreciated the variety of new materials and ideas to which they had been exposed and the opportunity to try resources that other teachers had found effective. Perhaps related to this item was the reference made by a number of teachers to the use of concrete materials. For example, one teacher commented:

Session on concrete materials - good "refresher" course or learning opportunity.

A number of teachers appreciated the new outlook the course had given them on mathematics; the exposure to new ideas with the result that they looked at mathematics in a new light. For some this meant the realisation that mathematics could be fun. Half of the teachers who had not been confident about teaching mathematics listed this aspect.

The practical and varied approach where teachers were encouraged to use real life situations in their teaching of mathematics was valued by some. A number of respondents also mentioned the use of exemplary lessons and the benefits gained from trialling these, evaluating them and discussing the outcomes, as being the most positive aspect of MINC. Others discussed the benefits that resulted from the reappraisal of their teaching methods. They considered that as a result they were better teachers of mathematics.

A number of teachers also specifically mentioned the role played by the course co-ordinators. They attributed the success of MINC to the input made by the course leaders.

A large number of different items were listed by participants as, for them, being the best aspects of the MINC course. Those listed above were the most often mentioned but by no means cover all the items given. There was no particular difference between networks in terms of what they considered the best aspects of the MINC program and, for all, the sharing opportunity provided by networking was the most valued aspect.

Suggestions for improvements to the MINC course

Participants of MINC 1 and 2 were asked what improvements they would like to see made to the MINC program. A wide range of suggestions was made and differences were evident from responses from MINC 1 and MINC 2.

A quarter of the teachers in MINC 1 indicated that they would have liked more demonstration lessons. This was not indicated by teachers in MINC 2. Both MINC 1 and MINC 2 participants, although not many, suggested more use of concrete materials.

Several teachers in MINC 1 and 2 had found the time constraints difficult. It was said by some teachers that one week on subject areas or topics was insufficient for full comprehension. There were concerns expressed by both MINC groups about the time needed to write lesson plans by each teacher every week. Although not evident in MINC 1, a number of MINC 2 teachers said that too much time had been given to reflection (twenty-six per cent).

Several teachers in MINC 2 commented:

Less time should be devoted to analysing and writing up post-mortems.

Not sure it is necessary to spend so much time tightening up last week's lessons.

A number of suggestions were made for changes to the group composition. MINC 1 and 2 teachers expressed a preference for mixed groups. Some considered the separate groups of Early Childhood, Middle Primary and Upper Primary meant that they missed out on other groups' ideas and would have benefitted from discussions with teachers in other groups.

Some teachers in MINC 2, nearly all from Southside 1, said that they would have preferred more input from 'experts'.

Suggestions were made that the experts could be the course co-ordinators or tertiary institutions or classroom teachers with expertise in special areas. This could have provided more variety as well as expert input.

A few teachers, mainly from MINC 2, would have preferred more than four teachers to have been involved from the one school. Teachers from large schools considered it to be preferable for more staff to be involved.

The above suggestions commented on were the most commonly repeated by teachers in MINC 1 and 2. There were many other suggestions made by individual teachers, including several conflicting proposals about preferred time, length of sessions, courses and timing of sessions.

In MINC 2, Southside 1 had been the least positive throughout the questionnaire regarding their response to MINC and the network. It was not surprising that a high percentage (ninety-two per cent) of teachers in this network made suggestions for the improvement of MINC. A number of teachers in this group said that the format each week was boring and that too much time was spent writing up lessons.

Change in approach - the introduction to the course was fine - an aura of enthusiasm prevailed but after lesson 1, 2, 3, 4..... the dull deadly boring ritual of lesson writing and then re-writing had killed all mathematics aspirations.

They tended to feel the course lacked stimulating input. This was also reflected by teachers in Southside Network 2 in MINC 2.

PART 8: Comments

Participants of MINC 1 and 2 were finally asked to comment on any aspect of the course. The comments covered a wide range of areas. Most teachers took the opportunity to express appreciation for being involved in the course, and commented in a very positive general way.

I really enjoyed the course - it was a 'shot in the arm' for my maths teaching. Thanks.

Terrific - a wonderful learning experience.

...great for the participants - great for their current classes. Only time will show the long term gains.

Several teachers commented on their improved attitude to teaching mathematics such as:

Thank you for the opportunity to do the course. Just like a new lease of life. I feel that I am much happier about teaching maths and I know my class has benefitted.

A benefit when devising maths lessons. Refreshed ideas/developed new ones.

A number of teachers said that the course had increased their enthusiasm which had resulted in the use of more varied and innovative practices. Appreciation was also expressed by a number of participants for the work done by the course co-ordinators.

A few comments were critical of the time taken to write up exemplary lessons and to put them into practice.

I found the process of exemplary lesson writing to be very time consuming - writing/rewriting each lesson every week became tedious.

Lessons all took much longer than expected and one wonders whether amount of time spent is worthwhile or at the expense of other subjects in a very tight school curriculum.

Finally, two respondents said that they did not consider the advantages of MINC to be worth the cost of the program. Off-lining teachers one afternoon a week for ten weeks is very expensive to the system and they did not consider this to be compensated by advantages gained.

Comments ranged from specific suggestions to enthusiastic appreciation and there were few negative remarks. Overall, the majority of teachers had appreciated the opportunity to be involved.

Conclusions

The responses to the questionnaire from participants in MINC 1 and 2 indicate that most teachers regard their participation in MINC as having been very successful.

The majority of teachers regarded the network experience as a very positive one and indicated their intention to continue meeting after MINC.

Teachers appreciated the network experience which enabled them to meet and exchange ideas with teachers from other schools. They appreciated the work of the co-ordinators and considered that they had benefitted from their participation in MINC in a number of ways. These included exposure to a variety of

resources and materials and the opportunity to write and use exemplary lessons.

It was said generally by participants that the students in their classrooms enjoyed trialling MINC lessons and that involvement in MINC had helped them to improve their teaching practice.

The overall pattern of responses showed that MINC had been influential in heightening teachers' interest and enthusiasm for teaching mathematics.

Continuation of Networks

The continuation of networks after the MINC program was an integral part of the inservice course design.

All networks from MINC 1 and 2 met after the 1985 and 1986 program and planned to continue meeting. The meetings included teachers exchanging ideas and resources, planning visits to schools and centres of interest and receiving exemplary activities from MCTP. Teachers were particularly interested in teaching strategies and discussing their experiences with one another.

After the initial meetings a gradual decline in the number of teachers attending post-MINC networks was evidenced.

The increasing number of MINC teachers as the program expanded from MINC 1 to MINC 5, placed an enormous burden on the two

course consultants. As well as the post-MINC networks, the course leaders were called upon to give parent courses, staff courses, and assistance to individual schools reviewing and renewing their mathematics curriculum.

A list of MINC-initiated additional demands on course co-ordinators is given in the table below for MINC 1, 2 and 3.

MINC-INITIATED ADDITIONAL DEMANDS
ON COURSE CO-ORDINATORS
(MINC 1, 2, AND 3) 1986

| | Co-ordinator A | Co-ordinator B | Total |
|--|----------------|----------------|-------|
| Number of schools | 22 | 14 | 36 |
| Number of schools in which additional sessions presented | 18 | 14 | 32 |
| Number of sessions | 39 | 12 | 51 |
| Staff inservices on aspects of maths teaching | 25 | 4 | 29 |
| Parent and sessions on new approaches to maths | 14 | 4 | 18 |

The enormous burden placed on the MINC co-ordinators in addition to their duties as primary and secondary mathematics consultants has meant that the post-MINC networks have been left to organise themselves. It is unfortunate that there has been a wane of interest shown by teachers in continuing post-MINC network meetings and that support from the consultants cannot be sustained.

The longer term prospects for the continuation of networks after MINC is in doubt unless additional support staff can be provided. As the likelihood of additional resources being provided is slim, it is almost certain that post-MINC networks will cease to operate.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The Maths In-service Network Course (MINC) has proved to be a successful professional development model. This is indicated by the responses given by teachers in the questionnaire given on completion of MINC 1 and MINC 2.

Most teachers regarded their participation in the MINC in-service as having been a very worthwhile experience. Over ninety per cent of teachers stated that the course had been successful for them.

An advantage of the MINC program model appears to be the contact it affords teachers with one another. This professional contact of teachers with one another was a factor which emerged strongly in the end of course questionnaires as an advantage gained from MINC.

This professional contact also occurs in shorter term in-service courses but the conscious fostering of professional contact over

an eleven week period seems to have produced real advantages in the professional development of teachers. It has given teachers the time and opportunity to learn from one another. It has afforded teachers the time in which to develop collegiality.

Advantages also appeared to be gained by teachers meeting teachers from neighbouring schools. This contact with other schools gave teachers a wider knowledge of other teachers' ways of working and thinking. Participants of the MINC 1 and 2 indicated that much was learned from colleagues and that this learning would not have been as effective if a single school had participated and there had been no network.

The continuation and development of networks of teachers after the in-service was an integral part of the design of MINC.

The continuing post-MINC networks posed a serious logistical problem for course co-ordinators. As the number of MINC courses increased, so did the number of post-MINC networks. The course co-ordinators had neither the time nor resources to service the post-MINC networks. In an attempt to overcome this problem, individual teachers within each network were asked to be responsible for organizing post-MINC network meeting twice a term. Unfortunately a wane of interest on the part of teachers was observed and numbers attending these meetings decreased significantly. This disappointing development leads the writer to believe that unless adequate leadership resources are provided to service and maintain post-MINC networks, then

teachers will lose interest and the post-MINC network will cease to exist.

Most post-MINC networks currently do not meet, but there has been a positive post-MINC development. Many course participants have requested the MINC co-ordinators to work within their schools with school staff and with parents. The co-ordinators have been able to satisfy these demands for support within the schools. This has been achieved largely by support being given during school-time and in the evenings.

An interesting development since the MINC was begun has been the increasing demand by teachers for places in the course. The MINC program has been endorsed and placed in high regard by senior management and school administrators.

Many teaching vacancies advertised in the Australian Capital Territory state that it is highly desirable that applicants have completed the MINC course.

Although it was never the intention of the course designer to regard the participation in MINC as a means of gaining a promotion or teaching position, it would appear that this has occurred. An unfortunate development has been evidence of resentment shown by teachers who applied to participate in the MINC program but who, for various reasons, were not offered a place. These teachers have indicated that their career

advancement and job opportunities have been adversely effected by not being offered a place in the MINC course.

The major resource available to MINC has been funding supplied by the Basic Learning in Primary Schools project. This funding discontinued at the end of 1987. As a result of teacher and administrator demands for MINC to continue, relief teaching days have been allocated by the ACT Schools Authority for the running of MINC in 1988.

The MINC in-service is clearly seen as a beneficial and worthwhile course by both teachers and administrators.

It is evident from personal observations made at school level and by teachers' responses to the questionnaires, that MINC has been influential in heightening teachers' interest and enthusiasm for teaching mathematics. The network experience has enabled teachers to meet and exchange ideas. It has exposed these teachers to a wide variety of resources and materials that have benefitted their teaching.

Although the in-service model used can be regarded as highly successful, there were aspects of MINC that were less successful.

The content of the MINC course came in for criticism by participants. Early Childhood teachers in MINC 2 complained that the course offered little beyond what they were already

doing. This was not unexpected as early childhood teaching is generally predicated on the use of concrete materials, multiple resources, practical work and activities that reflect a thematic approach to teaching. Later MINC's took cognizance of these criticisms and the course was adapted to reflect early childhood teacher needs. However, MINC remains a process rather than a content based course.

The first MINC program placed emphasis on the use of exemplary material and the documenting of successful activities for MCTP (Mathematics Curriculum and Teaching Program). It became apparent to the co-ordinators during the first MINC course that this component was being used to bring about change through the use of materials (content) rather than an understanding of the processes required to bring about change. It was considered important by the course leaders for teachers to understand the fundamental reasons for implementing change. This led the course leaders to reduce the emphasis on content and exemplary material and to increase emphasis on discussion and reflection. The documenting of successful activities requirement was removed and left to the discretion of individual groups of teachers. This action was approved of by participants and was made in response to criticisms expressed by teachers in the questionnaires. These criticisms indicated that some teachers regarded the writing up of activities as onerous and not of great benefit.

The length of time spent by teachers on reflection was also criticized by a few teachers. It was stated by some teachers that too much time was spent on reflection. No alteration was made to decrease this time as the majority of teachers expressed the view that this aspect of MINC was most beneficial.

The components and provisions included in the MINC model were all considered necessary for implementing and sustaining change in classroom practice as outlined in Chapter 1.

The aims and objectives of the course were clearly defined to participants. Current research and development in the teaching of primary mathematics was disseminated to teachers at the commencement of the course and during half-day sessions.

Practical activities were an integral part of MINC. Course leaders were successful in demonstrating and translating activities for use in the classroom and participants were supportive of their involvement in the design and trialling of activities.

A specified provision during the design phase was the inclusion of credible course leaders in the program and a recognition of their credibility by participants.

The MINC was led by two mathematics consultants. One was an experienced primary teacher and the second was an experienced secondary teacher. Resources were not available for the

appointment of a second primary teacher. A degree of dissatisfaction was evidenced by networks being led by the secondary teacher. The evaluation of MINC 1 and 2 responses to the questionnaire showed that Southside Networks 1 and 2, led by the secondary consultant, were generally satisfied with the course but were more critical of the format of sessions. Teachers from these networks called for more input from experts. This was not viewed as being critical of the person but rather the fact that the course leader was secondary trained rather than primary trained. Responses from the Southside networks in MINC 1 and 2 support the view that in-service leaders and their professional standing is perceived by participants as an important determining factor in implementing and sustaining change.

The strongest aspect of MINC as perceived by participants was the opportunity to meet and hold discussions with colleagues from within their schools and from other schools. The provision for, and development of, collegiality was realized. This aspect of MINC was extremely successful as indicated by teachers' responses to item 'best aspects of MINC for you' in the questionnaire, and is seen by the writer as a major factor contributing to the success of MINC.

The inclusion of the Principal in the MINC program was seen by the course leaders to provide support for the change proposals in the schools. Teachers worked with principals and shared equally in activity design and trialling.

The Principals were allowed to select the year group that they wanted to work with at the first half-day session. This caused a problem to occur in MINC 1. Four Principals selected the same year group which included four classroom teachers. The Principals tended to dominate discussion and this led to a certain amount of friction between the classroom teachers and the Principals. In the following MINC programs, no more than two Principals were permitted to join any one group. This change in procedure resulted in the elimination of friction between Principals and teachers.

The component, reflection, was considered by the participants to be a most worthwhile aspect of MINC. The degree of collegiality developed amongst teachers and being given the opportunity to share and analyse activities trialled in the classroom, enabled teachers to learn from one another. It afforded teachers the opportunity of meeting and discussing issues with others, removing for many the experience of isolation.

Support was provided to teachers within classrooms by the course leaders during and after the in-service course. All teachers were informed that this support was available and many teachers sought and received this support. Support from course leaders was also extended to parent groups from schools that were participating in the MINC program.

The leaders of the MINC hoped that the teachers effecting change in the teaching of mathematics would observe positive effects of

these changes in student behaviour and learning outcomes. The evaluation of MINC 1 and 2 and subsequent MINC programs indicate that the program has had a positive effect on students. Responses to the questionnaire indicate that students enjoyed the activities trialled and that they shared an increased enjoyment of mathematics. Whether the students had increased their knowledge and understanding of mathematics is supposition. The teachers improved their attitudes towards mathematics and the children enjoyed the activities, but the children were not tested before and after MINC to find out whether there was improved student performance as a result of teachers attending the MINC program.

The MINC in-service aims to raise teachers' knowledge and awareness of teaching strategies. It stresses the need to provide a wide variety of learning situations for students. Any increase in student learning performance as a direct result of teachers attending MINC would require appropriate assessment procedures to be carried out before and after MINC. Tests currently available are pencil and paper type tests and generally do not assess mathematical thinking skills or mathematical processes. The MINC program may need to consider the use and development of appropriate assessment procedures in the future in order to measure student learning outcomes which may result from the MINC program.

The Maths In-service Network Course was the first intensive mathematics in-service to be initiated in the ACT specifically for primary teachers.

Since the first MINC course was begun in August 1985, over 560 primary teachers have participated in the program.

Evaluation of MINC 1 to 5 supports the continuation of this model for mathematics education in-service for primary teachers. Minor modifications will continue to be made to the program in the light of further research and development.

Evidence gathered so far from the MINC courses completed would indicate that this professional development model may be hard to better.

Recommendations

Future in-service courses, based on the evaluation of MINC 1 and 2, should include the components and provisions as outlined in Chapter 1, page 14.

It is desirable that the in-service course be held during school time, but it is acknowledged that this may not be possible in the future due to financial constraints. The degree of success evidenced in MINC 1 and 2 may well be obtainable by running the in-service after school hours.

It is recommended that appropriate assessment procedures be developed to assess the effects of the MINC program on student learning outcomes.

The MINC program was designed to improve the teaching of mathematics in primary schools. Indications are that most teachers who participated in MINC found the program very successful.

The model used in MINC has proved to be effective in implementing changes in classroom practice. Only time will tell whether or not these changes can be sustained over a prolonged period.

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TEACHERS' OPINIONS ABOUT MINC
(MATHEMATICS INSERVICE NETWORK COURSE)

In this questionnaire we are trying to find out what you think about MINC.

PART I: BACKGROUND INFORMATION

1. I am in a MINC Network: (Please circle one)

Northside 1 Northside 2
Southside 1 Southside 2

2. I teach Grade K, 1, 2, 3, 4, 5, 6

3. I am Female/Male.

4. It was my decision to participate in MINC.

YES/NO

5. I have been teaching for years.

6. The highest level to which I studied Mathematics was:
(Please be specific about Mathematics level: e.g.
Diploma of Teaching, Major in Mathematics.)

.....
.....

INSTRUCTIONS FOR COMPLETING PARTS 2 TO 6

In the following questions you are asked to agree or disagree with the statements made about MINC and mathematics. Please indicate your response by circling one of the five indicators.

- SA = Strongly Agree
- A = Agree
- D = Disagree
- SD = Strongly Disagree
- DK = Do Not Know

For example, if MINC has definitely improved your ability to teach problem solving your response would be:

MINC has improved my ability
to teach problem solving SA A D SD DK

There are no right or wrong answers, it is your opinion that is important.

PART 2: YOUR PRE MINC EXPERIENCE

The following six questions refer to your experience in teaching before you participated in MINC.

To answer the statements use "Before participating in MINC" at the beginning of each of the following statements:

Before participating in MINC

- | | | | | | | |
|----|--|----|---|---|----|----|
| 1. | I was confident teaching mathematics | SA | A | D | SD | DK |
| 2. | I did not enjoy teaching mathematics | SA | A | D | SD | DK |
| 3. | I regularly integrated mathematics into other subject areas | SA | A | D | SD | DK |
| 4. | I did not regularly teach mathematics using 'real life situations' | SA | A | D | SD | DK |
| 5. | My students enjoyed mathematics | SA | A | D | SD | DK |
| 6. | I mainly used one resource for mathematics | SA | A | D | SD | DK |

PART 3: YOUR POST MINC EXPERIENCE

Use: 'As a result of participating in MINC' at the beginning of each of the following statements:

AS a result of participating in MINC

- | | | | | | | |
|----|---|----|---|---|----|----|
| 1. | My attitude towards teaching mathematics has become more positive | SA | A | D | SD | DK |
| 2. | I now regularly integrate mathematics into other subject areas | SA | A | D | SD | DK |
| 3. | I regularly teach mathematics using real life situations | SA | A | D | SD | DK |
| 4. | My students have shown enjoyment trialling MINC lessons | SA | A | D | SD | DK |
| 5. | My students have shown greater enjoyment of mathematics | SA | A | D | SD | DK |
| 6. | I am a better teacher of mathematics | SA | A | D | SD | DK |
| 7. | I make better use of multiple resources | SA | A | D | SD | DK |
| 8. | I am more likely to analyse mathematics resources before using them | SA | A | D | SD | DK |

- | | | | | | | |
|-----|---|----|---|---|----|----|
| 9. | I can better identify sections of mathematics which can present learning difficulties | SA | A | D | SD | DK |
| 10. | I can more effectively rewrite aspects of my mathematics curriculum to improve these sections | SA | A | D | SD | DK |
| 11. | I more readily identify learning difficulties of students in mathematics | SA | A | D | SD | DK |
| 12. | I am aware of strategies to use with students having learning difficulties in mathematics | SA | A | D | SD | DK |
| 13. | I now successfully use new strategies for student with learning difficulties | SA | A | D | SD | DK |

PART 4: NETWORKING

The following statements relate to your views on networking:

- | | | | | | | |
|----|--|----|---|---|----|----|
| 1. | Networking has been a positive aspect of MINC | SA | A | D | SD | DK |
| 2. | I intend to make the post MINC network operate effectively in 1986 | SA | A | D | SD | DK |
| 3. | I am not interested in having the post MINC network continue in 1986 | SA | A | D | SD | DK |
| 4. | Network meetings should be after school hours | SA | A | D | SD | DK |
| 5. | The network should meet regularly, say 2 or 3 times per term | SA | A | D | SD | DK |

PART 5: EXEMPLARY LESSONS

The following statements relate to your views on exemplary lessons:

- | | | | | | | |
|----|---|----|---|---|----|----|
| 1. | The process of exemplary lesson writing during MINC is a sound one | SA | A | D | SD | DK |
| 2. | The exemplary lessons produced by our network should not be available to the MCTP | SA | A | D | SD | DK |
| 3. | I look forward to trailing lessons from the MCTP data bank | SA | A | D | SD | DK |

PART 6: ROLE OF THE COURSE CO-ORDINATORS

The following statements relate to the presentation of the MINC program and the role of the Course Co-ordinators

- | | | | | | | |
|----|---|----|---|---|----|----|
| 1. | The sequence of topics in MINC was appropriate | SA | A | D | SD | DK |
| 2. | There was not sufficient variety in the presentation of MINC | SA | A | D | SD | DK |
| 3. | The course co-ordinators were a major influence in the successful operation of MINC | SA | A | D | SD | DK |
| 4. | There were not sufficient teaching notes issued during the MINC course | SA | A | D | SD | DK |
| 5. | I have found the teaching notes supplied very helpful | SA | A | D | SD | DK |
| 6. | I have found the materials supplied to be highly appropriate to my teaching situation | SA | A | D | SD | DK |
| 7. | The emphasis on exemplary lesson writing was appropriate | SA | A | D | SD | DK |
| 8. | Access to the course co-ordinators outside the MINC afternoons has been sufficient | SA | A | D | SD | DK |
| 9. | Help for me in school from the course co-ordinators has been sufficient | SA | A | D | SD | DK |

PART 7: DEGREE OF SUCCESS OF MINC FOR YOU

As you are aware the MINC program will continue in 1986. It is important for the future participants and the organisation of MINC that accurate and detailed information be collected.

THE FOLLOWING QUESTIONS RELATE TO YOUR VIEWS ON THE SUCCESS OR OTHERWISE OF MINC FOR YOU

- | | | |
|----|--|-------------------------|
| 1. | Overall how successful was the course for you? | - Very Successful |
| | | - Successful |
| | | - Moderately Successful |
| | | - Not Successful |

(Please circle one)

2. In your view what have been the best aspects of the MINC Course? (Nominate up to three.)

(a).....

.....

(b).....

.....

(c).....

.....

3. What improvements would you like to see made to the MINC course?

(a).....

.....

(b).....

.....

(c).....

.....

4. Your comments on any aspect of the course would be welcomed:

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Thank you for your co-operation.