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Chiraporn Sirithavee

Louisiana State University and Agricultural & Mechanical College

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An inservice training program in mathematics for Thai elementary school teachers: A proposed model

Sirithavee, Chiraporn, Ph.D.
The Louisiana State University and Agricultural and Mechanical Coll., 1989

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AN INSERVICE TRAINING PROGRAM IN MATHEMATICS
FOR THAI ELEMENTARY SCHOOL TEACHERS:
A PROPOSED MODEL

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Curriculum and Instruction

by
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The purpose of this study was twofold. First, to survey the existing needs of mathematics inservice education for primary school teachers in Thailand. Second, to develop a model for a systematic inservice mathematics education program for primary school teachers in Thailand.

The procedure used in gathering data for this study included the review of literature on inservice mathematics education and other related theories, documentary analysis, questionnaire, governmental publications and documents, official correspondence, and input from a Thai Committee of Experts in elementary and mathematics education. The culmination of these data gave direction for the development of a systematic inservice model for Thai primary school teachers. A three-year model for inservice training of Thai primary school teachers was developed.

Major components of the model include: (1) Objectives for the general program; (2) suggested learning experiences; (3) suggested mathematics topics; (4) a suggested method of delivery; (5) an organizational scheme; and (6) a plan for evaluation.

The findings of this study suggest that an inservice program possess the following characteristics: (1) It should be a long sustaining process - at least an academic year long; (2) primary teachers should be trained not only in the content
area but also in related area of child development and others such as teaching techniques and an effective utilization of instructional time; (3) the training procedure should emphasize the activity approach to learning mathematics and how to relate mathematics to everyday practice; and (4) the organization of the program should involve needed decision, careful planning, and a continuous evaluation procedure.
CHAPTER 1
Introduction

Although the potential of children to learn and to benefit from education is enormous, such potential is nowhere near to being fully realized in many countries, especially in a third world country like Thailand. Even when access to primary education is available, participation rates and quality of the teaching and learning are disappointingly low (UNESCO, 1983). During the past 18 years, Thailand achieved considerable success in quantitatively expanding primary, secondary, and higher education. Nearly all children have access to a primary school near their home and the number of students attending secondary schools and colleges is increasing. The administrative system has become less centralized (Chantavanich and Fry, 1981). Several major problems remain for the 90s. The issues of quality, relevance, equality, and educational resource allocation and finance are among them. Improving the quality of education and its relevance at all levels remains the major challenge of Thai education in the 90s.

The Problem and Its Significance

Factors known to be associated with learning problems in children include inadequacies in the training of teachers.
Some of the major difficulties and inadequacies at present in teacher training and recruitment include insufficiencies in the number and quality of teachers in the remote and backward areas. The literature reveals that most existing teacher training programs in Asia and the Pacific fail to provide teachers with a good understanding of young children's abilities and limitations; fail to establish a sense of commitment to the well being and progress of children; and fail to provide teachers with appropriate attitudes, strategies and instructional techniques to encourage the success and achievement of all children (UNESCO, 1983). These problems will persist and even get worse unless the teachers are provided with the skills to monitor children's school progress, the ability to recognize when learning problems are occurring, and the knowledge of how such problems can be effectively overcome.

In the school, other factors equally important contribute to learning problems. Among them are: (1) the effect of an inadequate learning environment; (2) the lack of adequate resource materials; and (3) the use of textbooks and teaching materials which are remote from children's interests and experience (UNESCO 1983). The role of school administrators and supervisors also influences the learning environment. In the regions where administrators are not familiar with the needs of the schools, the children, and their communities, the incidence of learning problems can be expected to be high.
This is also true if teachers are not appropriately supervised and provided with necessary support where required.

**Purpose of the Study**

The purpose of this study was twofold:

1. to survey the existing needs of mathematics inservice education for primary school teachers in Thailand in order to determine the following: (1) the demographic information about the teachers; (2) the teachers' need for the knowledge of the content and methods in the teaching of mathematics; (3) the views and preferences of teachers on mathematics inservice training agents; (4) the time and day options; and (5) whether teachers would volunteer or need an incentive to participate.

2. to develop a model for a systematic inservice mathematics education program based on the survey findings and other research findings from a review of literature relevant to inservice training and the learning of mathematics.

**Procedure and Source of Data**

The procedures used in gathering data for this study include: (1) the review of literature on inservice mathematics education and other related theories; (2) the construction and administration of a questionnaire; (3) the examination of governmental publications and documents; and (4) correspondence with the governmental officials.

**Literature Review**

A review of literature on inservice training both in the United States and Thailand was an essential component of the
study. Because of the changes in the primary school curriculum and in the technological environment, inservice training has been recognized as a necessity by teachers, administrators, and university personnel in many countries. Models and practices of inservice training programs have evolved. Literature on learning theories and mathematics instruction, theory and research on teacher education, and on planned educational change, was also included in the study. Governmental documents and publications were also used extensively.

The Survey Procedure

The sample was selected by using a simple random sampling technique. The survey was conducted to gather data from primary teachers using the investigator's designed questionnaire to ascertain their needs and interests in receiving inservice training in primary mathematics. The questionnaire was divided into five parts: part one was to gather demographic information about the respondents; part two asked teachers to rank order topics of interest; part three asked teachers to indicate the number of days and the time the inservice should take place; part four asked for the preference in an inservice agent; and part five asked if the teachers would volunteer or if an incentive would be required to initiate their participation. Details of the survey conducted were given in Chapter 4, Methodology.
Treatment of Survey Data

All aspects of data-coding were completed when responses were received at Louisiana State University. In order to describe the responses, statistical summaries were completed on a number of single questionnaire items, most of which provide background information about teachers in the form of frequency or percentage distribution. The responses of teachers in PART 2 of the questionnaire, dealing with the most preferred topics of interest were treated first on all teachers and secondly by an examination of teachers' views in subgrouping according to years of teaching experience.

Developing the Model

The investigator believes in the Chinese proverb stating, "If we give a person a fish, we only feed him a day. But if we teach the person how to fish, we feed him for life." From this position, the main objective of teacher training is not to repair a specific personal inadequacy in a teacher, but to seek greater fulfillment - to help the teacher establish confidence in performing his or her duty and to promote professional growth. The teacher needs to apply what is learned in inservice training sessions to life in the classroom. An implication of this view is that continuing education of the teacher should bear directly upon the problems he or she encounters in work. Because of this belief, the basic qualities which underlie the intent of the
model in this study are flexibility.

The design of the model was based on the examination of various inservice models in terms of the social problems, values and beliefs gathered from the analyzed data; the related research findings on the nature of the learner and mathematics learning; the new primary mathematics curriculum, the related theory and practice in teacher training; and planned educational changes across national boundaries.

The model includes:

1. Objectives
2. Selected Learning Experiences
3. Organization of the Inservice Program
   3.1 Components of Organization
   3.2 Suggested Method for Inservice Programs
4. Program Evaluation
5. Summary of Processes Suggested for Inservice in Primary Mathematics Training

**Basic Assumptions**

1. The teacher is a key factor in curriculum improvement.
2. Preservice education serves only as an introduction to the teaching profession. It does not adequately prepare a teacher for a lifetime of duty.
3. Education is a life long process. Teachers need to keep up with the fast moving technological environment.

4. Professional growth of teachers will bring about increased student achievement.

Definitions of Terms

For the purpose of this study, the following terms are defined:

Inservice education. A process of continuing growth of teachers in their professional and personal capacities toward meeting their needs, the needs of students, and the needs of the institutions.

Primary schools. Primary schools in Thailand are comprised of grades 1 to 6. At present, the primary schools are under the jurisdiction of the Office of National Primary Education Commission, Ministry of Education. Before 1980, these schools were under the jurisdiction of the Rural Primary Education Division, Department of Local Administration, Ministry of Interior, and the Ministry of Education. Primary schools referred to in this study do not include demonstration or laboratory schools which are under the jurisdiction of the Ministry of University Affairs. (In some documents the terms primary and elementary are used interchangeably. Both refer to grades 1 to 6.)
Primary School Curriculum. Thai primary education has an integrated curriculum comprising five learning areas: Basic Skills (Thai language, mathematics), life experiences (science, social studies, health), character development (ethics, morals, art, music, physical education), work experiences (industrial arts, home economics, agriculture), and special area (English).

A cluster school. A grouping together of a number of schools with the purpose of enabling them to assist one another by sharing the educational resources available in the clusters. Each school cluster consists of 5-10 schools in the same vicinity. A committee comprised of principals and directors of every school in the cluster is responsible for overseeing the schools' activities as well as for enabling member schools to assist one another in solving problems related to school improvement (Sudaprasert, 1983).

Compulsory education. The free six years of primary education that the Thai government provides for its citizens.

Limitations of the Study

The limitations of the study are:

1. The development of this primary school mathematics inservice model is for the Thai primary schools. It may not be generalizable to the primary/elementary schools of other countries.
2. Some of the sources were analyzed and translated from the available sources in Thai and in English without knowledge of how the data were collected;

3. A sample of two hundred teachers was randomly drawn from over 2,000 teachers in Bangkok. It is not representative of all Thai elementary teachers;

4. Detailed learning experiences at different phases of the training program are not sought. They are to be determined by participants and the program leaders;

5. No empirical testing of the practicality of the model was conducted in the present study.

Organization of the Study

Presented in this chapter were the problem and its significance, the purpose of the study, the procedure and sources of data, the basic assumptions of the study, definitions of terms, limitations of the study, and the organization of the study.

Chapter 2 describes the geographical setting of Thailand. A brief historical synopsis of the Thai educational system is also provided. The structure of the primary curriculum, the current primary school mathematics curriculum and the teacher education program for the preparation of primary teachers are also highlighted. Problems of improving the educational quality and the promising development of the education process
are examined.

Chapter 3 consists of a review of selected literature dealing with learning theories and mathematics instruction, and the patterns and practices in primary mathematics inservice programs both in the United States and in Thailand.

Chapter 4 presents methodology - the Delphi Technique, the selection of the panel of experts, and an analysis of the survey data on inservice mathematics education for primary school teachers in Thailand. Responses from teachers are analyzed. Major findings of the survey data are discussed and summarized.

Chapter 5 presents the inservice model for mathematics education for Thai primary school teachers. Taking into account the findings of Chapters 3 and 4 and the setting described in Chapter 2, criteria is developed for the selection of the inservice mathematics program objectives. This is followed by a description of the learning experiences, the organization of inservice training, and the program for evaluation. Suggested mathematics topics and some evaluation instruments for the inservice training program are presented. A summary of the suggested process is provided.

Chapter 6 concludes the study with specific recommendations for model implementation. Implications for inservice education of primary teachers and recommendations for further studies is included.
CHAPTER 2
Thai Educational System

In this chapter, a review of related literature concerning the Thai educational system, the structure of primary education, and teacher education in Thailand are discussed. The review is subdivided into the following areas: (1) historical synopsis of Thai educational system, (2) structure of primary education in Thailand, (3) teacher education in Thailand, (4) Thailand's current primary school mathematics curriculum, (5) problems of improving educational quality in Thailand, (6) promising developments, and (7) summary of the chapter.

Historical Synopsis

The earliest form of education was evident in the middle of the Sukhothai period (13th Century) when King Ramkamhaeng invented the Thai alphabet in 1283 (NEC, 1985). Stone scriptures of that period tell of moral, intellectual and cultural education. Education at this time was totally conducted by the monasteries. Senior monks taught junior monks and the junior monks taught youngsters who were staying in the temples. The teaching covered reading, writing, and Buddhism.

In the Ayudthaya Period (1350-1767) primary education was more structured. King Narai promoted formal education that required boys aged 7-8 to go to the nearby temple to study
reading, writing, accounting, and moral education. There were also some French missionary schools. Some significant developments included the first Thai textbook, Chinda Manee written by Pra Horathibordi (The Royal Prophet) around 1656. This textbook was used until 1880 (ONPEC, 1987).

The reign of King Mongkut, Rama IV (1851-1865) was the turning point of modernization in Thailand and the growth of Western influence (NEC, 1985). The use of the printing press began and the education patterns of Thai children were restructured to suit the new needs of the nation. Knowledge of English became a necessary tool and an English teacher was hired to teach the royal children. The King himself mastered English and Latin.

The modernization policy was further pursued by King Chulalongkorn, Rama V (1868-1910). Education was used as a significant means to maintain national stability and independence (MOE, 1964). The first school was established in the Royal Palace in 1871 to be a training ground for future government officials who would probably have to work in contact with foreigners. This was the first school where the teachers were not monks and the first situated outside the temple compound. Much of the curriculum was along the Western lines, and the students were the sons of princes and high government officials (NEC, 1985). In addition, the King sent his sons and other government officials to European countries for further studies. This period marked the growth of public
education in Thai history (Champatong, 1987). The first public school outside the royal palace was opened in 1885. In 1894, the first school for girls was in operation. One year later there were 17 schools in Bangkok and 13 in the provinces, and there were 2,044 students enrolled (NEC, 1985). The Department of Education was established in 1887 and was later upgraded to Ministry status in 1892 when the first teacher training college was opened. The Decree on Organization of Provincial Education issued in 1898 served as the first early form of a "national education plan" and marked a starting point in the development of Thailand's education.

During the reign of King Wachirawut, Rama VI (1910-1931) three years of primary education was made compulsory in 1913. The country's first university, Chulalongkorn University, was established in 1917 (NEC, 1985). In 1918, the Private School Act was issued which brought privately sponsored schools under state registration and supervision. In 1921, compulsory education was extended to four years for all Thai children; girls who had previously not participated in the education system now played a role equal to boys.

After the change of the government system from an absolute monarchy to a constitutional monarchy in 1932, education was seen as a means of furthering democracy by developing an intelligent and literate electorate (ONPEC, 1984). It was also used as a means of fostering a sense of nationalism. Compulsory primary education was then available
in about 80 percent of the country.

After the Second World War, education was viewed as a means of social and economic development. The government accepted that education was a basic right for all its citizens and pledged itself to fulfilling the seven years of primary schooling, the target set for it in the Karachi Plan of 1960 (Watson, 1980). Since this time, Thailand has engaged itself with national development. The Educational Development Plan has been an integral part of the National Development Plan. Two concepts about education and development were implied in the first three National Development Plans (1962-1976). Education was a social demand and also an appropriate means for changing the knowledge, skills, and values of people for future socio-economic well-being. In the Fourth National Development Plan (1977-1981), the view of using education as an instrument for the nation's socio-economic development became clearer. During the Fifth National Development Plan (1982-1986), a target on quantity was set to expand the enrollment for preschool education to cover 35 percent of children in the pre-school age group (ONPEC, 1984). Primary education was expanded to cover all students in the compulsory age group. The Plan also emphasized the improvement of education in terms of reducing the rate of repetition at the primary level by two percent annually, and upgrading the standards of schools in remote areas (UNESCO, 1984). It is now during the execution of the Sixth National Development
Plan (1987-1991) which emphasizes the qualitative improvement of primary education which is a more critical issue than the attainment of total access in primary education, since the drop-out rate, 27%, among primary school children continues to rank high (ONPEC, 1984).

Structure of Primary Education Curriculum

The primary education curriculum in Thailand has undergone various changes since the emergence of the primary schooling system in Thailand. At present, there is only one primary education curriculum which is currently used in Thailand, i.e., the 1978 primary education curriculum (Office of the National Primary Education Commission (ONPEC), 1987). The new primary curriculum, aiming at education for life and national unity, was introduced to replace the 1960 curriculum which had been in use for nearly two decades (Royal Thai Government, 1977). The reform was motivated by the fact that the 1960s curriculum reflected the rigidity of prescribed course contents, the emphasis on strict academic orientation, and the teaching-learning process which tended to stress rote memorization. The school system has been changed from 4:3:3:2 into 6:3:3 class structure (Appendix A). Compulsory education was reduced to six years from seven years. The content of the curriculum for compulsory education was not reduced. What had been taught in seven years would now be taught in six years. In addition, each educational level was asked to give
more emphasis to vocational subjects (Champatong, 1987). The teaching-learning period must not be less than 200 days per year or not less than 1000 hours for grades 1-4 and not less than 1,200 hours for grades 5-6 per year.

The content of the new curriculum is integrated and divided into five subject-areas as follows (MOE, 1977):

1. Skill subject-area, comprising the Thai language and mathematics.

2. Life experience subject-area (e.g., health education, social studies, science), involving the problem-solving process, and the various aspects of human societal needs and problems, for the purposes of survival and living a good life.

3. Character development subject-area (e.g., art, music, physical and moral education), dealing with experiences conducive to development and habit formation.

4. Work-oriented subject-area (e.g., home economics, carpentry, agriculture, and handicrafts), involving practical work and the establishment of a vocational foundation.

5. Special experience subject-area, comprising "English For Everyday Life" and a "Basic Vocational Course," is elective for grades 5-6 only. Time allocated for this area is five hours per week. Therefore these two grades must take at least 1200 learning hours
altogether for each school year. The primary schools can provide an English course and/or a basic vocational course according to their environment conditions or their community needs. The implementation of special experience subject-area has been effective since 1982.

Since students' background in the various parts of the country are different, a basically national core curriculum allows certain flexibility for different geographical backgrounds and diversifications (ONPEC, 1986).

The allocation of time for each of the five main areas of learning experiences is depicted in Appendix B.

The measurement, evaluation and follow-up processes, organized to develop appropriate teaching and learning activities, and for students to achieve mid-year or end-of-year promotion, are the responsibilities of school administrators and classroom teachers. They are to carry out formative and/or summative evaluation according to the kinds of experiences and subject contents involved. These, in effect, are to be done in conformity with the evaluation regulations as prescribed by the Ministry of Education (MOE, 1977).
Current Primary School Mathematics Curriculum

The most current primary school mathematics curriculum stresses critical thinking and understanding which are achieved through teaching/learning activities, and personal experiences in dealing with real objects and or manipulatives. The following concepts are covered: numerals and place value, algebra, measurement, geometry and statistics (MOE, 1977). These concepts are integrated based on the nature of the concepts as related to everyday life. The content is designed to achieve the following goals (MOE, 1977):

1. Students appreciate the value of mathematics and are able to utilize it in their daily routine.
2. Students understand mathematical concepts.
3. Students develop skills, concentration, observation and analytical thinking, and confidence including an ability to utilize these skills in a precise and systematic way.
4. Students establish and develop scientific and mathematical inquiry which helps in developing problem solving skills.
5. Students practice solving problems which will be used as a means to develop initiation and creativity (MOE, 1977).

The mathematical content contained in the Mathematical Curriculum Guide 1-6 has been identified within 11 domains. These domains are:
1. Readiness Skills
2. Numeration
3. Whole Number Operations
4. Fractions and Operations
5. Decimals and Decimal Operations
6. Percent, Ratio, and Proportion
7. Measurement and Estimation
8. Geometry
9. Relations and Functions
10. Graphing
11. Problem Solving

Within each domain, specific content has been identified and expressed as performance objectives necessitating particular student behaviors. The objectives are arranged along a continuum which will allow the student to advance at a rate consistent with his ability. The sequencing of the content material at each grade level is determined by a committee of experts. The activities included in the curriculum guide are merely suggested and may be used by different teachers in a variety of ways to stimulate the teaching of mathematics. Teachers are encouraged to use their innovative teaching ideas and activities to enhance their mathematics program. The ultimate purpose of the curriculum guide is to serve as a framework to promote effective instruction, thereby resulting in improved performance on the part of the students. Since children vary largely in rate and
degree of mastering specific skills listed at each grade level, it is necessary that the guide be adapted to the needs of the students and the resources available. Teachers use whatever they deem appropriate to help students accomplish their goals (MOE, 1977).

The course content is grouped into three strata, Grades 1-2, Grades 3-4, and Grades 5-6, as illustrated in the following table.

**Teacher Education**

A history of teacher education in Thailand is comparatively brief. Nothing was changed much from 1892-1954. The first step was taken in 1892 when King Rama V established a school to prepare elementary teachers (MOE, 1983). In 1954, Prasarnmitr College of Education was founded. In 1958, teacher colleges came into existence.

Teacher education aims at producing teachers who will be able to motivate students to seek knowledge and to discover their own potentialities and aptitudes. Teachers are trained to be morally respectful individuals with tolerance and understanding towards their students. Their training stresses that their personalities and character should be in harmony with Thai culture and in accordance with a constitutional monarchy (NEC, 1985).
Table 1

Content Taught by Grade Strata

<table>
<thead>
<tr>
<th>Grades 1-2</th>
<th>Grades 3-4</th>
<th>Grades 5-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Readiness Skills</td>
<td>Numeration &gt; 1000</td>
<td>Numeration &gt; 100,000</td>
</tr>
<tr>
<td>Numeration 1 - 1000</td>
<td>Addition (2 and 3 digit numbers)</td>
<td>Whole Number Operations</td>
</tr>
<tr>
<td>Addition (sums less than 1000)</td>
<td>Subtraction (Multi-digit Numbers)</td>
<td>Functions and Operations</td>
</tr>
<tr>
<td>Subtraction (Minuends &lt; 1000)</td>
<td>Multiplication</td>
<td>Factor</td>
</tr>
<tr>
<td>Counting forward and backward</td>
<td>Division</td>
<td>Fractions</td>
</tr>
<tr>
<td>Multiplication</td>
<td>Time</td>
<td>Decimals</td>
</tr>
<tr>
<td>Division</td>
<td>Measurement (weight)</td>
<td>Angles</td>
</tr>
<tr>
<td>Measurement (weight)</td>
<td>Measurement (volume)</td>
<td>Segments</td>
</tr>
<tr>
<td>Measurement (volume)</td>
<td>Measurement (distance)</td>
<td>Parallel Lines</td>
</tr>
<tr>
<td>Measurement (distance)</td>
<td>Area</td>
<td>Linear Measurement</td>
</tr>
<tr>
<td>Money</td>
<td>Money and Record Keeping</td>
<td>Triangles</td>
</tr>
<tr>
<td>Time</td>
<td>Fractions</td>
<td>Squares</td>
</tr>
<tr>
<td>Geometric Figures and Geometry</td>
<td>Decimal</td>
<td>Circles</td>
</tr>
<tr>
<td>Fractions</td>
<td>Multi-step Problem Solving</td>
<td>Perimeter and Area</td>
</tr>
<tr>
<td>Problem Solving (Mixed Operations)</td>
<td>Point, Line, Segment and Ray</td>
<td>Congruent Figures</td>
</tr>
<tr>
<td>Angles</td>
<td>Geometric Solids</td>
<td></td>
</tr>
<tr>
<td>Polygons and Circles</td>
<td>Teaching Bearings</td>
<td></td>
</tr>
<tr>
<td>Linear Measurement</td>
<td>Symmetric Figures</td>
<td></td>
</tr>
<tr>
<td>Parallel Lines</td>
<td>Diagrams and Charts</td>
<td></td>
</tr>
<tr>
<td>Symmetric Figures</td>
<td>Pictograph and Bar Graph</td>
<td></td>
</tr>
<tr>
<td>Pictograph, Bar Graph and Table</td>
<td>Coordinates</td>
<td></td>
</tr>
</tbody>
</table>
Teacher education is the sole responsibility of the State. Twenty Faculties of Education in various universities under the jurisdiction of the Ministry of University Affairs produce teachers at the B.A. and post-graduate levels. Training teachers at the higher certificate level (two years past secondary education) and the B.A. level is the responsibility of the Ministry of Education (NEC, 1981). Thirty-six teachers' colleges are under the Department of Teacher Education, and forty colleges offering teacher training programs are attached to the Department of Physical Education, Fine Arts, Vocational Education, and the College of Technology and Vocational Education. In addition, the two open universities, Ramkhamhaeng University and Sukhothai Thammathirat Open University, include teacher education among their disciplines.

In 1978, 13 percent of teachers had a B.A. or higher degree, 45.5 percent held the higher certificate, and 4.8 percent vocational training. Relative to international standards, Thailand has a satisfactory student-teacher ratio at all levels of education. The highest is 27.7 at the kindergarten level, and the lowest is 19.6 at the primary level (NEC, 1980).

The accelerated production of a large number of teachers to cope with the temporary short-term deficiency and population growth during the Third National Development Plan (1971-1976) had generated a large number of teachers and
graduates who were unemployed. Thus, during the Fourth Plan (1977-1981), the training of teachers at the higher certificate level was progressively decreased. The decreased production of teachers affects severely the roles of teacher colleges. In contrast, given the great demand for vocational teachers, vocational teacher training was then and remains a high priority (NEC, 1981).

A committee to coordinate and to improve the quality of teacher training was established in 1979. The committee has proposed numerous recommendations such as the need for more selective criteria for the recruiting of instructors and students in teacher training, revision of curricula, and the promotion of research and development in teacher training. Most of the recommendations were incorporated into the Fifth Education Plan and some are already being implemented.

Thailand has made a major effort to improve and upgrade its educational system. Although considerable progress has been made as a result of such effort, still greater progress might be achieved if the leadership responsible for the gain already made could be enhanced, broadened, and supplemented on a nationwide scale. An early expansion of leadership at all levels of education is an absolute necessity (United States Overseas Mission, 1971). The study conducted by the United States Overseas Mission in 1971 revealed that there is a pressing need to increase inservice education, to achieve further curricular revision on a board scale, and to
strengthen and expand teacher education. Many senior Thai educators feel strongly that the curriculum for teacher training needs to be changed and improved because the present teacher training curriculum has many problems (MOE, 1983). Thailand needs improvement in the quality of the programs. Still further, there are 38 ways to become certified to teach in Thailand (United States Overseas Mission, 1971). This allows a prospective teacher to continue to fall back to a "rescue step" when he is unable to enter or remain in any given level. These conditions result in many teachers obtaining certificates with the bare minimum of training and without practice teaching. Some teachers obtain certificates entirely through correspondence courses and examination. According to a study conducted by the Department of Teacher Education in 1981, 43 percent of the teachers holding Secondary Teaching Certificate and 20 percent of the teachers holding Lower Certificate of Education received their certificates through examination and correspondence courses (NEC, 1985).

Problems of Improving Quality in Education

Education has long played a significant role in contributing to Thailand's national progress both in terms of national growth and the raising of the standard of living of the people as well as in enhancing the security, status and prestige in the international community (Champatong, 1987).
Thailand has utilized different National Economic and Social Development Plans as a means to cope with the myriad of educational problems. During the Second (1967-1971) and the Third (1972-1976) Plans, the periods where increased overall growth in national productivity and income ranked high in priority in the national development plan, insufficient attention was given to the distribution of income and the problems in the rural areas, especially the unemployment problem. The quantitative aspect of education was emphasized at the expense of quality education. For example, while the expansion of secondary, technical, higher and teacher education was accelerated, the qualitative aspects of education was neglected. The educational curricula was out-dated and did not meet the needs of individuals and localities. Teacher training was inadequate for the improvement of the teaching and learning process in educational institutions. As a result of the low quality of education at all levels, the plan for the production of middle and high level manpower to meet the national economic and social development needs failed to provide the supply of manpower at the quality and expertise required by the labor market. The mismanagement of educational funds during these periods widened the gap between the urban rich and the rural poor. Another problem was the conventional centralized administration policy of Thai education. Coupled with the centralization problem was the lack of cooperation between the
two Ministries that comprise the educational system (Fry, 1980).

The Fourth National Economics and Social Development Plan (1977-1981) was the Government's first serious attempt to cater to the needs of the rural population with the emphasis on the reduction of disparities between the urban and rural areas. Sixty percent of the total national development was subsidized to education under the category of development of social services (Champatong, 1988). Despite the large investment for the development of social services, the Fourth Plan failed to live up to expectations. Many factors were responsible for this failure, for example, the inability on the part of the authorities to implement measures and develop strategies at the community level. The Government became the eternal giver. During these periods, most of the development efforts were directed toward the renovation and construction of facilities which were considered to be the priority needs of the rural population, i.e., buildings, roads, electricity, and irrigation systems. Therefore, the Fourth Educational Development Plan only managed to accelerate the quantitative growth of educational services in the rural areas. This period witnessed an exceptionally rapid expansion of educational institutions at every level in the rural areas. The problems of improving the quality of education during the Second and Third National Plans became the problems of the Fourth Plan; i.e., low quality teaching, supervision, and
technical support; lack of teaching and learning materials and equipment; high wastage (drop-out) rate in rural areas; the inability of vocational, technical and higher education to produce the qualified manpower demanded by the labor market; inadequate participation of the private sector in the educational affairs of the State; and also the lack of a unified educational administrative system (Champatong, 1987).

Despite the inadequacies of the Fourth Plan in overcoming these problems, it was during this period that a modern educational development concept, proposed by the Educational Reform Committee, was officially accepted and embodied in the national Educational Scheme of 1977 (MOE, 1981). The Scheme was accepted as containing sound and far-sighted educational improvements for a modern Thailand. The essential feature of the Scheme was to actualize a life-long educational process for the masses with the emphasis on equal educational opportunity, qualitative improvement of education and its equalization both within the schooling and out-of-school systems. The Fourth Educational Development Plan (1977-1981) in Thailand represented radical reform in two respects: (1) The reform in the structure, changing the 7-3-2 system to the 6-3-3 system, and (2) the curriculum reform grouping teaching subjects under five categories which are skills, life experience, character development, work-oriented education, and special subject (MOE, 1981). In spite of the impact these reforms had on education in Thailand, some of what was
proposed remained unsuccessfully implemented or only met with partial success. The lack of success was due to a shortage of effective means to implement changes more than a shortage of ideas for implementation (MOE, 1981).

The Fifth National Economic Social Development Plan (1982-1986), like its predecessor, viewed rural development as a major problem in national development efforts because of the belief that rural poverty is a major obstacle to overall national development and especially national security (ONPEC, 1987). Surrounded by countries, i.e., Laos, Vietnam, Burma, and Cambodia, which have adopted the communist regime (Appendix C), Thailand, the only country in the Southeast Asian region which remains independent, finds itself in a vulnerable position (Office of the Prime Minister, 1984). Therefore, the Fifth Plan, differing from its predecessor in its development strategy and approaches, made an effort to accelerate rural development in the most cost-effective manner. The management of the Fifth Plan was changed from a top-downward approach to a parallel system of bottom-upward and top-downward approach with rural development being the primary target of all sectors. Education was geared for the effective solution of the problem of rural poverty both in the quantitative and qualitative aspects. Quantitatively, the goal of the Fifth Plan was directed toward achieving total access at the primary level for six-year-old children and the expansion of lower-secondary education in remote rural areas.
However by the end of the Fifth Plan, there was still a remaining 3.4% of primary school-age children not enrolled in school (Appendix D). Most of these children represented the so-called "pocket area" category i.e., the disabled, children in congested urban areas, and children of minority groups (Nathalang, 1985).

In the area of qualitative improvements in education, the educational objective of the Fifth Plan more or less reflected the concerns of the Fourth Plan. Its goal was to improve the quality of education at every level with an emphasis on the reduction of inequality in the standard of education in primary and secondary schools between the urban and rural areas. Problems which arose during the implementation of the Fifth Plan included low efficiency in school administration, inadequate teaching-learning facilities and the schools inability to carry out teaching-learning activities in certain types of subjects such as sports and music education. The effort to expand primary education to Grade 6 in the rural areas was difficult because of declining birth-rates. With insufficient numbers in some remote areas, a school could not economically justify a separate teacher for each grade level. The authorities undertook various experimental projects in an attempt to find suitable alternatives for the pupils. For example, pupils in small primary schools were allowed to pursue their education in larger nearby schools. Provisions for moving pupils to other school were provided by a special
transport allowance which was used to arrange a school-bus service, a ferry-boat service or a bicycle-lending program (ONPEC, 1987). A second project allowed alternate-grade-teaching in neighboring schools; that is, one school had grades 1-3-5 while another school had grades 2-4-6.

Thailand is currently implementing its Sixth National Economic Social Development Plan (1987-1991) in which the primary emphasis will be on the quality of education. The goal is to achieve 100% enrollment in primary education by 1990 (ONPEC, 1987).

Throughout the implementation of Thailand's five plans for economic and social development, factors which contribute to the improvement of the internal efficiency in the Thai educational system have emerged. The study conducted by the Department of Teacher Education confirms that the improvement of Thailand's national education system inevitably depends on the following (Champatong, 1987):

1. The quality of the teaching force. Primary teachers do not have sufficient knowledge to teach. Even though Thailand has seen much improvement in the upgrading of the status of its teaching force, it still recognizes that the recruitment of people with the ethical and professional qualities suited to the teaching profession must be improved.

2. The lack of cohesion and co-ordination in the administration of education is another problem. Two ministries are responsible for the long-term educational planning in Thailand. The Ministry of Education administers primary, secondary, vocational, teacher and non-formal education, while the Ministry of University Affairs administers higher education. The duplication of work at the same level of education results in a considerable waste of money earmarked for education. For
example, both the Ministry of Education and the Ministry of University Affairs produce the degree-level vocational and teacher education graduates.

3. There is a need for change in social values and attitudes towards the ultimate goals of education. Viewing education as a stepping-stone for furthering one's economic and social status produces the effect of a "degree craze" in Thailand. The danger of the "degree craze" lies in the fact that a degree in higher education does not always guarantee the economic and social betterment of an individual. The government is attempting to raise both the standard of living of its population through its process of education and attain ethical qualities so-called "educated man" in a social attitude.

Promising Development

In spite of the problems that face education, Thailand is more fortunate than some of its neighboring countries in the Southeast Asian Region. Culturally, it does not have a huge ethnic problem which could be an added burden to its existing problems (Watson, 1980).

Thailand has a relatively stable political system which is a positive, supporting factor for national education development efforts. Abundant natural resources are available for the expansion of its economy which is a positive influence toward financing education reform. It is a country united behind His Majesty the King as the center of spiritual solidarity. Its democratic system is progressing, paving the way for greater participation of its population in the determination of the future of its education. Its authorities are fully aware of the problems that exist in education and
are attempting to conquer as many as possible by the end of this century (Office of the Prime Minister, 1984).

Summary

Education in Thailand assumed a definite form during the Sukhothai period (1238-1378). Thailand had a well developed indigenous system of education centered on the Buddhist temples, the villages, and the palace long before the introduction of a western type of schooling. All boys ages nine or ten would go to live in the local temples to receive their education on basic concepts and the teachings of Buddhism by the monks. The children of the aristocrats and higher level administrators received a slightly more formal education in the palace with the intent to become civil servants. While the boys were studying in the temples, the girls received education at home where they were taught housekeeping, cooking, the arts of handicrafts, the traditional methods of farming, and child care. In the royal circle, many people sent their daughters to live in the palace to study crafts and social manners. This traditional form of education remained uninterrupted for more than 500 years, from the 13th to the middle of the 19th century when western influences were merged through trade and missionary activities. Around 1868 King Chulalongkorn realized that if Thailand were to effectively withstand the western powers, it would be necessary for him to adopt a western type of
education. The first school founded in 1871 marked the end of the monastic tradition and the beginning of the western school system. In 1887, the Department of Education was established and become the Ministry of Education in 1892 - the same year as a school for training primary teacher was founded. In 1917 the first university, Chulalongkorn University was founded. During the early part of the century, there was little change in the educational system. Thailand was the second country in Asia, after Japan, to introduce universal compulsory education. The 1921 Act required all boys and girls to attend school between the ages of seven and 14.

The year 1932 witnessed the revolution which changed the monarchical rule to a constitutional monarchy. During the 1930s, education was regarded as an instrument for furthering democracy and developing a sense of Thai nationalism. The National Education Plan (1951) - aiming at achieving seven-year compulsory primary education and the secondary vocational education - was succeeded by the National Scheme of 1960. Since that time, major education policy has been organized in the subsequent Five-year Plans as follow:

The Second Plan 1967-1971;
The Third Plan 1972-1976;
The Fourth Plan 1977-1981;
The Fifth Plan 1982-1986; and
These plans have increasingly become more sophisticated and have attempted to link education with the development of economic and social reform and more recently with an integrated approach to rural transformation.

Regarding the structure of primary school curriculum, the structure was changed from 7-3-3-4 system to 6-3-3 system during the implementation of the 1977 National Educational Scheme. Free compulsory education was reduced from seven to six years. Primary education is no longer divided into lower and upper levels, but has become a continuous whole. The primary curriculum is an integrated system representing five major areas: basic skills, life experience, character development, work experience and special experience. Teacher education is offered at two levels, namely: the higher certificate (two years beyond secondary education) and the bachelor's degree.
CHAPTER 3

Review of the Literature

Literature dealing with inservice education for primary school teachers is examined in this chapter. The examination is specially made upon seven major aspects:

1. Introduction
   1.1 Definition of Inservice Education
   1.2 The Necessity of Inservice Training in the Field of Education

2. Historical Development of Inservice Education
   2.1 Historical Development of Inservice Education in the United States
   2.2 Historical Development of Inservice Education in Thailand

3. Principles and Characteristics of Effective Inservice Education

4. Teacher Perceptions of Inservice Education

5. Applications of Models to Inservice Education

6. Summary of the Chapter

The review is organized in chronological order as much as possible, tracing the development of inservice education from its earliest inception to the present.
Introduction

Definition of Inservice Education

Inservice education is defined differently by different groups. Definitions of inservice education are nearly as many as the authors proposing them. Some include all levels of learning experiences related to current job, identified future jobs, and those related to the future of the society, the organization, and the individual (Hender, 1976; Nadler, 1976; and Hite and Howey, 1977). Accordingly, there is a great difference in the way authors perceive inservice education.

Hite and Howey (1977) explained the range of perceptions about inservice education as follow:

Unlike the preparation of beginning teachers, inservice education has no tradition of what constitutes a basic program. Different perceptions imply different sets of values--what ought to be the way to undertake professional development. Because values do not lend themselves to technical criticism, each definition may be legitimate for its supporters. The way inservice education is perceived seems to determine the activities and content of programs (p.29-30).

Edelfelt and Johnson (1975), in Rethinking Inservice Education, defined inservice education as "any professional development activity that a teacher undertakes simply, or with other teachers, after receiving his or her initial teaching certificate, and after beginning professional practice" (p.5).

Joyce and his colleagues (1977) gave a more concise definition when they stated that "every teacher is also a career long student and the portion of his education which follows in time (1) his initial certification and (2)
employment is known as inservice education" (p.12).

Marsh (1976) in his review of literature suggested that inservice education can be categorized as to whether it is primarily directed toward (a) personal growth, (b) professional development, or (c) implementing educational improvement activities (p.110).

Howsam and others (1976), citing that there are three components in the education of teachers, namely, preservice, inservice, and continuing education, suggested that "inservice" should be used to refer to unemployment-oriented education--activities which have as their intended purpose preparation for specific program demands which decisions within the system have created. "Continuing education" should refer to activities designed to supplement and extend the preservice education of teachers and to update them on recent approaches and findings.

Hite and Howey (1977) observed that some of the above definitions were unacceptable to teacher educators because they do not seem to include planned education for teachers both at the school and on campuses of higher education. They suggest the following definition:

Inservice education consists of those experiences which are designed to help practicing teachers improve their services, both to clients and colleagues (p.5).

Nicholson (1976) identified eight separate components of inservice education definitions. Each of those components was stated in the form of question, that when answered, clarified
the intent of the program. His major categories were:

1. **When** should inservice training education start?
2. **What** are activities involved?
3. **Where** is it conducted?
4. **By whom** should inservice training education be done?
5. **For whom** - teachers or administrators?
6. **Through whom** - deals with economic and political nature.
7. **Why** do teachers engage in inservice training education?
8. **How** should inservice training education be conducted?

**The Necessity of Inservice Training in the Field of Education**

Korinek, Schmid, and McAdams (1985) assert that at least two factors contribute to the need for continuing staff development. First, college training is but an introduction to the world of teaching. Only entry skills and knowledge can be developed in the time allotted preservice training. They believe that the competent teacher is developed over time and in the crucible of experience. Teachers in the field believe they learned more from their first year of teaching than from all of their combined undergraduate professional courses. As Feiman (1972) points out, "The teacher's real education for teaching often begins when he takes over his first class" (p.17).
Second, the accelerating acquisition of knowledge makes some learning strategies and tactics obsolete while creating a need for new ones. A. N. Whitehead (1929) expressed the idea of new knowledge replacing the old by saying what is learned today becomes out of date tomorrow. He said, "Knowledge is like fish, it has to be ever fresh if it is not to stink" (p.98).

The continuing education of teachers is of far-reaching importance to innovative education. Teachers must be trained in the kinds of skills, attitudes and understandings that are required to keep education a potent vehicle and an energizing force for social and economic transformation.

Rosas (1980) examined definitions of "education" from various sources and found that education is one of the newer professions that is still attempting to gain the status of a profession. The professions of law, medicine and religion have always required that the practitioners continue his/her education throughout the entire professional life in order to maintain a current level of knowledge within the profession (Rosas, 1980). Not only is there a need for "lifelong education" for one's personal satisfaction and happiness but also a basic necessity for professional development in order to avoid drifting into professional obsolescences (Boyer, 1976).
Historical Development of Inservice Education

Historical Development of Inservice Education in the United States

The historical development of inservice education in the United States has been uniform, but has reflected the different educational programs of various states. From an historical perspective, inservice programs have evolved from a basic remedial experience to the professional growth of teachers.

Richey (1957) identified several factors which contributed to the development of inservice education and influenced the nature of this development. These factors were: (1) changing concepts of the values and aims of education, (2) the nature of the learner and learning, (3) function of the school, and (4) the role of the teacher.

During the 1700's, the "town-fathers" served as the directors of teacher education; i.e., primarily deciding what to be taught to children (Yarger, 1977). The topics suggested included how to maintain order in the schools, how to deal with discipline problems, and how to minister corporal punishment (Tyler, 1971).

During the nineteenth century, the assumption that the immaturity, meager equipment, and inexperience of the teacher rendered him unable to analyze or criticize his own teaching and, thus, could not improve without direction from his senior
teachers. The practice of "inservice programs" was started at this time. Around the middle of nineteenth century a formal type of inservice program began to appear. These were established as "institutes" which "... were designed to review and drill teachers in the primary subjects ..." (Asher, 1967, p.3).

During the 1820's, Henry Bernard found that local school committees in Connecticut attempted to select the most likely and available persons in the community as teachers. The main requirement was that the teacher be able to read, write, and compute somewhat better than the students. Understandably, the first teachers were generally untrained and inefficient. The first teachers' institute was established in Connecticut by Bernard (Edwards and Richey, 1947). The teachers received instruction in subject matter, observed demonstrations, attended lectures on the relationship of the teacher to school and community, and visited schools in Hartford (Lins, 1945).

The courses offered were two or three days in duration or short courses in the evening. The main purpose was to enable teachers to bridge the gap between what they were expected to know and do and what, in fact, their level of knowledge and teaching competencies enabled them to do. Inservice at this time was remedial (Tyler, 1971). The earlier programs were designed to review primary subjects. As the programs matured time was allotted to some topics suggested by teachers. As the number of public schools
increased, teachers became more concerned with inservice education. The teachers' institutes had a hard time trying to keep up with the current trends and could no longer fulfill the educational needs of teachers.

Various types of schooling, i.e., reading circles, summer schools, and extension courses began to appear to fill in what the teachers' institutes could not provide. Later on, the summer courses in the normal schools were strategically the most important agencies of American inservice education (Tyler, 1971).

From approximately 1900 - 1930 inservice education was affected by the establishment of quantitative standards for teaching certificates. Educators believed that improvements in teaching quality in the public school could be achieved by requiring all teachers to have a bachelor's degree. By 1930 the conception of teacher improvement as a major aspect of supervision had grown in popularity. The supervisor became a guide and counselor to teachers rather than a director of activities (Corey, 1957).

The Depression brought new problems to the schools, and inservice education took on a new focus. Job opportunities were limited and students were forced to stay in school. The education reform was a serious economic necessity. Tyler (1971) stated:

The differentiating characteristics of inservice education during the period arose from the primary concern of developing curricula and educational procedures that would better service youth under the
conditions of the day. This involved new approaches to curriculum building, the identification of new content, the development of new instructional materials, the discovery of new teaching-learning procedures, and the education of teachers to understand and to conduct new programs effectively (p.11).

The reform brought about the "workshop" approach which allowed teachers to be more involved in attacking real educational problems. The workshops were intended to be problem-solving, action-oriented inservice (Edelfelt and Lawrence, 1975). Cooperative work in instructional problems was viewed as the catalyst of the professional growth of the school staff (Corey, 1957).

Inservice methodology after World War II emphasized process, procedure, and techniques. Toward the end of this period, the National Education Association (NEA) stressed the importance of planned programs to help teachers become more effective (NEA, 1949).

The immediate increase in the population after World War II resulted in a shortage of school teachers. Teachers were hired without proper credentials. Consequently, inservice education, again, changed its role to focus on providing for completion of degree and certification requirements (Yarger et al., 1976). By the middle of the 1950s, the pattern of inservice education shifted to post graduate studies through teacher colleges, universities, and workshops (Stephens and Hartman, 1978).
In 1957 the National Society for the Study of Education, recognizing inservice education as a major topic of interest, devoted one of its yearbooks to the subject of inservice education. The yearbook provided guidelines to represent an operational principle which could direct individuals in planning, organizing, and conducting inservice activities. It was realized that the needs of teachers were changing.

In the 1960s inservice programs assisted teachers in developing attitudes, skills, and understandings necessary to implement packaged programs - math, social studies, English - (Harris, 1980). Administrators started to see the need for inservice education also. The American Association of School Administrators issued a report in 1963 that called for inservice programs directed toward the improvement of school administrators.

An oversupply of teachers in many geographic areas became a reality in the 1970s after a shortage of approximately thirty years. High unemployment rates of education graduates resulted in declining school and college enrollments. These events also triggered a new interest in inservice education on the part of militant teacher organizations which were seeking more control over personnel decisions in an attempt to respond to the concerns of their constituents. Simultaneously, administrators, school boards, and state legislatures demonstrated an interest in inservice education as a necessity in assuring responsiveness to the demands of
society for better education (Harris, 1980).

One of the major innovations of the 1970s was the establishment of the teacher center. One of the underlying concepts of teacher centers was the premise that inservice education should be the responsibility of school districts and teacher professional organizations (Stephens and Hartman, 1978). The center emphasized inservice training, curriculum development, and better utilization of educational research (Miller, 1982).

Schmieder and Yarger (1974) have noted that "of all the new concepts in American Education today, the teacher center is probably the most widely accepted as having significant premise for improving the quality of instruction in our schools" (p.5). Through the development of teacher centers, control of inservice planning and programming shifted out of the teacher training institutions to cooperative efforts by public schools, institutions of higher education, and teacher organizations (Pilcher, 1973).

Prior to the current decade, inservice efforts were focused on credential-oriented context. Preservice education resulted in either a Normal School Diploma, a Bachelor's Degree, or a Master of Arts in teaching. Teachers continued their education in order to increase their salaries, or to climb up the career ladder (Speiker, 1978). The institutions of higher education had organized the specifics of inservice education to meet requirements for course credits and degrees.
These course credits and degrees were translated by the school districts into salary increments. This process was viewed as the primary incentive for inservice education. Colleges and universities controlled courses and, therefore, the structure of inservice education. These developments, in the view of critics and school teachers in recent years, have yielded too little in the improvement of teaching or school programs because the college instructors have lacked appropriate skills or have had little or no recent classroom teaching experience (Lippitt and Fox, 1971; Lawrence, 1974; Edelfelt and Lawrence, 1975; Joyce et al., 1976; and Edelfelt and Johnson, 1975). There has been little concern regarding the classroom application of newly acquired skills (McLaughlin and March, 1978; Joyce and Showers, 1981; Brandt, 1982; and Fullan, 1982). Most programs do not address actual problems teachers encounter in the classroom (Sobol, 1971; Lortie, 1975; Elliott, 1979; Tikunoff and Ward, 1979; and Fullan, 1982).

Staff development or inservice programs have traditionally been the responsibility of the local school district. There is no basic curriculum for inservice education as has been developed in preservice education (Agne and Ducharme, 1977). Fundamentally, there are two types of inservice programs, those designed for the individual and those for the institution (Olivero, 1976). There is a great variety of formats for inservice programs, and almost as many sources of planning as there are formats (Zigarmi et al.,
1977). Programs are planned arbitrarily by individuals at local levels, by political groups operating at state levels, and cooperatively by groups at all levels (Hite and Howey, 1977; Agne and Ducharms, 1977; McLaughlin and Herman, 1977). However most programs do not focus on the "social interaction perspective" of change but instead focus on the individual teacher (Watson, 1967; Lippilt and Fox, 1971; Havelock and Havelock, 1973; and Edelfelt and Lawrence, 1975).

Regardless of the format or the source of planning, organization, and/or implementation, the programs lack continuity. The most common type of program is organized and implemented within a single school system, in a short duration and address single, unrelated topics (Lippilt and Fox, 1971; Sobol, 1971; Havelock, 1973; Draba, 1975; Edelfelt, 1975; Mann, 1976; and Hite and Howey, 1977).

Many sources indicate that inadequate resources, especially time, money, and leadership are provided for staff development (Harris and Bessent, 1969; Sobol, 1971; Schmieder and Yarger, 1974; Goodlad, 1975; and Joyce et al., 1976; Lawrence, 1974; Bell and Peightel, 1976; and Mann, 1976). There is also significant evidence of a lack of teacher input in the inservice planning process (Kinnick et al., 1957; Sobol, 1971; Schmieder, 1972; Edelfelt and Johnson, 1975; and Joyce et al., 1976).
Programs have focused on remediation of teacher weakness rather than capitalizing on recognized teachers' strengths (Waynant, 1971; Edelfelt & Johnson, 1975; Tikunoff & Ward, 1979; and Chall, 1980). Therefore they often fail to take into account the individual needs and general stages of professional development of the teachers (Perloff et al., 1970; Rubin, 1971; Sarason, 1974; Bell, 1975; Howey, 1978; and Lieberman, 1978). Nevertheless, participation is required whether or not the teacher has an interest in or a need for the inservice training (Graubard & Rosenberg, 1974; Edelfelt & Lawrence, 1975; Bell & Peightel, 1976; and Mann, 1976).

The most significant finding by many investigators is that many people write about staff development, yet few provide methodologically sound and rigorous evaluations of programs (Peeler and Shapiro, 1974; Nicholson et al., 1976; Griffin, 1978; Watts and Hammons, 1981; Hockman, 1982; and Loucks and Melle, 1982). Attention needs to be given to identifying systematic procedures through which the diagnosis of teaching strengths and weaknesses can be accomplished. Teachers must be equipped to assess the quality of their performance accurately. Miller (1982) suggests that the outcomes of inservice education can be viewed through student learning.
Summary

The history of inservice education gives a perspective from which to view today's issues. The most current inservice education programs can thus be categorized as attempting to work on isolated aspects of need. This trend appears to be an almost universal practice even though the basic problems facing teachers and schools across the United States are essentially the same.

Historical Development of Inservice Education in Thailand

Thailand is a country about the size of Texas with a population of 49,515,074 as of December 31, 1983 (Office of the Prime Minister, 1984). It is comprised of 73 provinces. Nearly 80 percent of the population are engaged in agriculture and agriculture-oriented occupations. This accounts for the scattered nature and existence of thousands of small communities. The economics, social, and geographical circumstances necessitate that basic education be provided through small primary schools located in the dispersed small communities. It is estimated that over three-fifths of its 30,641 primary schools are small schools which have enrollments ranging from less than 50 to at most 200 pupils (Kaewdaeng, 1985). Since 90 per cent of the total number of primary schools are situated in remote areas, they inevitably lack basic teaching/learning materials and equipment. The quality of teaching/learning and supervision in the majority
of the primary schools is low (Kunarak and Saranyajaya, 1986). The government has realized this fact. Quality improvement efforts have therefore been decentralized to the local level.

The idea of encouraging the primary schools themselves to pool their resources to help one another seems to be the most cost-effective method. A school cluster is a grouping of a number of schools with the purpose of enabling them to assist one another by sharing the educational resources available in the cluster. Each school cluster consists of 5-10 schools in the same vicinity (Appendix E). The concept of cluster schools was already operational for two decades before its formal integration into the educational system in 1980 (Kunarak and Saranyajaya, 1986). The inservice and/or the exchanging of the knowledge between the cluster schools in the 1960s and the 1970s was carried out only on an informal basis.

In 1978, when the new primary curriculum was introduced, the Department of Curriculum and Instruction Development had informally grouped schools to help facilitate the implementation of the new curriculum. Schools with qualified teachers and good facilities were selected as lead schools to provide academic and supervisory support to eight or nine other schools in the vicinity, i.e., of the same cluster. Since 1980, the school clusters have been the core units at the grass roots level for the management and improvement of school activities in all aspects (Kaewdaeng, 1985).
Regarding inservice training for teachers, teachers in the school clusters have exchanged/shared their teaching/learning techniques informally since the 1960s. The most evident formal inservice training began to take shape in 1978 along with the implementation of the new primary school curriculum (Kunarak and Saranyajaya, 1986). The changeover to the new curriculum, initiated in 1978, took six years to complete, beginning with grade 1 in 1978, and proceeding to the next grades year by year until all six grades were completed in 1983 (ONPEC, 1987).

In the implementation of the new curriculum which is nation-wide, those who are directly involved in the change were school teachers, supervisors, and provincial and regional education officials all over the country (The Institute for the Promotion of Teaching Science and Technology (IPST), 1984, 1986). Meetings were scheduled to inform all supervisors and administrators of the nature of the new curriculum. These personnel had the responsibility of going back to their school districts to educate the teachers under their administration. How far these intermediary agents, particularly, the school teachers, have been able to absorb and become professionally committed to the innovative changes in the curriculum remains a question unanswered.

To cope with the challenge of the task, various measures have already been undertaken by the Ministry of Education. For example, it has designed a package of handbooks, teachers'
guides, curriculum plans as well as instructional materials for inservice training of primary school teachers. It has also launched several teacher training programs to acquaint the teachers with the new approach in the teaching of the new curriculum. However the first formal inservice training was conducted during February - March, 1984 after the new curriculum had been implemented for six years. The audience was 234 supervisors, provincial and regional education officials who were responsible for the education of grades 1 and 2. There were no classroom teachers (IPST, 1984). Two years later, a similar inservice training for 238 intermediary agents who were responsible for educational administration of grades 3-6 was conducted (IPST, 1986).

These supervisors, provincial and regional education officials were responsible for conducting inservice training for teachers under their jurisdiction. The evaluation concluded from both meetings conducted by IPST reflected that most teachers still do not understand how to effectively teach the new curriculum (IPST, 1984, 1986). At present, the Office of National Primary Education Commission (ONPEC), the Division for Inservice Training of the Department of Teacher Education, the Institute for the Promotion of Teaching Science and Technology, and the Faculties of Education at various universities and teacher training institutions continue to conduct annual inservice programs on the new curriculum, especially for school-clusters' technical teachers, provincial
Three teacher certificate programs are offered by the Division for Inservice Training (NEC, 1985). They are:

1. **Examination Program**

   Teachers can apply to take, twice a year, examinations which are offered at two levels: Lower Certificate of Education which is equivalent to grade 12 and Secondary Teaching Certificate which is equivalent to an associate's degree. According to a study conducted by the Department of Teacher Education in 1981, the results of this program were unsatisfactory. The number of teachers who took the examination was relatively low. During the period from 1977 to 1980, out of almost 100,000 annual applicants for Secondary Teaching Certificate, only 43 per cent could pass the examination while 20 percent of almost 50,000 annual applicants for Lower Certificate of Education could pass the test. Such results call for an improvement of learning materials and the learning system.

2. **Summer Courses**

   Summer courses are offered every year with an examination at the end of each course. It was also found that over 60 per cent of about 32,000 applicants for the Secondary Teaching Certificate and 53 per cent of the applicants for the Lower Teaching Certificate could pass the examination. This indicates that the training system as a whole should be reexamined and the teaching-learning process revised (NEC,
3. **Correspondence Course**

A correspondence course was introduced to teachers in 1978. The results have been satisfactory with 79 per cent earning a certificate and it becomes more popular for inservice training (NEC, 1985).

In 1979, teacher's colleges, in collaboration with teacher employment agencies, initiated a project known as the Community-Based Inservice Training Program. Its goal was to improve the quality of teachers through a training program that leads to a Bachelor's degree. Statistics provided by the Department of Teacher Education revealed that, in 1983, over 30,000 participants of the project had completed a bachelor's degree and that there were about 66,500 others working towards the degree. However, a primary criticism of this program was that the curriculum content should be adjusted to be more relevant to the teachers' work (NEC, 1985).

Other than inservice training programs offered through the Division for Inservice Training, each cluster of schools usually organizes their own workshops during the summer semester break. No definite model for inservice currently exists. Each cluster of schools and the inservice agents working with these schools decide on what model to utilize in the inservice training (Kunarak and Saranyajaya, 1986). Research studies in Thailand indicate that many teachers at both primary and secondary school levels still utilize the
traditional teaching method which was predominantly teacher-centered despite efforts to introduce innovative methods and techniques (ONPEC, 1987). It is evident that this teaching method does not encourage student participation. Teachers' questions are rarely meant to receive answers from students because the teacher would eventually answer his/her own questions or suggest clues for possible answers. Teachers seldom ask questions of "why" and "how", but often ask either "true" or "false" questions (Chantavanich and Fry, 1981). The main causes are inadequate inservice teacher training, weak supervision, lack of the appropriate teaching materials and slow adaptation of teacher-training curricula to the restructured primary and secondary education programs. Based on the information gathered, it is relevant to conclude that Thailand is in need of a good inservice model to train its primary teachers.

Principles and Characteristics of Effective Inservice Education

Joyce and Showers (1981) studied and analyzed more than two hundred studies on effective teacher training models which have been used over the last twenty years. According to them, the most effective training activities will be those that combine theory, modeling, practice, feedback, and coaching to application. And if any of these components are left out, the impact of training will be weakened in the sense that fewer
number will progress to the transfer level which is the only level of impact which has significant meaning for school improvement. That is to say, inservice training education programs need to provide teachers with a range of content, a variety of models of teaching, and a combination of training components, so that the teachers can select the content and process most suited to their needs and learning styles and most important in their present and emergent roles as teachers.

However, Nicholson (1976) asserted that there were other important factors which directly involve successful inservice training:

1. Teachers should have a pertinent voice in determining not only the content of their own inservice education programs, but should also help decide the means by which they will acquire the newer skills (Also Rosas, 1980; Miller, 1982; and Eberwine, 1984). The National Educator Association also stresses the importance of teacher participation in policy-level decision making although it is an administrative responsibility.

2. Opportunities for inservice education must be more closely related to the day-to-day job needs and should be made a part of the teachers' job assignments, while others must be related broadly to a teacher's total professional development and
overall competence. This finding is supported by Osibodu (1975).

3. Inservice training should not duplicate course offerings at colleges and universities, but should be designed to meet the needs of individual teachers as identified through teacher-oriented needs assessment. This suggestion is opposed by Joslin (1980) and Lawrence and Harrison (1980). These investigators found that college courses and institutes resulted in higher effect size mean than did workshops.

Other than Nicholson's findings on important factors that directly involve successful inservice training, Joslin (1980) and Lawrence and Harrison (1980) found that programs that attempted to increase knowledge were more effective than those that attempted to change the behavior of participants. They also found that programs with fewer than sixty participants were more effective than larger programs.

Joslin (1980) and Berman and McLaughlin (1975) reported that programs directed at primary school teachers were slightly more effective than those focusing on secondary school teachers.

Types of inservice training have been classified by Joyce and Showers (1981) as follows:
1. Job-embedded inservice training occurs while a teacher is performing the task of teaching and the teacher is allowed to interact informally with other teachers. Examples are team teaching and committee work for program development.

2. Job-related inservice includes college courses, seminars and workshops. The most recent ones developed are teacher centers and training packages.

3. Other inservice training has as a primary purpose, the acquisition of professional credentials.

4. Professional meetings are also a mode of inservice training.

5. A self-directed inservice program is one in which the teacher is regarded as the sole person responsible for meeting his training needs. Motivation and direction for learning come from the teacher himself. However, teachers generally prefer release time to accomplish inservice work.

**Summary**

The most effective inservice training activities are those that combine theory, modeling, practice, feedback, and training to application. Teachers should be allowed to participate in policy-level decision making. The activities are applicable to the day-to-day teaching/learning assignments. Teachers tend to prefer programs which increase
their knowledge over those that attempt to change their behavior. Generally, inservice training program offered at an elementary school level is more effective than those offered at secondary school level.

**Teacher Perceptions of Inservice Education**

Only recently has it been recognized that staff development is very big business (Bierly and Berliner, 1982). A study conducted by Moore and Hyde (1980) to examine overt as well as hidden costs associated with staff development in three urban school districts revealed that ... "staff development activities cost an average of $1,000 to $1,700 per teacher per year." These expenditures are cooperatively funded by local, state and federal agencies. Most of the federal support was aimed at designing activities that help teachers meet the needs of special populations, i.e., ethnic, minorities, limited English proficiency students and the disabled (Feistritzer and McMillion, 1980). Extrapolating from currently available cost analyses, one can conclude that the annual expenditure for American inservice education is about two billion dollars per year (Bierly and Berliner, 1982).

With the realization that staff development is big business, it is important to be aware of current attitudes and perceptions of teachers regarding inservice education in order to design and deliver appropriate programs. A five state
study conducted by the Iowa Center for Research in School Administration at the University of Iowa, reported that regardless of length of experience, grade level, subject concerns, whether male or female . . regardless of any particular variable involved . . teachers overwhelmingly indicated that their chief desire from an inservice training program was to improve their teaching skills (William and Kindsvatter, 1978).

Kelly (1974) surveyed teachers in Knoxville, Tennessee to determine their attitudes toward aspects of inservice education. The results were that fifty-four percent of the respondents were dissatisfied with the inservice programs. The teachers indicated that the activities provided little help for the grade level they taught. Many felt the meetings were dull and repetitious.

A later study done by Brimm and Tollett (1974) found that highly positive responses were received when sessions having to do with freedom of selection, recognition of different interests, involvement of teachers in planning, released time, and emphasis on performance objectives. A majority, ninety-three percent, of the respondents asserted that teachers need to be involved in the development of process, activities, and methods of evaluation for inservice education.

Again in 1974, sixty percent of the 732 teachers in Prince George's County, Maryland indicated a greater concern for the quality of presentations than for the possibility of
pay or credit for their attendance. The five qualities mentioned by more teachers were: practicality, support and encouragement, systematic program, variety, and teacher sharing. This seems to imply that the teachers wanted a structured program of other teachers presenting new and different ideas (Ainsworth, 1976).

Davies and Armistead (1975) conducted a study attempting to find answers to the question "What do teachers like about inservice education?" Major findings from this study were:

1. Teachers like meetings in which they can be actively involved. They like Dewey's theory of "learning by doing."

2. Teachers like to watch other teachers demonstrate various techniques that they can take back to their classrooms.

3. Teachers like practical information—almost step-by-step—on how to do certain activities. As suggested by Henze et al., teachers do not want "pie in the sky" (p. 20). Planners and organizers of inservice education must be able to show participants that the changes being advocated can be implemented with visible and effective results.

4. Teachers like short meetings and to the point.

5. Teachers like an in-depth treatment of one concept that can be completed within one meeting rather than a generalized treatment that attempts to solve every
6. Teachers like a well-organized meeting.
7. Teachers like variety in inservice programs.
8. Teachers like some incentives for attending inservice meetings; released time, salary increments, advancement points on rating scales.
9. Teachers like inspirational speakers.
10. Teachers like to visit other schools to observe other teachers in situations similar to their own. These visits, even when observing poor teachers, are highly educational.

Regarding the most preferred trainer, many research findings suggested that inservice teachers were more likely to take the advice of experienced teachers who were currently teaching than other professionals. This finding is also supported by survey data collected from 77 elementary school teachers in the East Baton Rouge Parish, Louisiana, in the Spring of 1988 by this investigator. Thirty-six of 77 teachers confirmed that they preferred having an experienced teacher in their parish as their inservice agent. Inservice programs may prove more effective when they include teachers in the training (Adams, 1974; Reilly and Dembo, 1975; and Wheeler, 1982).

Ogletree and Allen (1976) conducted a study to investigate the opinions of Chicago inner-city teachers of inservice meetings. Major findings of this study indicated
that: (1) the objectives of the inservice training were not clearly defined. The teachers' interests or needs were not included; (2) lack of follow-up or evaluation of inservice programs was a natural consequence of either unidentified objectives, poor planning, or lack of consideration for the needs of teachers; (3) most teachers did not see the practical implication in a classroom setting; (4) no orientation occurred for new teachers. The researchers also found that teachers do not want full responsibility for planning and organization of programs, but want to work in collaboration with the administration. The researchers suggested that in order for inservice education to be successful it should be organized by considering the following criteria:

1. Cooperatively planned by all participants.
2. Problem-based and task-centered.
3. Activity oriented, systematic and continuous.
4. Individualized.
5. Evaluated, based upon mutually agreed upon and understood criteria.
6. Flexible and modifiable to all participants' needs.

In 1976, Bartholomew did a national survey and the results were similar to what Davies and Armistead (1975) found. The problem areas were: programs were too general to satisfy teachers' special needs; they had little value for the teachers; they were not planned cooperatively with teachers; and most of all they focused on the school system's
needs rather than on the teachers' needs.

Zigarmi, Betz, and Jensen (1977) also found many similar answers as the previous researchers. However, the results of their research reflected that teachers should act as resources to each other and that teachers were more committed to staff development if they had been involved in planning and had some control over their own inservice education. Teachers would like to be provided with choices about whether to attend, what to focus on, when to start, and who to use as a resource.

Regarding essential components of an inservice model, various literature seems to agree upon the following five items.

1. Inservice education should be a collaborative venture among all parties involved in teacher education: university faculty, school administrators, teachers, and community members.
2. In order for the program to be most effective, teachers need to be involved in the planning of goals, content, and instructional approaches of inservice education.
3. The needs and abilities of teachers must be assessed and reflected in the nature and design of inservice education programs. There is a substantial body of empirical findings (Lawrence, 1974; Bernam and McLaughlin, 1975; Fullan and Ponfret, 1977; and Emrick and Peterson, 1977) that suggest the
requirements, needs and preferences of users or clients should serve as the starting point of all inservice activities. This notion is also strongly supported by Wood and Russell (1981) who advocates that educators vary widely in their readiness, professional competencies, and approaches to learning. For programs to be effective, they need to accommodate the individual differences that exist among the participants. Individualization is essential in effective staff development programs.

4. School administrators should support inservice endeavors and allocate specific funds for inservice education sufficient to maintain comprehensive and continuous programs. Without the financial commitment neither the variety of activities nor the quality of the programs offered will be sufficient to meet more than the most primary needs of the system (Wilson, 1978). Goodlad (1975) and Lawrence (1974) both view the role of school administrators in facilitating and inhibiting teacher growth as critical. To them, the school principal is the key agent in the process of change. Lawson (1974) stated that the administrators and boards of education must view inservice education as a top priority although today's principals are more and more responsible for providing
instructional leadership, it is not necessary that they be "experts" in all curriculum areas; but they should be competent engineers of the improvement process (Harris and Others, 1969).

5. A systematic and relevant set of evaluation procedures is an important key to successful inservice education programs. Otto and Erickson (1973) observed that without evaluation there can be no assurance that inservice efforts are effective. In this age of accountability, without evaluation there can be no accounting for the expenditure of time and money required for worthwhile inservice programs. The evaluation procedures can be summative evaluation; i.e., evaluation leading to a description of the worth of an inservice training exercise at its end or perhaps sometimes after it has been completed. Through this type of evaluation, the effectiveness and appropriateness of both the formats and techniques can be identified. No less important is formative evaluation; which provides feedback to staff, preferably continuous, which will enable them to monitor their performance and to detect and correct deficiencies as the program proceeds (Miller, 1982).

Harris (1980) suggests 8 sequential steps to evaluate inservice education. They are:
1. Selecting, defining, and specifying evaluative criteria. What specific measurable events do we anticipate as evidence of success?

2. Selecting, designing, or adapting instruments and procedures for measuring events related to the evaluative criteria.

3. Gathering data, using appropriate instruments and procedures.

4. Analyzing data in ways that reduce and array them in relation to evaluate criteria.

5. Interpreting results by comparing and contrasting findings with each other, by classes, and against criteria.

6. Valuing findings by relating them to values and expectations of the individuals or institution of the individuals or institutions being served.

7. Deciding one or more actions that should logically follow.

8. Acting on the decisions so as to improve and maintain the best of the operation.

Even though these processes were suggested to be conducted in sequence, they may also overlap one another. Harris (1980) indicated in his book entitled Improving Staff Performance through Inservice Education that the use of simple questionnaires tends to be the most dominate instrument used in evaluation procedures. Other approaches to gather data
include interviews, observations, and tests. Each can be utilized in a variety of ways. The source of the data and the kind of data gathered are both important considerations in the selection and design of an evaluation instrument.

Evaluation poses unique problems in professional development because judgments are inevitably involved regarding the worth of the activity or programs. For this reason, Rubin (1971) suggests that multiple assessment procedures can help to effectively evaluate the inservice program.

Applications of Models to the Study of Educational Phenomena

An inservice training model will be presented in Chapter 5. It is necessary at this point to review some literature which encourage the use of a model to deliver inservice activities to teachers.

What is a Model?

Lippitt (1973) defined a model as a "...symbolic representation of the various aspects of a complex event or situation, and their interrelationships (p.2)." The term model is found in abundance in the educational literature. Models have been developed for communication, organization, group interaction, and learning (Miller, 1982).
What Good does a Model do as an Aid to Understanding?

Tracing back to ancient history, the ability of early people to engage in visual thinking was not much less developed than ours is today. Communication seemed to rely on symbols. The use of symbols to communicate graphically is the basic unit of behavior and civilization. Early civilizations, such as the Egyptian and Chinese, used pictorial language as a means of communication. As man has progressed through the industrial era, man has produced a proliferation of kinds of models (Lippitt, 1973). Lippitt also finds that modeling helps stimulate problem solving and change because it enables those involved to conceptualize the multiple factors through visualized thinking. Knezevich (1962), Guilford and Merrifield (1960) asserted that the interrelationship between the cognitive process and problem solving cannot be separated from perception; problem solving involves cognition, and cognition includes perception. Visualization improves the capability to perceive and, therefore, assists the cognitive process. Building a model is similar to constructing a theory. Brodbeck (1963) stated that "... the most general use of the model is as a symbol for theory (p. 95)."

Another term discussed in the literature related to an inservice model is paradigm. Gage (1963) defined paradigms as models, patterns, or schemata. "Paradigms are not theories; they are rather ways of thinking or patterns for research
that, when carried out, can lead to the development of theory" (p. 95).

A model may be classified in many ways. A typical classification is to view models as being either physical or abstract. Physical models are usually replicas of objects under study. Abstract models are substitutes in our thinking for the system they represent. These models use symbols to represent thought processes or written language, rather than physical replicas. A breakdown of models within these two classifications refers to the use of their symbolism (Miller, 1982). A mathematical model (abstract) states a relationship in mathematical or engineering terms; a symbol represents a systems analysis problem; and a theoretical model is an attempt to represent a theory or explain a general observation (Gage, 1963).

The use of models can assist educators to study, to design and to communicate the full dimensions of a complex area such as inservice education. Characteristics noted in the literature are theory, practical application, and abstract symbolism.

Summary

This chapter is a review of the related literature. The review includes literature available in the field of teacher education and other fields relevant to the planning and operation of inservice education.
Historically, inservice education has evolved from basic remedial experiences for teachers to advanced experiences for the professional growth of teachers. An interest in inservice training has increased throughout the United States and Thailand in the past decade. Various references confirm that not only does inservice education offer the best approach to the improvement of the teaching/learning process, but there exists a continuous need and demand for inservice education.

After reviewing the literature, this investigator has identified five major components which must be included in a successful inservice education program:

1. Inservice education should be a collaborative venture among all parties involved in teacher education.

2. Teachers need to be involved in the planning of goals, content, and instructional approaches of inservice education.

3. The needs and abilities of teachers must be assessed and directly influence the nature and design of inservice education programs.

4. School administrators should support and allocate specific funds for inservice education sufficient to maintain comprehensive and continuous programs.

5. A systematic and relevant set of evaluation procedures is a key to successful inservice education programs.
Models are recognized as a popular means to design an inservice education programs because they help educators to predict the predetermined conditions of performance or evaluate the consequence of various alternatives before committing themselves in a particular program. The most common characteristics mentioned in the literature are theory, practical application, and abstract symbolism.
CHAPTER 4
Methodology

This chapter presents a review of the Delphi Technique, a panel of experts, an evaluation process of the proposed model, the survey data, the analysis and interpretation of survey data, the findings and a summary of the major findings based on the analysis.

The Delphi Technique

The Delphi technique is defined by Linstone and Turoff (1975) as "... a method for structuring a group communication process so that the process is affective in allowing a group of individuals, as a whole, to deal with a complex problem" (p. 3). Dalkey and Helmer (1963) defined it as a device "to obtain the most reliable opinion consensus of a group of experts by subjecting them to a series of questionnaires in depth interspersed with controlled opinion feedback" (p. 458). The main characteristic of the Delphi technique is to obtain the most reliable consensus of opinion of a group of experts. It attempts to achieve this by a series of intensive questionnaires interspersed with controlled opinion feedback.

While many people label the Delphi technique as a forecasting procedure, there are a variety of other applications which include:
1. gathering current and historical data not accurately known or available;
2. planning university campus and curriculum development;
3. putting together the structure of a model (Linstone and Turoff, 1975)

Those who seek to utilize Delphi usually recognize a need to structure a group communication process in order to obtain a useful result from their objective.

**Characteristics of the Delphi**

According to Dalkey and Helmer (1963), the Delphi process today exists in two distinct forms. The most common is the paper-and-pencil version which is commonly referred to as a "Delphi Exercise". In this situation a small monitor team designs a questionnaire which is sent to a larger respondent group. After the questionnaire is returned the monitor team summarizes the results and, based upon the results, develops a new questionnaire for the respondent group. The respondent group is usually given at least one opportunity to reevaluate its original answers based upon examination of the group response. To a degree, this form of Delphi is a combination of a polling procedure and a conference procedure which attempts to shift a significant portion of the effort needed for individuals to communicate from the larger respondent group to the smaller monitor team. This technique is known
as Conventional Delphi (Dalkey and Helmer, 1963).

A newer form, sometimes called a "Delphi Conference," replaces the monitor team by computer which has been programmed to carry out the compilation of the group results. This later approach has the advantage of eliminating the delay caused by summarizing each round of Delphi, thereby turning the process into a real-time communications system. However, it does require that the characteristics of the communication be well defined before Delhi is undertaken, whereas in a paper-and-pencil Delphi exercise the monitor team can adjust these characteristics as a function of the group responses. This later form is known as real-time Delphi (Dalkey and Helmer, 1963).

Usually Delphi, whether it be conventional or real-time, undergoes four distinct phrases (1) exploring the subject under discussion; (2) reaching an understanding of how the group views the issue; (3) bringing out the underlying reasons for the differences and possibly evaluating them; and (4) analyzing and evaluating all previously gather information (Dalkey and Helmer, 1963).

The method used to evaluate the proposed model of this study is a modified conventional Delphi technique utilizing a panel of eleven experts. All eleven panelists received a degree in elementary education and have experiences focusing on elementary mathematics teaching.
The Selection of the Panel of Experts

A letter was sent to selected people in Thailand asking them to name at least three experts in the field of elementary education and/or elementary mathematics education. The people asked to respond to this inquiry represented Thailand's leading educators as well as educational administrators. Eleven people named most often were invited to serve on a panel of experts whose responsibility was to evaluate the model being proposed in this study. A roster of these experts is given in Appendix F. A copy of the letter of invitation sent to each expert is provided in Appendix G. The experts have been asked to confirm their willingness to serve on the panel by signing a letter provided for their convenience or by writing their own letter of acceptance. A copy of the response letter is provided in Appendix H.

An Evaluation Process of the Model

A letter, enclosing a rough draft of Chapters 1-4, was sent to the Thai Committee of Experts on March 15, 1989. This letter informed them that the prospectus for this research had been approved by the dissertation committee (Appendix I). The purpose of the letter was to allow the experts ample time to become familiar with some general information pertinent to this study before examining the proposed model. On March 10, 1989, the eleven experts were asked to indicate days which they would agree to meet to examine the model on a provided
form (Appendix J). Chapter 5: A Model for Inservice Mathematics Education was mailed to the eleven experts on April 22, 1989 (Appendix K). The documents in Appendices I and K were sent while this investigator was still in the United States. On May 4, 1989, the eleven experts were informed by letter that two meetings were scheduled on Tuesday, May 9, 1989, and Tuesday, May 23, 1989 (Appendix L). They were requested to submit written comments or contact the investigator by phone before May 16, 1989 if they could not attend the first meeting. This was to provide sufficient time for the investigator to revise the model and prepare the document to be submitted for examination in the second meeting which was scheduled on May 23, 1989. The majority of the experts, 10 of 11, agreed to meet with no reservations to evaluate the proposed model on Tuesday, May 23, 1989. Only three experts could meet on Tuesday, May 9, 1989 (Appendix M). Since one of these three experts, Dr. Chaweewan Kirtikara, could not meet on May 23, the meeting was conducted to collect preliminary input. A majority of time spent in this meeting was on the revision of Figure 2: Organization of Inservice Program in Mathematics Education for Thai Elementary Teachers. An original profile of Figure 2 is listed in Appendix N. Dr. Chaweewan Kirtikara was satisfied with other sections of the model. She indicated her approval on the prepared form (Appendix O). The results of this meeting were mailed to all experts with the request that they submit their comments
before May 16, 1989 so that this investigator could revise the model based on their recommendations to be submitted for the second review. Ten experts re-examined the revised model and met on May 23, 1989 (Appendix P). Major revisions were made on Table 2: Mathematics Topics for Inservice Training Programs during this meeting. An original profile of Table 2 is included in Appendix Q. Even though this model recommends that participants be from grades one to six, ten experts requested that this investigator design Table 2 focusing on the content of Grades 5-6 since there was an immediate need for the training of teachers at these grade levels. Initially, this investigator prepared a list of ten units based on findings from the survey data (Appendix S), a review of the literature (Chapters 2 & 3), the guidelines suggested by the Thai Primary School Curriculum (Table 1), and suggestions by a committee of eleven Thai elementary education and mathematics education experts. However, the ten experts recommended that it should be coherent to the Thai Primary School Curriculum. After an extensive review, ten experts indicated their approval by signing on a prepared form (Appendix O).

The ten experts recommended that some forms of incentive be needed to keep both inservice agents and participants motivated since the duration of the trainings was relatively long. They also had reservations about the availability of the training staff. Well-planned training sessions for
training staff were highly recommended. Both meetings were scheduled at Meeting Room 1, Faculty of Education, Kasetsart University, Bangkok, Thailand.

Analysis and Interpretation of Survey Data

Because of the belief that teachers should determine educational growth programs and that teachers can judge what makes a good inservice program, a questionnaire was designed by the investigator to assess elementary school teachers' inservice training needs in the teaching of elementary mathematics (Appendix R). The items on the questionnaire were selected based upon a review of the related literature, personal experiences in the teaching of elementary mathematics, and input from other mathematics educators.

Bangkok Metropolitan consists of five cluster schools with a total of 37 schools and 2,399 teachers. Two hundred and twenty two teachers, six teachers - one from each grade level - from each school, were selected by supervisors of the Office of the Bangkok Metropolitan Primary Education, Klongsarn Office. Only two hundred teachers agreed to participate in this project. The questionnaire and instructions for its administration were mailed to the Director of the Office of Research, Faculty of Education, Kasetsart University serving as a mediator between the Supervisors in The Office of the Bangkok Metropolitan Primary Education, Klongsarn Office and this investigator. Teachers
were asked to complete the questionnaire which was divided into five parts:

Part 1 : Demographic Information
Part 2 : Topics of Interest
Part 3 : Time and Number of Day Options
Part 4 : Preferred Inservice Agent
Part 5 : Volunteer or Need Incentive

Questionnaires were administered to the teachers during the second semester of the academic year 1987-1988. Selected teachers were asked to complete the information and return the questionnaire to the Office of the Bangkok Metropolitan Primary Education by November 10, 1988. However, due to the conflict of the schools' schedule, teachers requested to extend the deadline to December 1988. 178 (89%) questionnaires were returned to the Office of Research, Faculty of Education, Kasetsart University. Initially, all aspects of data coding were scheduled to be completed by a graduate student in educational research of Faculty of Education, Kasetsart University, Bangkok, Thailand. However, the death of his father prohibited him to do so. This caused a delay of receiving the data back at Louisiana State University. The Director of the Office of Research, Faculty of Education asked him to return all raw data gathered to the Office. She, together, with her staff coded and analyzed the data. Both raw and an analysis of the data were mailed to this investigator to be interpreted. In order to describe the
responses, statistical summaries are given on a number of single questionnaire items, most of which give background information about teachers in the form of frequency or percentage distribution.

Summary of Survey Data

The major findings concluded from the survey data are as follows: Regarding demographic information, approximately 59 percent of this group of teachers was female. The majority of them (41%) have taught for sixteen or more years. About 86% have a Bachelor's degree. They indicated that they liked teaching mathematics (83%) even though most of them (37%) had a background in science education and social studies. Most teachers (58%) have had an experience teaching at grades 1-3. The detailed information regarding the demographic information is displayed in Appendix S.

A majority of the primary teachers surveyed (74%) said they would volunteer to attend an inservice training program. The three most preferred topics listed in order from the most interesting to the least interesting are:

(1) How to design and construct math center materials (146 = 82%);

(2) How to utilize manipulatives in the teaching of mathematics at your grade level (138 = 79%);

(3) How to assess error patterns and instruct for their correction (135 = 76%).
The detailed information regarding this selection process is displayed in Appendix S.

Regarding time and number of day options, 68% of the teachers prefer inservice during the summer vacation and the length should be 4-5 days (48%). The majority of the teachers (92%) prefer having a university professor who has direct experiences in the teaching of elementary school as their inservice agent. They also indicated that the least preferred inservice agent (36%) is a university professor who has no direct experiences in the teaching of elementary school.

The detailed information regarding this selection process is displayed in Appendix S.

In summary, the findings suggest that teachers are willing and ready to participate in inservice mathematics programs. They prefer receiving their inservice training from a university professor who has experiences in the teaching of elementary school mathematics and the training should be conducted within a period of 4-5 days during the summer vacation. Lastly, findings suggest that there is a demand for the design and construction of teaching aids needed for mathematics instruction.

While the survey data indicates that 74% of this group of teachers would volunteer to participate in an inservice training program, a panel of eleven experts seemed to agree that this figure was, in fact, too high. Based on their experiences working with elementary teachers all over
Thailand, the experts felt that 74% of teachers would volunteer for one or two years but not for three years. They also agreed that in order to sustain a three-year commitment, external funding would be needed to pay teachers and inservice agents.
CHAPTER 5
A Model for Inservice Mathematics Education

This chapter presents a description of the proposed inservice training model in mathematics education for Thai primary school teachers. The model is developed in accordance with a synthesis from a review of related literature, the results of a survey, and the social and economic factors as described in Chapter 2. The selection of the mathematics program objectives, a description of the learning experiences, the suggested mathematics topics, the organization of inservice training, and the program for evaluation are developed. This is followed by a summary of the suggested process.

Introduction

As mentioned in the basic assumptions in Chapter 1, an ultimate goal of inservice training is to provide an opportunity for growth within the profession. It is a belief that no school can achieve its educational goals without qualified teachers. This implies that teachers are an important factor in determining the quality of education provided by the school. For elementary teachers, the so-called "generalists" who are vitally concerned with all areas of the curriculum, inservice training in mathematics can be a real adventure. A well-planned inservice program in
mathematics should help elementary teachers become better mathematics teachers and at the same time help them to be more acceptable of future curriculum changes.

The development of the proposed model is adapted from the model suggested by Runchareon (1974). The visual representation of the model is presented in Figure 1. That is: (1) The local supervisor, the principal, and the teachers cooperatively assess needs by taking into account the National Education Aims, the preservice education program, educational problems, and existing programs in the school; (2) the priority of goals and objectives are established; (3) a program is designed to meet all needs, i.e., desired outcomes, content, methods and strategies, and evaluation by considering the constraints of time, money, personnel, and the availability of the materials and resources; (4) the implementation and monitoring is carried out utilizing various strategies, i.e., staff orientations, demonstrations, workshops, faculty meetings, seminars, conferences, and classroom research; (5) intervisitations, conferences, and discussions are used as a means of follow-up activity; and (6) a variety of education measures, i.e., classroom observations, questionnaires, interviews, self-evaluations, and student scores are used throughout the inservice years.
Figure 1
Inservice Teacher Education Model

LOCAL SUPERVISORS AND SCHOOL PERSONNEL (PRINCIPALS & TEACHERS) NEEDS ASSESSMENT

National Ed. Aims

Existing Programs

Pre-service Ed.

Educational Problems

NEEDS ASSESSMENT

ESTABLISHED PRIORITY GOALS AND OBJECTIVES

Constraints
- Time
- Money
- Personnel

PROGRAM DESIGN:
- Desired outcomes
- Content
- Methods & Strategies
- Evaluation Procedures

Availability of Materials & Resources

IMPLEMENTATION & MONITORING:
- Staff Orientations
- Demonstrations
- Workshops
- Faculty Meetings
- Seminars
- Conferences
- Classroom research

FOLLOW-UP
- Intervisitations
- Conferences
- Discussions

EVALUATION
- Observations
- Questionnaires
- Self-evaluations

NEW NEEDS ASSESSMENT
Rationale for Model Objectives

The history of educational development in Thailand, as mentioned in Chapter 2, illustrates that although substantial educational progress has been made, Thailand is still facing many critical problems, especially at the elementary level. These problems are: (1) The problem of a high drop-out rate in all elementary grades (United States Overseas Commission, 1971); (2) the problem of illiteracy (UNESCO, 1984); (3) the problem of unqualified teachers (Sudaprasert, 1983); (4) the problem of insufficient preparation of teachers and an inappropriate structure of teacher certification (ONPEC, 1987); (5) the problem of teaching methodology which is limited by traditional methods of teaching, inadequate teaching/learning materials, and having minimal applications of modern technology (Chantavanich and Fry, 1981); and (6) the problem of changing the curriculum without appropriate training of teachers and local administrators (UNESCO, 1983). These problems are too big for a single institution to solve. The effort should be done cooperatively among all parties involved starting from the Ministry of Education to classroom teachers.

This investigator recognizes that education for teachers does not stop when they finish their preservice education and after each inservice training program. Teachers must continue to professionally grow in order to keep up with a continually changing curriculum which is influenced by the development of
a nation's society. Therefore an inservice program which helps establish a good foundation for teachers to stand on is essential.

A Conceptual Framework of a Model for an Inservice Training Program in Elementary Mathematics Education

This model recognizes the existing problems in Thailand's elementary educational system. The proposed model is concerned with inservice mathematics education for teachers in school clusters under the jurisdiction of the Ministry of Education. It is designed to be used in these schools because they are recognized as having under qualified teachers (Sudaprasert, 1983). The model is comprised of six components: (1) A suggested list of objectives; (2) suggested learning experiences; (3) suggested mathematics topics; (4) a suggested method of delivery; (5) an organizational scheme; and (6) a plan for evaluation.

The first step towards a meaningful, worthwhile inservice program is the identification of the needs of teachers. Therefore, a major criterion for the establishment of this inservice model's objectives is the identification of the needs of the teachers for the teaching of primary mathematics. This phase of the model was analyzed in a previous chapter and supported by the review of the literature. The following criteria were considered in forming the inservice model's
objectives:

1. The design of the inservice model must be based on the teachers' needs.

2. An attempt should be made to offer the training opportunity to all teachers.

3. The method of training should activate both the cognitive and affective aspects of the learners.

4. The sequence of inservice activities should be organized as problem-solving efforts in which the participants take the initiative for inquiry.

5. The program should take into account individual differences in readiness, sophistication and the content needs of the teachers.

6. Provisions should be made in the inservice model for the appropriate continuation of support of participants who attempt to implement the strategies learned.

7. An effective inservice program in primary mathematics should focus not only on teachers' understanding of mathematics structure, the methods of teaching, and the use of instructional materials, but also on theories of how children learn mathematics.

8. An inservice program should provide opportunities for teachers to try out new ideas in the setting.
9. An inservice program should contain provisions for its own evaluation and self-correction. Participants should be allowed to discuss and share their ideas with their fellow teachers. Teachers should also be allowed to criticize training activities. This helps to uncover new training needs for the future.

**A Suggested List of Objectives**

The following are suggested general objectives for the inservice training program in mathematics education for Thai elementary school teachers:

1. To promote a well-organized and carefully planned continuing inservice education program designed to upgrade the mathematical competencies of teachers towards the improvement of classroom instruction in the first year of training.

2. To train teachers to become a resource person in their school in the second year of the model. This is to establish an acceptance of professional responsibility and serve as professional leaders.

3. To provide opportunities for teachers to conduct inservice sessions in their school in the third year of training. This is to promote teacher's self-improvement in their career in becoming more proficient in the teaching of mathematics.
4. To suggest instructional and supervisory techniques and practices which have been found effective to meet local needs.

5. To stimulate the educational field in the preparation and production of instructional materials that may be produced on a local or nationwide basis.

6. To stimulate teachers and other staff personnel of the inservice centers in conducting classroom research, especially those related to how Thai children learn mathematics, how to effectively organize instructional time, and in the preparation of evaluation instruments and tests.

7. To develop evaluative criteria for measuring the outcomes of the inservice education activities.

Selected Learning Experiences

The ultimate goal of the proposed inservice model is to help teachers improve their mathematical understanding and their classroom performance in the teaching of mathematics and, in the long run, become independent and be able to conduct inservice training sessions in their school cluster. The objectives of inservice learning experiences provided in this model include helping teachers to develop behaviors that deal with the knowledge of mathematics as well as the techniques and procedures used in providing and managing
instruction through the use of activity-oriented approaches and also cooperative group activities. The following are representative examples of the objectives of inservice learning experiences:

Objectives related to the mathematics content:

1. The teacher will exhibit an improvement in his/her mathematics skills, teaching methods, and effective utilization of instructional time.

2. The teacher will demonstrate a mastery of mathematical concepts being studied by his/her pupils.

3. The teacher will demonstrate an ability to select and organize activities that help his/her pupils to achieve the objectives of the mathematics curriculum.

Objectives related to teacher-pupils interaction:

1. The teacher will allow pupils to freely participate in a group discussion or other group work without negative criticism.

2. The teacher will respond to a student's statement by asking for validation or justification of the mathematical ideas expressed.

3. The teacher will practice asking questions rather than providing answers.
Objectives related to class practices:

1. The teacher will use various types of instructional grouping; i.e., cooperative grouping, small groups, individualized work, and whole class instruction where appropriate.

2. The teacher will provide remedial instruction for those who have not mastered the mathematical objective.

3. The teacher will use the appropriate assessment instruments to assess a pupil's performance and to complete a performance record.

4. The teacher will allow students to move purposefully about the classroom to obtain materials, to consult with others, and for other task-oriented reasons.

Objectives related to the use of manipulative materials:

1. The teacher will exhibit an ability to select and use appropriate concrete materials to simplify abstract ideas.

2. The teacher will exhibit an ability to organize teaching/learning materials and decorating the classroom in a way that promotes learning.

3. The teacher will exhibit an ability to construct and make use of local materials available in his/her teaching.
Suggested Mathematics Topics

Based on the findings from the survey data (Appendix M), Thai elementary teachers strongly set their first priority in receiving their inservice training in classroom procedures and materials and children's learning over the mathematical content knowledge. The first three topics recommended are listed in order of their preferences as follows:

1. How to design and construct mathematics center materials (146 of 177 = 82%).
2. How to utilize manipulatives in the teaching of mathematics at your grade level (138 of 174 = 79%).
3. How to assess error patterns and instruct for their correction (135 of 177 = 76%).

The proposed list of eight mathematics units for the suggested inservice program (Table 2), designed for grades 5-6, is based upon findings from the survey data (Appendix M), a review of the literature (Chapters 2 & 3), the guidelines suggested by the Thai Primary School Curriculum (Table 1), and suggestions by a committee of eleven Thai elementary education and mathematics education experts. Each unit takes into account the three most preferred topics as indicated in Appendix M. These eight units are ordered by the guidelines suggested by the Thai Primary School Curriculum 1978.
Table 2

Mathematics Topics for Inservice Training Programs

Suggested Grades: 5-6

UNIT 1: Whole Numbers
- Counting and one-to-one correspondence
- Order and cardinality
- The fundamental operations with whole numbers
- Solving text-book word problems
- Solving non-routine problems

UNIT 2: Numeration and Place Value
- Logical Thai number names and grouping patterns
- Counting
- Reading and writing number symbols and words
- Place value in whole numbers
- Estimation Strategies
- Factors, multiples, and composites
- Solving text-book word problems
- Solving non-routine problems

UNIT 3: Common and Decimal Fractions
- Basic concepts and notations
- Equivalent fractions
- Decimal fractions
- Fundamental operations with fractions
- Ratio, Proportion, and Percent
- Application of fractions to problems
- Estimation Strategies
- Solving text-book word problems
- Solving non-routine problems

UNIT 4: Basic Concepts of Geometry
- Closed plane figures, points, lines, angles, and plane
- Parallel lines
- Solid shapes
- Symmetry and congruence
- Perimeter, area, and volume of solid shapes such as rectangular prism, cone, cylinder, and sphere
- Simple geometric constructions including scaled drawings
- Solving text-book word problems
- Solving non-routine problems
Table 2 (Cont.)

UNIT 5: Measurement
   Knowledge of Thai measuring system
   Non-standard and standard measures
   Metric System - length, weight, volume,
   capacity, area, and perimeter
   Time and Money
   Solving text-book word problems
   Solving non-routine problems

UNIT 6: Reading, Interpreting, and Constructing Graphs
   Pictorial representation of data -- bar graph,
   pictogram, circle graph, and ordered pairs
   Interpreting graphical data
   Solving text-book word problems
   Solving non-routine problems

UNIT 7: Number Theory
   Prime and composite
   Factors, multiples, divisors
   Divisibility rules
   Exponents and exponential notation
   Solving text-book word problems
   Solving non-routine problems

UNIT 8: Calculator and Computers*
   History of computing
   Calculator/computer concepts/components
   Calculator/computer in society
   Calculator/computer in the teaching of
   mathematics
   Software selection criteria

*UNIT 8 is designed to be a supplementary unit provided upon request.
This investigator agrees with Bartholomew (1976) that...

Teaching is a complicated process. Determining what teachers want and need based on instructional problems does not lend itself to simple scientific measurement. What they teach, where they teach, when they teach, and many other factors must be considered. We must remember that conditions in schools and society are in constant flux. The continuous collection of information is always a first step toward better schools (p.84).

Because of this belief, the choice of topics for a particular inservice program should help the participants with their teaching and other related assignments.

Suggested Method of Delivery

To assure the success of the program, an integrated approach to content and method in mathematics learning and teaching which has been proven to be effective in helping teachers improve their mathematical competencies as suggested by the findings of Boltz (1987) should be utilized.

From a comprehensive review of the literature Joyce and Shower (1980) suggested five essential components of an integrated approach to effective inservice training: (1) presentation of theory or skills; (2) modeling or demonstration of skills; (3) practice in the classroom setting; (4) some form of evaluation; and (5) coaching from another teacher, a supervisor or other qualified person to put theory into practice.

The proposed model has adapted Joyce and Shower's findings in the following ways.
The first component, presentation of the theory must include the rationale and a description of the new concept. Common methods used are reading, lectures, films, and discussion. Through the presentation of the theory, teachers should gain an increased awareness of the content and how to apply information in the classroom.

Since over 80% of teachers, from this sample group, indicated in the survey data that constructing and utilizing instructional materials in the teaching of mathematics was among the first two topics they would like to have a training on, this model provides opportunities for teachers to both construct and utilize instructional materials in each suggested unit as appeared in Table 2.

The second component, modelling or demonstration of skills, can be accomplished by live demonstration, films or videotapes. Modelling should be done many times consistently throughout the inservice training session. This investigator proposes the modelling of the Missouri Model for Teaching Mathematics Effectively (Appendix T) and the use of cooperative groups (Appendix U).

The third component is practice in the classroom setting. This investigator believes that in order for a person to master a concept, he should go through the following experiences: (1) see one; (2) practice one; and (3) teach one. Therefore this model suggests activities which allow teachers to observe, practice, and teach. The investigator
believes that "Practice makes perfect." Teachers need opportunities to practice to become proficient at a new skill. This practice cannot be effectively done without first understanding the theory/concept and observing the demonstration.

The fourth component, coaching from another teacher, a supervisor, or other qualified person, allows an opportunity for teachers to put theory into practice. With the help from a more qualified teacher and/or a supervisor or other qualified persons, teachers are able to analyze the application of the skill in the classroom. The model suggests that during the first two years, the project teachers are under the close supervision of the inservice agent. During the third year, they are provided opportunities to conduct inservice training in their school. They more or less self-evaluate their efforts during the third year.

The fifth component, some form of evaluation, is designed and adapted from various sources by the investigator. To evaluate the effective utilization of class time, a classroom observation sheet adapted for the Missouri Model is recommended. The project teachers will be observed by an inservice agent, a supervisor, a principal, or a project evaluator using the classroom observation form (Appendix V). The observer or evaluator would decode what they have observed on a rating scale provided (Appendices W & X).
Organizational Scheme

This is a three-year program having the following objectives:

FIRST YEAR: To train teachers to become proficient in the teaching of primary mathematics.

SECOND YEAR: To train teachers to become a resource person in their school.

THIRD YEAR: To provide opportunities for teachers to conduct inservice sessions in their school.

The visual representation of the organization of the inservice program is depicted in Figure 2.

The organization of the proposed inservice training program is divided into two stages: (1) planning stage; and, (2) a suggested program procedure. These stages are interrelated and continue through the implementation of the model.

Planning Stage: The model calls for a cooperation of all parties concerned, especially classroom teachers. To ensure success, the concerted efforts are required from such agencies as Thailand's 36 teacher colleges, universities, the Office of National Primary Education Commission, the Ministry of Education, the Institute for the Promotion of Teaching Science and Technology, the Office of Provincial and District Primary Education, the School-Clusters, Professional Organizations, such as the Mathematics Association of Thailand, and the Parent-Teacher Associations. These
Figure 2

Organization of Inservice Program in Mathematics Education for Thai Elementary Teachers

FIRST YEAR

35 teachers and administrators from school cluster Focus: Classroom Teaching

SECOND YEAR

35 teachers and administrators from school cluster Focus: In-school Resource Person

THIRD YEAR

35 teachers and administrators from school cluster Focus: Cluster School Inservice Agent

FOURTH YEAR:

35 teachers and administrators from school cluster Focus: Cluster School Inservice Agent

A, B = Inservice Agents
A, B = Cluster School Groups
institutions should work cooperatively, taking into account the availability of resources and priorities to avoid duplication and wastage.

The planning stage involves the following decisions: (1) Roles of the different agencies; (2) selection of inservice participants; (3) selection of date, time, and place; (4) physical facilities; (5) content of the inservice program; and (6) implementation of the program.

1. Roles of Different Agencies: Each concerned agency will make an important contribution to the success of the model. For example, The Ministry of Education is responsible for making various decisions on subsidizing the budget, timing especially when a certain aspect of the program has to be carried out during the school hours, providing some form of a follow-up evaluation by supervisors, providing honorary promotion for those who outstandingly perform; e.g., making them an assistant to the school cluster supervisors in the area they best perform, giving a certificate of recognition, promoting the ablest teacher to become a resource teacher in their school cluster.

The Institute for the Promotion of Teaching Science and Technology, and 36 teacher colleges and universities, such as Chulalongkorn University, Kasetsart University, Sri Nakarinwirot University, will provide the agents for inservice programs. These agencies are well-equipped in terms of having dealt with teacher preparation at the preservice level, having
qualified staff, and having sufficient knowledge to help classroom teachers conduct classroom research in order to promote their professional growth.

The Parent-Teacher Associations, especially community participation in some school activities, are assumed to be supportive of educational innovation or change (Sudaprasert, 1983). Community support can be in various forms, such as donations in kind, as well as in cash, and local community assistance by both teachers and students. Strong community support can facilitate the production of teaching/learning materials.

2. Selection of Participants: Ideally, all elementary school teachers should participate in the inservice training program. However most of the time it is necessary to alternate teachers in the school. The Project Director together with the committee members should set the following criterion with the help from the principal and the local administrators. The selection of participants involves: (a) The selection of participants at different stages of inservice training which will represent grades 1-6; (b) the qualification of the teachers; that is, the most experienced teachers or the least experienced teachers or the content specialist; (c) location of teachers; i.e., urban or rural or a combination of both; (d) the selection of administrators; i.e., the principal or the supervisor. The selection of the participants depends pretty much on the goal which the program
wishes to reach.

3. Date, Time and Place Option: The consideration concerning time should be done during the planning stage. Some basic questions which the program organizers should ask themselves include: (a) When is the most appropriate time to conduct an inservice training session; i.e., during the school breaks, on weekends, during regular school hours, after school? (b) Where should the inservice session be conducted; i.e., on campus or off campus? (c) How long should the session be; i.e., a week during the summer vacation, one day of each month during a regular school days, one Saturday of each month, an hour after school?

4. Physical Facilities: As indicated earlier, the success of an inservice training program can depend upon the location and availability of equipment. Some questions which should be asked include: (a) Will the inservice training site be at the school, at a central office, at a community center, at a conference hall or at a teacher training institute? (b) What size of room can appropriately hold the number of participants expected? (c) Where can audio visual equipment be secured?

5. Program Content: This is a task of the program committee with the leadership of inservice agents. The content should be designed based on the teachers' needs assessment and input from teacher educators. It should consider the culture as well as the language used in the area.
A large scope should be designed with the provision for local inservice agents to adapt to meet the local needs.

6. Program Implementation: This involves such decisions as: (a) How should the program be organized starting from day one to the last inservice day? (b) What delivery method should be used; i.e., demonstration, lecture, workshop, whole group vs. small group instruction? (c) What type of follow-up activities should be considered? (d) How will the program be evaluated - formative and summative evaluation? (e) How will data be collected; i.e., will a pre-test and a post-test be given and when should it be given?

The decisions made in the planning stage are vitally important to the success of the model. A program's success often depends on how well it is organized. An old saying reflects this position. "Well begun is half done." An inservice model can vary based upon the decisions made in the previous paragraphs. The following section presents a suggested format for procedurally implementing an inservice model for Thai elementary schools.

A Suggested Program Procedure: This section of the study presents a suggested format for procedurally implementing an inservice model for Thai elementary schools based on the results from the survey findings in Chapter 4, and input from a Thai Committee of Experts in elementary and mathematics education. The Thai Committee supports this suggested schedule for implementation in a small setting (using one or
two clusters), but has reservations about its implementation on a large scale in terms of budget and manpower who will be willing to commit themselves for a three-year period. The suggestions include timing, place, inservice staff, participants inservice program activities, follow-up activities, and evaluation.

Timing: The investigator proposes the following time line which has been developed in accordance with findings from the survey data and from a review of related literature (Table 3). This time schedule can be adapted accordingly. A sample unit on calculators is provided in Appendix Y.

The second year procedure is mainly for providing teachers with ample opportunities to construct and explore teaching materials from various sources. Teachers will attend the same amount of inservice training days and hours. But the emphasis is put on training teachers to become a resource person in their school. The program activities in year two are as follows:

SUMMER VACATION (April-May): Two weeks of at least 10 days with 6 hours of inservice activities each day.

The inservice agents share the summative content evaluation of the first year with the teachers so that they are aware of what goes on during the past year. Teachers will acquire their learning experience through lecture in large group, small group and individual; tutorial, group discussion, workshop activities, demonstration, constructing teaching
Table 3

**Suggested Time Schedule of Inservice Training Program in Mathematics Education for Thai Elementary School Teachers:**

**First Year**

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Place</th>
<th>Program Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUMMER VACATION (April-May)</td>
<td>School cluster office or at a school in a cluster</td>
<td>Preassessment of participants.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preparation and orientation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Learning Experiences</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lectures in large group, small group and individual;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tutorial, group discussion, workshop activities,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>demonstration, constructing teaching materials,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>audio visual aids, special lectures, and other activities.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRST SEMESTER (June-September)</td>
<td>School cluster office or at a school in a cluster</td>
<td>Discuss and answer all questions teachers have after each month of teaching. Provide more teaching tips and how to use manipulatives.</td>
</tr>
<tr>
<td>Four Saturdays, each of six hours duration.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FIRST SEMESTER

BREAK
(October)
One week (5 days) of at least 6 hours of inservice activities.

School cluster
Office or at a school in a cluster.

SECOND SEMESTER

(December-March)
Four Saturdays, each of six hours duration.

School cluster
Office or at a school in a cluster.

Explore some topics of the 2nd semester. Constructing teaching materials. Bring in research findings related to the topics being introduced. Formative evaluation.

Discuss and answer all questions teachers have after a semester of teaching. Cover the content of UNIT 5-8 in Table 2. Put more emphasis on the skills suggested by the survey data. Provide more teaching tips and how to use manipulatives. Constructing teaching materials. Bring in research findings related to the topics being explored. Formative evaluation.

Discuss and answer all questions teachers have after each month of teaching. Provide more teaching tips and how to use manipulatives. Summative content evaluation. Planning for the second year.
materials, audio visual aids, special lectures, and other activities. The content covers UNIT 1-4 in Table 2. Encourage teachers to volunteer and take turns demonstrating a lesson on any topic in UNIT 1-4 to a whole class. This can be done individually or in a small group. Teachers are asked to submit a copy of a lesson plan including a list of sources where they acquire information and/or materials. The emphasis is on providing an extensive source of teaching materials and ideas which teachers can make or take back to their school. Through this training teachers will be equipped to serve as resource persons in their school. Teachers will help each other design an instrument used to record their performance. A sample of a Record of Service is provided in Appendix Z.

FIRST SEMESTER (June-September): Four Saturdays each of 6 hours duration.

Allow teachers to share, discuss, and ask questions concerning problems they encounter after each month of their teaching and service provided to their colleagues. Provide opportunities for teachers to make suggestions concerning the revision of the instrument used to keep record of their service.

Explore some topics of the second semester putting more emphasis on teaching tips and how to use manipulatives in the teaching of elementary mathematics. Provide opportunities for teachers to demonstrate lessons and explore teaching materials from various sources. Allow teachers to make copies of the
lessons and a list of materials to take back to their school.

FIRST SEMESTER BREAK (October): One week (5 days) of at least 6 hours of inservice activities.

Allow teachers to share, discuss, and ask questions concerning problems they encounter after a semester of teaching. Revise the instrument to keep record of their service if they request.

The inservice training content covers UNIT 5-7 in Table 2 putting more emphasis on teaching tips and how to use manipulatives in the teaching of each unit. Provide opportunities for teachers to demonstrate lessons and how to explore teaching materials from various sources. Allow teachers to make copies of the lessons and a list of materials to take back to their school.

SECOND SEMESTER (December-March): Four Saturdays, each of 6 hours duration.

Allow teachers to share, discuss, and ask questions concerning problems they encounter after each month of their teaching and service. Finalize the "Record of Service" instrument. Provide more teaching tips and how to use manipulatives in the teaching of suggested units. Allow opportunities for teachers to take a leadership role in demonstrating the lessons. More opportunities are provided for teachers to make and explore teaching materials from various sources. At the last inservice session of the second year, teachers share their composite list of teaching
materials and resources with other teachers.

A sample of a lesson plan of the second year training is provided in Appendix AA.

The third year procedure is focused on providing opportunities for teachers to conduct inservice sessions in their school. Teachers will attend the same amount of inservice training days and hours. The main purpose is mainly for follow-up, supervision and evaluation of classroom practice.

SUMMER VACATION (April-May): Two weeks of at least 10 days with 6 hours of inservice activities each day.

Share a brief summary of the findings from the data collected during the second year with the teachers. Teachers are encouraged to offer input.

During these two weeks teachers spend a majority of their time constructing inservice training lessons covering UNIT 1-4 in Table 2 which will be used to inservice their colleagues during the first semester. This investigator recommends that teachers work in four groups of approximately 7-8 teachers in a group. Each group is responsible for a unit. At the end of the second week, provide opportunities for teachers to try out their plans with other teachers. This way, teachers will have a copy of each unit to take back to their school. An inservice agent's role is to provide supervision as needed. Teachers will work cooperatively in constructing an instrument to keep a record of their service
provided to their colleagues. This instrument will be revised after the teachers have actually utilized it. A sample of "A Record of Inservice Activities" is provided in Appendix BB.

FIRST SEMESTER (June-September): Four Saturdays each of 6 hours duration.

Provide opportunities for teachers to share, discuss, and ask questions concerning problems they encounter after each month of their teaching and service. Revise inservice training lessons and the instrument used to keep records of their service based on teachers' recommendations. More tips on teaching, the use of manipulatives, and teaching materials resources are provided upon request. Divide teachers into four groups - each group is responsible for taking a leading role in conducting an inservice on a suggested or selected topic on a Saturday. If time is available, start planning inservice training units to cover the content of the second semester, UNIT 5-7. Provide time for teachers to try out their lesson plan with their fellow teachers.

FIRST SEMESTER BREAK (October): One week (5 days) of at least 6 hours of inservice activities.

Provide opportunities for teachers to share, discuss, and ask questions concerning problems they encounter after a semester of teaching/inservice. Revise inservice training lessons and the instrument used to keep records of their service based on teachers' recommendations. Divide teachers into four groups with 7-8 people in each group. Each group
is responsible for constructing an inservice training lesson covering the content of the second semester, UNIT 5-7. Allow time for teachers to try out their lessons and gather input from other teachers. Teachers will have a copy of each unit to take back to their school. More teaching tips, the use of manipulatives, and teaching material resource are provided upon request. The major role of an inservice agent is as a supervisor to the project teachers.

SECOND SEMESTER (December-March): Four Saturdays, each of 6 hours duration.

Provide opportunities for teachers to share, discuss, and ask questions concerning problems they encounter after each month of their teaching and service. Revise "A Record of Inservice Activities" and inservice lessons based on teachers' recommendations. More teaching tips, the use of manipulatives, and teaching material resources are provided upon request. Divide teachers into four groups - each group is responsible for taking a leading role in conducting an inservice on a suggested or selected topic on a Saturday. At the end of the third year, each teacher will be provided with a composite inservice training lessons covering UNIT 1-7 for their future reference.

A sample of a lesson plan of the third year training is provided in Appendix CC.
Place: This investigator proposes the use of "mother school" as defined by Sudaprasert (1983) or school cluster office/center as a site for an inservice training program. This decision has been made based on the information provided by Kunarak and Saranyajaya (1986). According to Kunarak and Saranyajaya, the "mother school" has four characteristics:

(1) the school is large in size; (2) its location is in the central geographical area of the cluster, or is the most convenient for communication among the member schools; (3) there are at least two excess rooms at least 6x8 square meters each which may be used or modified as a cluster's resources center; and (4) this resource center will also serve as the office or secretariat of the cluster (p.31).

According to the ONPEC's Regulation, the cluster is expected to carry out its activities within six main frames..." academic affairs, facilities, personnel, pupil activities, management and finance, and school-community relations" (Kunarak and Saranyajaya (1986, p. 31).

Not only is the "mother school" physically equipped for conducting inservice, it is also assigned ten functions by the ONPEC to cooperate and support the physical needs and intellectual development of teachers in the cluster school. These ten functions are as follows (ONPEC, 1984):

1. formulating school improvement plans and conducting school activities in line with the educational management policies of the National, Provincial and District Primary Education Committees.

2. considering and approving plans and projects for school improvement in the cluster,

3. considering and improving plans for staff development in the cluster,
Based on the described information, the "mother school" seems to be the most appropriate site for an inservice training program of the proposed model.

Inservice Staff: This includes an advisory board, a chairman and a group of advisors, Project Director and researcher, project researchers, research assistants, inservice agents or inservice instructors, and secretary or other assistants. The identification of the inservice staff should be done during the planning stage. The continuous chain of communication between all staff members is necessary for the program success. The planning for learning experiences should be initiated by all inservice instructors. A meeting or a workshop to familiarize these instructors with the overall profile of the model/project, content, materials, and
method of teaching should be done prior to the inservice sessions. Two sets of inservice agents is recommended for each inservice training site. That is, SET A stays with participants from school cluster A for the period of three years. SET B stays with participants from school cluster B for the period of three years. This is to guarantee the consistency of the inservice procedure and format. Both parties, participants and inservice agents, have enough time to become familiar with each other. All inservice instructors have to report to the central office after each inservice session is concluded. This includes submitting the evaluation forms filled out by the participants.

Participants: This investigator recommends that each school cluster select 30 teachers - three from each school provided that there are 10 schools in a cluster - based on the criteria suggested in the selection of participants during planning stage. These 3 teachers are: representatives from each strata: grades 1-2, grades 3-4, and grades 5-6. Five administrators from each school cluster are highly recommended to attend an inservice training program along with the teachers. The main purpose is to hold them accountable for whatever is going on in each inservice training session. The administrators' roles are different from that of the teachers'. The teachers attend the inservice sessions to learn more of the content of elementary school mathematics of their grade level, to become a resource person in their
school, and to become an inservice agent in their school cluster. The administrators' roles are: (1) to keep up with what is going on in each inservice session; (2) to be able to assist teachers in any way they can including acting as a mediator between the project teachers and the inservice agent(s); (3) to make intervisitations at least once a semester and observe teachers in action. They will be required to submit observation forms to the central office at the end of each semester. The summary of these observations will be discussed at the beginning of each inservice year.

Because both teachers and administrators have to commit themselves in these distinguished roles for a three year period, the Thai Committee of Experts highly recommended that some form of incentive be provided to keep them stimulated.

Inservice Activities. Suggested activities are listed in Table 3. For the first three hours of each inservice day (6 hours per day) the time is organized as follows:

- 10 min. on Warm-up Activity
- 50 min. on Modelling the Missouri Plan
- 110 min. on Teacher Activities; i.e., construction of teaching/learning materials, cooperative group activity, developing lesson plans, and laboratory work
- 10 min. on Conclusion
The afternoon session will start with a warm-up activity and cooperative group activity related to the topic(s) being introduced during the morning session. Because the cooperative group has been proven effective in terms of achievement, acceptance of differences, and attitudes (Appendix DD), this model adapts the use of cooperative groups (Appendix U) throughout the inservice session. That is, within the 50 minutes of modelling the Missouri Plan there will be a series of lecture-discussions on mathematical concepts. Cooperative group activities will be used to enhance the concept being introduced. Teacher activities stress the construction of teaching/learning materials or planning a lesson to take back to their classroom. All activities conducted during the teacher activity time are done in cooperative groups. This is to get teachers used to working as a team rather than individually. Toward the end of the day's session, teachers are encouraged to share their work. The main purpose is to get teachers used to expressing their views and accepting the views of others. Teachers are expected to implement this strategy with their students. Through cooperative effort, each teacher will return to their school with sufficient amount of ready made lesson plans or manipulative materials. An example of a daily plan on the use of calculators stressing cooperative group effort is provided in Appendix T.
Follow-up Activities: The success of this model rests upon the fact that teachers can transfer learning experiences acquired during the inservice sessions into the classrooms. A regular monthly classroom visit by the inservice agents, a school cluster supervisor, or a principal is recommended. This is one of many reasons why school cluster supervisors and principals should participate in an inservice session. If the supervisors have attended the inservice sessions along with the teachers, they are well aware of what has been going on in each inservice session. Therefore, if the teachers have any questions or problems regarding the implementation of a certain concept or procedure, the supervisors can help teachers solve the problems. In case the supervisors themselves do not know the answers, they can act as a mediator contacting the inservice instructors or finding information from other sources for the teachers. As a rule, they have access to the communication system of the school cluster to do so.

A Plan for Evaluation. An evaluation plan is divided into two parts: (1) An evaluation of the model and (2) an evaluation of the project teachers.

(1) An Evaluation of the Model. Suggested criteria which should be included are: an ability of the inservice agent in carrying out the inservice session, an appropriateness of the selected topics, the development of new
teaching skills and instructional materials, were expected outcomes achieved, time, general atmosphere, site, meeting room, and handouts.

(2) An Evaluation of the Project Teachers. The process is divided into the following steps:

During the first year, teachers will be expected to implement an adapted version of the Missouri Model. Classroom observations utilizing a classroom observation sheet adapted from the Missouri Model is recommended to be used to code teachers' instructional time and organization (Appendix V). The coded observation data will be translated on a classroom observation summary sheet (Appendix W and/or X) by the research assistants. An evaluation as to how effective a teacher can use manipulative materials is recorded on an Evaluation Scale for Using a Manipulative in Teaching Elementary Mathematics (Appendix EE). The purpose of the first year evaluation is to evaluate how well teachers organize their instructional time and how appropriate and how often manipulative materials are used in the classroom. The findings will be shared with the project teachers during the first inservice session of the second year. The investigator believes that teachers should be informed of their performance and allowed to offer suggestions as to how to make changes in order to do a better job in a following year.

The second year continues to evaluate the implementation of the Missouri Model. Observation is focused on how well the
teachers can implement the Missouri Plan in their teaching. The same classroom observation sheet, the classroom observation summary sheet, and the Evaluation Scale for Using a Manipulative in Teaching Elementary Mathematics are used. The monthly observations are, again, done by the inservice instructors, a supervisor, a principal, or the research assistants. Since the main objective of the second year training is to train teachers to become a resource person in their school, teachers are advised to keep a daily record of service. This record of service should describe in detail the types of service they have provided to their fellow teachers. For example, a discussion over a certain lesson, a demonstration of how to utilize some manipulative materials in the teaching of a particular concept to a whole group of teachers or to a teacher. An example of a record of service form is provided in Appendix Z. The findings from the data collected will be shared with the teachers during the first inservice meeting of the third year. Teachers are encouraged to offer input.

The third year's evaluation is focused on how well teachers can perform as an inservice agent. This is more or less a self-evaluation process. During the third year, the teachers are provided with opportunities to conduct inservice training sessions in their school. The teachers are expected to model the Missouri Plan while conducting an inservice session. A monthly intervisitation will be done by an
inservice agent, a research assistant, a supervisor, or a principal. The observation forms used are the same as those used in the first and second year. The teachers will also be evaluated by the participants. A sample of a participant's evaluation form from the East Baton Rouge Parish School System is provided in Appendix FF. A version of this form can easily be adapted for use by Thai teachers. Since the main objective of the third year training is to provide opportunities for teachers to conduct inservice sessions in their school, the teachers are required to keep a record of inservice activities they have conducted throughout the year. An example of a record of inservice activity is provided in Appendix BB.

While observation is suggested as the basic technique of evaluation, other techniques; i.e., questionnaires, interviews, rating scales, and different forms of formative and summative evaluation should also be used (Wade, 1984). Some examples of these instruments are: Levels of Use (LOU), developed by Hall, et al. (1975), is a commercially available interview instrument used to reveal behavior not occurring during observation times. It can also help an interviewer to get past events as well as relationships that cannot be observed. The Stages of Concern Questionnaire (Hall, 1978) is an instrument used to measure participants' developmental progress regarding their level of concern.
Summary

In this chapter the model for inservice in mathematics education was described. The model is developed in accordance with a synthesis from a review of related literature, the survey data, input from a Thai committee of experts, and the social and economic factors in Thailand.

The chapter includes: (1) Introduction; (2) rationale for model objectives; (3) a conceptual framework of a model for an inservice training in elementary mathematics education; and (4) a chapter summary. The model for inservice consists of the following components: (1) A suggested list of objectives; (2) suggested learning experiences; (3) suggested mathematics topics; (4) a suggested method of delivery; (5) an organizational scheme; and (6) a plan for evaluation. The Missouri Model has been adapted to be used as a guideline in developing an instrument to measure the utilization of the instructional time of each project teacher. All inservice activities utilize cooperative group activities.
CHAPTER 6
Summary, Conclusions and Recommendations

This chapter presents a summary of the study, the conclusions drawn from the study, and recommendations related to the implementation of the developed model for inservice mathematics education of primary school teachers in Thailand.

Summary of Findings

The purpose of the study was twofold. First, it was to survey the existing needs of mathematics inservice education for primary school teachers in Thailand in order to determine the demographic information about the teachers, the teachers' needs for the knowledge of the content and methods in the teaching of mathematics, the views and preferences of teachers on mathematics inservice training agents, the time and day options, and whether teachers would volunteer or need an incentive to participate in the inservice training. Secondly, the study attempted to develop a model for a systematic inservice mathematics education program based on the survey findings and other research findings from a review of literature relevant to inservice training and the learning of mathematics.

The procedure used in gathering data for this study included the review of literature on inservice mathematics education and other related theories, documentary analysis,
questionnaire, governmental publications and documents, and official correspondence. A historical analysis of Thai educational system and structure of Thai primary education curriculum was made. Literature dealing with inservice education for primary school teachers both in the United States and in Thailand was analyzed and described. Problems of instructional quality especially in primary school mathematics teaching were raised with a focus on the role that inservice training programs could play a significant role in solving these problems. The analyzed survey data was used as a means to identify needs of the teachers and their preferences for inservice organization and as a basis for the development of the inservice model.

The most crucial aspect of the designed model is the need for important decision-making towards the organization of a systematic inservice mathematics education for primary school teachers in Thailand. The suggestion was made for a cooperative effort of representatives from all the institutions involved in any respect of primary education. The model also called for other policy decisions related to selection of inservice participants; selection of date, time, and place; physical facilities; content of the inservice program; selection of inservice agents, and implementation of the program. Procedurally, the model described objectives for the general program, suggested learning experiences, suggested mathematics topics, a suggested method of delivery, an
organizational scheme, and a plan for evaluation.

Conclusions

The conclusions are drawn from the evidence obtained from a review of literature, the findings of the survey, the existing social and economical setting in Thailand, and input from a Thai Committee of Experts in elementary and mathematics education.

A review of literature pertinent of the present study revealed numerous findings in the area of inservice education and the teaching of primary school mathematics. Some important findings are as follows:

1. Many approaches are being practiced in inservice mathematics education with considerable degree of success. These are ranged from national, statewide, and local school district programs.

2. Theoretically, teachers need to be involved in the planning of goals, content, and instructional approaches of inservice education. In reality, governmental bodies have played an active role in laying down national objectives and policy for inservice education since they are the ones who provide funds. These policies are continually revised in light of achievements or failures in inservice objectives.
3. For maximum benefit, inservice should relate to needs of teachers, and should actively involve teachers both in planning and in implementing the program.

4. Provided teachers’ readiness and motivation, supports from the central government, available physical facilities, and capable inservice agents, schools can benefit from the inservice programs.

5. A systematic and relevant set of evaluation procedures is a key to successful inservice education programs.

The findings from the survey can be concluded as follows:

1. The majority of teachers are willing and ready to participate in inservice mathematics programs in order to upgrade their mathematical knowledge and to teach mathematics better. However, some forms of incentives are highly recommended by the Thai Committee of Experts in elementary and mathematics education when a cycle of the program is longer than one year period.

2. The majority of Thai primary teachers strongly set their first priority in receiving their inservice training in classroom procedures and materials and children's learning over the mathematical content knowledge. They prefer receiving their training
from university professors who have direct experiences in the teaching of elementary school.

3. Opportunities for retraining in primary mathematics in Thailand have been scanty and have not reached many teachers.

4. It appears that there is an absence of a definite policy for a systematic retraining of primary teachers in the area of mathematics.

Based on the information received from the review of the literature, the findings of the survey, the recommendations of the Thai Committee of Experts in elementary and mathematics education, as well as the significance and needs for quality mathematics teaching in Thailand, the inservice program should possess the following characteristics:

1. It should be a long sustaining process - at least an academic year long where the concentration is placed on a summer vacation and semester brakes and a lot of follow-up activities in each monthly meeting between semester brakes.

2. Primary teachers should be retrained not only in the content area but also in related area of child development, new teaching techniques, construction and use of teaching materials, effective utilization of classroom time, and working cooperatively with other fellow teachers.
3. The procedure of the training should emphasize the activity approach to learning mathematics and the application of mathematics to other disciplines as well as to everyday practice.

4. The organization of the program should involve needed decision, careful planning, and a continuous evaluation procedure.

**Recommendations**

It is this investigators' philosophy that inservice training programs should help the teachers already in the schools to improve their knowledge of subject matter, to increase their understanding and appreciation of the teaching materials they use, and to improve their teaching skills as well as the effective utilization of the instructional time. The inservice training program should provide depth and professional competence. The present study represented an attempt to develop a systematic inservice training model for Thai primary school teachers. Even though there are some limitations such as budget and human resources, the Thai Committee of Experts in elementary and mathematics education affirmed that the proposed model is practical to be implemented in a smaller scale having one or two school clusters. What is needed is a concerted effort of all groups interested in improving the quality of mathematics teaching, of education in general, and in primary education in
particular. These efforts will necessarily include adopting new rules, prescribing new procedures, changing and providing materials, altering the functions of some officials, or creating temporary organizational structures such as experimental or pilot programs. Above all, the supports in terms of encouragement, stimulation, and morale towards the acceptance of improved practices are needed.

Recommendations from the present study are divided into three categories: (1) recommendations for implementation, (2) recommendations for primary teacher training, (3) recommendations for further research.

**Recommendations for Implementation**

To be effective, the inservice model described above would need the adaptation of certain governmental policies to guide its planning and procedures. There is a need for a mediator or central body that would be in charge of resource integration and coordinate the different inservice activities at the central and local levels. A certain policy is needed on how to provide incentives to both teachers and administrators who have committed themselves to the project for a three-year period. In order to keep teachers and administrators motivated, the Ministry of Education through the Institute for the Promotion of Teaching Science and Technology should begin to employ evaluation and promotion procedures based on performance rather than on time criteria.
The investigator recommends that the Institute for the Promotion of Teaching Science and Technology be the central inservice coordinating body who is responsible for program planning both in the urban and rural areas. This way, it is easier for the Institute to make the most use of human and physical resources. Since the effectiveness of the model depends upon careful planning among all parties involved, adequate time should be allowed for planning before implementing the first phase of the model.

Recommendations for Primary Teacher Training

Primary teachers are recognized as generalist teachers who are responsible for teaching all subject areas. It is the fact that the longer these teachers stay on the job, the more they need more specific retraining in skill subjects, mathematics and Thai language as well as in other subject areas such as life experience education, character development area, work-oriented area, and English language. Therefore, for the general upgrading of primary teachers, similar systematic inservice programs in other subject areas other than mathematics should also be organized. Other than participating in the proposed model, a primary teacher should also be encouraged to enroll in part time and summer courses at any university he/she selects.
Recommendations for Further Research

The most direct follow-up to the present study would be to field test the effectiveness of the various aspects of the inservice model. Some other identified problems for further research are listed below:

1. The development and testing of various materials/activities of instruction for inservice mathematics education should be conducted.
2. The appropriateness of the selection of the participants should be considered.
3. The role of universities and teacher colleges in the service education of primary school teachers should be explored.
4. The role of community and of teachers' organizations in providing inservice education to teachers should be examined.
5. The effectiveness of various instructional approaches in mathematics should be evaluated.
6. Correlation between pupil achievement and inservice mathematics education of the teachers should be determined.
7. Correlation between the effectiveness of the utilization of the instructional time and inservice mathematics education of the teachers should be determined.
8. The strengths and weaknesses of the various aspects of the proposed model should be tested.
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APPENDICES
APPENDIX A

Structure of the Present School System

[Diagram showing the structure of the school system, with stages labeled from Primary Education to Higher Education, including Teacher Training, University, Vocational Technical, Military Police, and Music/Dramatic Arts.

Approximate Ages:
- Primary Education: 6-13
- Secondary Education: 13-16
- Undergraduate: 16-19
- Graduate: 20-24

Source: EDUCATION IN TANZANIA, the Office of the National Education Commission, Office of the Prime Minister, 1970.]
APPENDIX B

- Instructional Time by Grade (unit: %)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Skill</th>
<th>Life Experience</th>
<th>Character Development</th>
<th>Work Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>50%</td>
<td>15%</td>
<td>25%</td>
<td>10%</td>
</tr>
<tr>
<td>II</td>
<td>50%</td>
<td>15%</td>
<td>25%</td>
<td>10%</td>
</tr>
<tr>
<td>III</td>
<td>35%</td>
<td>20%</td>
<td>25%</td>
<td>20%</td>
</tr>
<tr>
<td>IV</td>
<td>35%</td>
<td>20%</td>
<td>25%</td>
<td>20%</td>
</tr>
<tr>
<td>V</td>
<td>25%</td>
<td>25%</td>
<td>20%</td>
<td>30%</td>
</tr>
<tr>
<td>VI</td>
<td>25%</td>
<td>25%</td>
<td>20%</td>
<td>30%</td>
</tr>
</tbody>
</table>

- Minimum instructional time: 1,000 hours per academic year (G.I-G.IV)
  - Each instructional period is equal to 20 minutes
  - Each instructional session may comprise more than one instructional period, depending on the nature of educational activities and the learners' capability for absorption at different ages
  - The composition and the schedule of the school timetable vary from school to school, depending on the school's own judgment as to what would be the best education for its pupils, given the available educational resources, local needs and conditions

Aspects of Primary Education in Thailand: An Introduction of The National Primary Education Commission
(August 1984)
APPENDIX C

Education in Thailand of the Office of the National Education Commission, Office of the Prime Minister (May 1980)
APPENDIX D

STUDENT/POPULATION RATIO BY LEVEL OF EDUCATION (1981)

- Higher Education: 4.4%
- Upper Secondary: 20.5%
- Lower Secondary: 31.1%
- Primary: 96.6%
- Pre-Primary: 9.2%

APPENDIX E

Organization Structure of a Cluster School

Grass-Roots Networking for Primary Education: Case Studies.
APPENDIX F

Roster of Experts
A Panel of Experts of Chiraporn Sirithavee's Inservice Model

1. Mrs. Normsri Cate
HIGHEST DEGREE EARNED: Ph.D. (Elementary Education)
INSTITUTE: University of Oklahoma
AREA OF EXPERTISE: Curriculum Instruction, Mathematics Teaching
POSITION: Assistant Professor
ADDRESS: Department of Elementary Education
Chulalongkorn University
Phayathai Rd. Bangkok 10500
Thailand
TELEPHONE: (W) 215-3571
(H) 465-6331, 465-0717

2. NAME: Mrs. Mali Chaigomol
HIGHEST DEGREE EARNED: B.Ed. (Elementary Education)
INSTITUTE: Sri Nakharinwirot University (Prasarnmitr Campus)
AREA OF EXPERTISE: Classroom Teaching Technique
POSITION: Assistant Director
ADDRESS: Praneilwatchara School
45 Sukhumvit Rd.
Tambol Paknam, Ampur Muang
Samut Prakarn 10270
Thailand
TELEPHONE: (W) 394-2070
(H) 399-4000-4 Ext. 56

3. NAME: Mr. Chuchart Churngslard
HIGHEST DEGREE EARNED: M.Ed. (Elementary Education)
INSTITUTE: Chulalongkorn University
AREA OF EXPERTISE: Teaching/Learning Activities, Individualized Instruction
POSITION: Assistant Professor
ADDRESS: Dhonburi Teacher College
Issarapab Rd. Dhonburi
Bangkok 10600, Thailand
TELEPHONE: (W) 466-1087, 465-4750
(H) 585-9136
4. NAME: Mrs. Patrakoon Jariyavidyanont  
HIGHEST DEGREE EARNED: Ph.D. (Mathematics Education)  
INSTITUTE: Indiana University  
AREA OF EXPERTISE: Curriculum Development  
POSITION: Head Department of Mathematics  
ADDRESS: The Institute for the Promotion of Teaching Science and Technology  
924 Sukhumvit Rd.  
Bangkok 10110, Thailand  
TELEPHONE: (W) 392-4020-9 Ext. 185

5. NAME: Mr. Suworn Kanjanamayoon  
HIGHEST DEGREE EARNED: M.A.T. (Teaching Math)  
INSTITUTE: Kasetsart University  
AREA OF EXPERTISE: Teaching Materials Construction and Development  
POSITION: Head of Industrial Arts  
ADDRESS: The Institute for the Promotion of Teaching Science and Technology  
924 Sukhumvit Rd.  
Bangkok 10110, Thailand  
TELEPHONE: (W) 392-4020-9 Ext. 185

6. NAME: Mrs. Chaweewan Kirtikara  
HIGHEST DEGREE EARNED: Ph.D. (Educational Administration)  
INSTITUTE: Kent State University, Ohio  
AREA OF EXPERTISE: Educational Administration, Textbook and Supplementary Materials Development  
POSITION: Head Publishing Department  
ADDRESS: Kurusapa Business Organization  
Phahonyothin 8 (Soi Sailom)  
Phayathai, Bangkok 10400  
Thailand  
TELEPHONE: (W) 278-3071

7. NAME: Mr. Preecha Nowyenphon  
HIGHEST DEGREE EARNED: M.Ed. (Mathematics)  
INSTITUTE: Sri Nakharinwirot University (Prasarnmitr Campus)  
AREA OF EXPERTISE: Teaching Material Construction, Mathematics Games  
POSITION: Instructor  
ADDRESS: Sukhothai Thammathirat Open University  
9/9 Moo 9 Tambon Bangphud Changwatana Rd. Pakkred  
Nonthaburi 11120, Thailand  
TELEPHONE: (W) 573-0030
8. NAME: Mrs. Somprasong Pinchinda  
HIGHEST DEGREE EARNED: M.Ed.  
INSTITUTE: Sri Nakharinwirot University (International Institute for Child Study)  
AREA OF EXPERTISE: Teaching Activities, Curriculum Evaluation  
POSITION: Director of Art & Culture Center  
ADDRESS: Suan Dusit Teacher College  
Rachasrima Rd. Dusit  
Bangkok 10300, Thailand  
TELEPHONE: (W) 243-2253-5  
(H) 573-4993

9. NAME: Mrs. Pawinee Srisukvatananan  
HIGHEST DEGREE EARNED: Ph.D. (Educational Measurement and Evaluation  
INSTITUTE: Chulalongkorn University  
AREA OF EXPERTISE: Curriculum Evaluation, Inservice Program Evaluation  
POSITION: Assistant Professor  
ADDRESS: Faculty of Education  
Kasetsart University  
Phahonyothin Rd. Bangkhen  
Bangkok 10903, Thailand  
TELEPHONE: (W) 579-3020, 579-1541  
(H) 278-4324, 270-1651

10. NAME: Mrs. Piyavadee Wongyai  
HIGHEST DEGREE EARNED: Ph.D. (Mathematics Education)  
INSTITUTE: Indiana University  
AREA OF EXPERTISE: Mathematics Curriculum Development (Elementary)  
POSITION: Associate Professor  
ADDRESS: Faculty of Science  
Sri Nakharinwirot University  
Prasarnmitr Campus  
Soi 23, Sukhumvit Rd.  
Bangkok 10110, Thailand  
TELEPHONE: (W) 258-3989  
(H) 234-2393
11. NAME: Mrs. Shirley Yoodee
HIGHEST DEGREE EARNED: B.S. (Mathematics)
INSTITUTE: Chiangmai University
AREA OF EXPERTISE: Construction of Textbooks and Teacher's Manuals
POSITION: Resource Person of Elementary Mathematics Education
ADDRESS: The Institute for the Promotion of Teaching Science and Technology
924 Sukhumvit Rd.
Bangkok 10110, Thailand
TELEPHONE: (W) 392-4020-9 Ext. 185
February 8, 1989

Dear ...............:

Miss Chiraporn Sirithavee is an official on leave from Kasetsart University Laboratory School, College of Education, Kasetsart University, Bangkok, Thailand. She is presently a doctoral student in Curriculum & Instruction (Elementary Mathematics Education) at Louisiana State University, Baton Rouge, Louisiana, U.S.A. She is beginning her research for the doctoral dissertation, entitled "An Inservice Training Program in Mathematics Education for Thai Elementary School Teachers: A Proposed Model." The Delphi technique has been selected as the means to evaluate her model. To complete this process, she needs to organize a panel of expert to evaluate her model.

Because of your distinguished expertise in elementary and/or mathematics education, I am, as her major professor, inviting you to serve on the evaluation panel.

Your cooperation, assistance, and participation in this important research endeavor will be greatly appreciated.

Sincerely,

Diane Miller, Ph.D.
Assistant Professor of Mathematics Education
APPENDIX H

Copy of Response Letter
Mrs. Normsri Cote
Department of Elementary Education
Faculty of Education
Chulalongkorn University
Phayathai Rd. Bangkok 10500
Thailand

Dr. Diane Miller
Department of Curriculum & Instruction
Peabody Hall Rm 210
Louisiana State University
Baton Rouge, Louisiana 70803-4728

February 21, 1989

Dear Dr. Miller

In reference to your letter dated on February 10, 1989, I am pleased to accept your invitation to serve on the panel of experts to evaluate Miss Chiraporn Sirithavee's proposed model. I am willing to cooperate, assist, and participate in any way I can in this important research endeavor.

I look forward to working with you on this matter. Should there be any questions please feel free to contact me at the above address.

Sincerely,

Mrs. Normsri Cote
Assistant Professor
Mrs. Mali Chaigomol
Assistant Director, Praneilwatchara School
45 Sukhumvit Rd.
Tambol Paknam, Ampur Muang
Samut Prakarn 10270
Thailand

Dr. Diana Miller
Department of Curriculum & Instruction
Peabody Hall Rm. 210
Louisiana State University
Baton Rouge, Louisiana 70803-4728

February 21, 1989

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I look forward to working with you on this matter. Should there be any questions please feel free to contact me at the above address.

Sincerely,

Mrs. Mali Chaigomol
Assistant Director, Praneilwatchara School
Mr. Chuchart Churngslard  
Dhonburi Teacher College  
Issarapob Rd. Dhonburi  
Bangkok 10600, Thailand  

Dr. Diane Miller  
Department of Curriculum & Instruction  
Peabody Hall Rm 210  
Louisiana State University  
Baton Rouge, Louisiana 70803-4728  

February 21, 1989  

Dear Dr. Miller:  

In reference to your letter dated on February 10, 1989, I am pleased to accept your invitation to serve on the panel of experts to evaluate Miss Chiraporn Sirithavee's proposed model. I am willing to cooperate, assist, and participate in any way I can in this important research endeavor.  

I look forward to working with you on this matter. Should there be any questions please feel free to contact me at the above address.  

Sincerely,  

Chuchart Churngslard  
Assistant Professor
February 21, 1989

Dear Dr. Miller

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I look forward to working with you on this matter. Should there be any questions please feel free to contact me at the above address.

Sincerely,

Mrs. Patrakoon Jariyavidyanont
Head Department of Mathematics
Mr. Suworn Karnjanamayoon  
Office of the Superintendent  
Ministry of Education  
Rachadumnern Nok Rd  
Bangkok 10200, Thailand

Dr. Diane Miller  
Department of Curriculum & Instruction  
Peabody Hall Rm 210  
Louisiana State University  
Baton Rouge, Louisiana 70803-4728

February 21, 1989

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I look forward to working with you on this matter. Should there be any questions please feel free to contact me at the above address.

Sincerely,

Suworn Karnjanamayoon

Mr. Suworn Karnjanamayoon  
Instr.
March 28, 1989

Dear Dr. Miller:

In reference to your letter dated on February 10, 1989, I am pleased to accept your invitation to serve on the panel of experts to evaluate Miss Chiraporn Sirithavee's proposed model. I am willing to cooperate, assist, and participate in any way I can in this important research endeavor.

I look forward to working with you on this matter. Should there be any questions please feel free to contact me at the above address.

Sincerely,

Chaweewan Kirtikara.

Mrs. Chaweewan Kirtikara, Ph.D.
Mr. Preecha Nowyenphon
Sukhothai Thammathirat Open University
9/9 Moo 9 Tambon Bangphud
Changwatana Rd. Pakkred
Nonthaburi 11120, Thailand

Dr. Diane Miller
Department of Curriculum & Instruction
Peabody Hall Rm 210
Louisiana State University
Baton Rouge, Louisiana 70803-4728

February 21, 1989

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I look forward to working with you on this matter. Should there be any questions please feel free to contact me at the above address.

Sincerely,

Preecha Nowyenphon
Mr. Preecha Nowyenphon
Instructor
February 21, 1989

Dear Dr. Miller:

In reference to your letter dated on February 10, 1989, I am pleased to accept your invitation to serve on the panel of experts to evaluate Miss Chiraporn Sirithavee's proposed model. I am willing to cooperate, assist, and participate in any way I can in this important research endeavor.

I look forward to working with you on this matter. Should there be any questions please feel free to contact me at the above address.

Sincerely,

Mrs. Somprasong Pinchinda
Director of Art & Culture Center
February 21, 1989

Dear Dr. Miller:

In reference to your letter dated on February 10, 1989, I am pleased to accept your invitation to serve on the panel of experts to evaluate Miss Chiraporn Sirithavee's proposed model. I am willing to cooperate, assist, and participate in any way I can in this important research endeavor.

I look forward to working with you on this matter. Should there be any questions please feel free to contact me at the above address.

Sincerely,

[Signature]

Mrs. Pawinee Srisukvatananan
Assistant Professor
February 21, 1989

Dear Dr. Miller,

In reference to your letter dated on February 10, 1989, I am pleased to accept your invitation to serve on the panel of experts to evaluate Miss Chiraporn Sirithavee's proposed model. I am willing to cooperate, assist, and participate in any way I can in this important research endeavor.

I look forward to working with you on this matter. Should there be any questions please feel free to contact me at the above address.

Sincerely,

Mrs. Piyavadee Wongyai
Associate Professor
Mrs. Shirley Yoodee  
The Institute for the Promotion of  
Teaching Science and Technology  
924 Sukhumvit Rd.  
Bangkok 10110  
Thailand  

Dr. Diane Miller  
Department of Curriculum & Instruction  
Peabody Hall Rm 210  
Louisiana State University  
Baton Rouge, Louisiana 70803-4728  

February 21, 1989  

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I look forward to working with you on this matter. Should there be any questions please feel free to contact me at the above address.  

Sincerely,  

Mrs. Shirley Yoodee  
Inservice Agent of Elementary Mathematics Education
APPENDIX I

A Letter to the Thai Committee of Experts #1
(translated)

5116 Highland Rd. #7
Baton Rouge, La 70808

March 15, 1989

Expert's name and address

Dear:.................

The prospectus for my dissertation research has just been approved by my dissertation committee. Their signatures which indicate their approval for me to continue with my research appear on the first page of the enclosed document. The committee has recommended some minor changes, mostly typing errors and sentence structures, which will not distort the true meaning of the content. In order to allow you sufficient time to read Chapters 1-4 to acquire a general idea before examining a model which I will present in Chapter 5, Dr. Diane Miller, my major professor, and I decided to mail you this draft. Chapter 5 will be mailed to you as soon as possible.

Since I received a letter of confirmation from Dr. Piyawadee Wongyai, Mrs. Mali Chaigomol, Mr. Chuchart Chunngsland, and Dr. Normsri Cate after putting together Chapter 1-4 and submitting to the dissertation committee, these names are not included in the APPENDIX H. As of this writing, I have not received a letter of confirmation from the following experts: Mrs. Somprasong Pinchinda, Dr. Chaweean Kirtikara, and Mr. Suworn Karnjanamayoon. All names will be included in a final document.

Please feel free to offer input, suggestions and/or recommendations where appropriate. Thank you in advance for your cooperation in this important matter.

Sincerely,

(Miss Chiraporn Sirithavee)
A Letter to the Thai Committee of Experts #2
(translated)

Faculty of Education
Kasetsart University
Bangkok 10903

March 13, 1989

Expert's name and address

Dear:..................

I have been asked by Miss Chiraporn Sirithavee to organize the Thai Committee of Experts meetings. Please check in an appropriate space indicating when is the best time for you to examine Miss Chiraporn Sirithavee's proposed model.

____ Tuesday, May 9, 1989
____ Tuesday, May 16, 1989
____ Tuesday, May 23, 1989

Thank you for your cooperation in this important matter.

Sincerely,

(Mrs. Pawinee Srisukwatananan)
APPENDIX K

A Letter to the Thai Committee of Experts #3
(Translated)

5116 Highland Rd. #7
Baton Rouge, La 70808

April 22, 1989

Expert's name and address

Dear: ...............

Enclosed is a copy of Chapter 5: A Model for Inservice Mathematics Education. Please feel free to offer input, suggestions and/or recommendations where appropriate. I will be contacting you in the near future to arrange a meeting time and place to discuss your input. Please be sure to bring this document and Chapter 1-4 which has been mailed to you on March 15th to this committee meeting.

Thank you very much for your cooperation in this important matter.

Sincerely,

(Miss Chiraporn Sirithavee)
A Letter to the Thai Committee of Experts #4
(translated)

273/10 Moo Ban Supawan
Petchkasem 82, Pasrichareon
Bangkok 10160

May 4, 1989

Expert's name and address

Dear: .............

In reference to my letters dated March 15, 1989, enclosing a rough draft of Chapters 1-4, and April 22, 1989, enclosing a rough draft of Chapter 5, please contact me at 413-2215 if you have not yet received the document(s).

Dr. Pawinee has informed me that the following two meetings have been scheduled.

First Meeting:  
Tuesday, May 9, 1989, 9:30 a.m. - 11:30 a.m. in Meeting Room 1 of Faculty of Education, Kasetsart University

Second Meeting:  
Tuesday, May 23, 1989, 1:30 p.m. - 3:30 p.m. in Meeting Room 1 of Faculty of Education, Kasetsart University

If you cannot attend the first meeting indicated, please be sure to submit your comments to me before May 16th so that I will have enough time to revise the model and prepare the document to be submitted for examination in the second meeting on May 23rd. You can also contact me at 413-2214.

Thank you very much for your cooperation in this important matter.

Sincerely,

(Miss Chiraporn Sirithavee)
APPENDIX M

A Panel of Thailand's Experts' First Committee Meeting
to Evaluate Miss Chiraporn Sirithavee's Dissertation,
Entitled "An Inservice Training Program in Mathematics Education for Thai Elementary School Teachers: A Proposed Model"

May 9, 1989
9:00 a.m. - 11:00 a.m.
Meeting Room #1
Faculty of Education
Kasetsart University
Bangkok, Thailand

<table>
<thead>
<tr>
<th>Name</th>
<th>Signature</th>
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<tbody>
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<td>Mrs. Normsri Cate</td>
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<td>Mrs. Shirley Yoodee</td>
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<tr>
<td>Mrs. Loretta Diane Miller</td>
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<tr>
<td>Miss Chiraporn Sirithavee</td>
<td>Chiraporn Sirithavee</td>
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</tbody>
</table>
APPENDIX N

Organization of Inservice Program in Mathematics Education for Thai Elementary Teachers (first draft)

FIRST YEAR:

SECOND YEAR:

THIRD YEAR:

FOURTH YEAR:
APPENDIX O

An Approval Form

Louisiana State University
College of Education

An Inservice Training Program in Mathematics Education
for Thai Elementary School Teachers:
A Proposed Model

by

Miss Chiraporn Sirithavee

A proposed model submitted to
Thailand's Panel of Experts
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

Approved, May 23, 1969

(date)

[Signatures]

[Signature]

[Signature]

[Signature]

[Signature]

[Signature]
APPENDIX P

A Panel of Thailand's Experts' Second Committee Meeting to Evaluate Miss Chiraporn Sirithavee's Dissertation, Entitled "An Inservice Training Program in Mathematics Education for Thai Elementary School Teachers: A Proposed Model"

May 23, 1989
1:30 p.m. - 3:30 p.m.
Meeting Room #1
Faculty of Education
Kasetsart University
Bangkok, Thailand

<table>
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<tr>
<th>Name</th>
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<td>Chiraporn Sirithavee</td>
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</tbody>
</table>
APPENDIX Q

Mathematics Topics for Inservice Training Programs
(first draft)
Mathematics Topics for Inservice Training Programs

UNIT 1: Problem Solving and Applications
Solving mathematical problems
Making up problem solving lessons

UNIT 2: Common and Decimal Fractions
Basic concepts and notations
Equivalent fractions
Decimal fractions
Fundamental operations with fractions
Ratio, Proportion, and Percent
Application of fractions to problems
Estimation Strategies

UNIT 3: Numeration and Place Value
Logical Thai number names and grouping patterns
Counting
Reading and writing number symbols and words
Place value in whole numbers
Estimation Strategies
Factors, multiples, and composites

UNIT 4: Set and Logical Games
Matching, joining and separating with limited use of notations and terminologies
Set operations

UNIT 5: Whole Numbers
Counting and one-to-one correspondence
Order and cardinality
The number line
The fundamental operations with whole numbers

UNIT 6: Measurement
Non-standard and logical measures
Metric System - length, weight, volume, capacity, area, and perimeter
Time, Temperature, and Money

UNIT 7: Basic Concepts of Geometry
Closed plane figures, points, lines, angles, and plane
Parallel lines
Solid shapes
Symmetry and congruence
Perimeter and area of plane figure
Simple geometric constructions including scaled drawings
Problem solving involving geometry
UNIT 8: Statistic, Probability and Graphs
Pictorial representation of data — pictogram, bar graph, line graph, and circle graph
Interpreting graphical data
Mean, median, mode
Simple ideas of probability

UNIT 9: Calculator and Computers
History of computing
Calculator/computer concepts/components
Calculator/computer in society
Calculator/computer in the teaching of mathematics
Software selection criteria

UNIT 10: Number Theory
Prime and composite
Factors, multiples, divisors
Divisibility rules
Exponents and exponential notation
APPENDIX R

Questionnaire
(translated)
A Questionnaire to Assess Elementary School Teachers' Inservice Training Needs in the Teaching of Elementary Mathematics

INSTRUCTION: This questionnaire is divided into 5 parts. Please answer ALL 5 parts.

PART 1

DEMOGRAPHIC INFORMATION

INSTRUCTION: Please make a check (✓) or fill out information where applied to you.

1.1 Gender

_____ male
_____ female

1.2 Teaching Experience

_____ 16 ---> years
_____ 11 - 15 years
_____ 6 - 10 years
_____ 0 - 5 years

1.3 Highest Degree Earned

_____ Ph. D.
_____ Master's
_____ Bachelor's
_____ Certificate (Below Bachelor's)
_____ Other (Please Specify)

1.4 Major:_____________________________________________________________________

1.5 Most Preferred Teaching Subject: _____________________________________________

1.6 Grade Level Taught

_____ Grade 1
_____ Grade 2
_____ Grade 3
_____ Grade 4
_____ Grade 5
_____ Grade 6
### TOPICS OF INTEREST

**INSTRUCTION:** Please indicate your interest in topics for an inservice training program by rating ALL the following topics. Place 1 by a topic that interests you a lot; a 2 by a topic that is somewhat interesting; and 3 by a topic that is of very little interest to you. Add topics not included in the list that are of interest to you in "others."

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td>1. How to teach numeration and place value.</td>
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<td></td>
<td>2. How to teach the addition, subtraction, multiplication, and division of whole numbers at your grade level.</td>
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<td>3. How to teach measurement, including the metric system.</td>
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<td>4. How to teach fractions; basic concepts and operations.</td>
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<td></td>
<td>5. How to teach geometry at your grade level.</td>
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<td></td>
<td>6. How to teach decimals; basic concepts and operations.</td>
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<td>7. How to teach graphing, probability, and statistics at your grade level.</td>
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<td></td>
<td>8. How to teach problem solving.</td>
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<td>9. How to utilize calculators in the teaching of mathematics at your grade level.</td>
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<td>10. How to utilize computer technology in the teaching of mathematics at your grade level.</td>
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<td></td>
<td>11. How to utilize manipulatives in the teaching of math at your grade level.</td>
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<td></td>
<td>12. How to design and construct math center materials.</td>
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<td></td>
<td>13. How to decrease students' anxiety towards math and improve their attitudes.</td>
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</tbody>
</table>
How to assess error patterns and instruct for their correction.

Others (Please specify) __________________________

PART 3

TIME AND NUMBER OF DAY OPTIONS

INSTRUCTION: Please make a check (✓) where appropriate.

3.1 TIME OPTIONS

1. on Saturdays
2. after school
3. during the first semester break (October)
4. during the summer (April - May)
5. others (Please specify) __________________

3.2 NUMBER OF DAYS

1. one day
2. two days
3. three days
4. four to five days
5. others (Please specify) ____________
PART 4

PREFERRED INSERVICE AGENT

INSTRUCTION: Please rank in order of preference, 1 being first choice and 7 being last choice.

1. An experienced teacher in your cluster.
2. An experienced teacher from another cluster.
3. An in-province content specialist.
5. A university professor who has direct experiences in elementary school.
6. A university professor who has no direct experiences in elementary school.
7. A curriculum or textbook specialist.

PART 5

VOLUNTEER OR NEED INCENTIVE

INSTRUCTION: Please check one:

Would volunteer
Need cluster incentive
APPENDIX S

Questionnaire Results
PART 1
Demographic Information

1.1 Gender 200 questionnaires were sent, 178 (89%) were returned.
73 (41%) males
105 (59%) females

1.2 Teaching Experience
42% 16 ---> years
35% 11 - 15 years
16% 6 - 10 years
7% 0 - 5 years

1.3 Highest Degree Earned
0% Ph.D.
5% Master's
87% Bachelor's
8% Certificate (Lower than Bachelor's)

1.4 Major
19% Mathematics Education
37% Science Education and Social Studies
44% Other

1.5 Most Preferred Teaching Subject
84% Mathematics
16% Other

1.6 Grade Level Taught (N = 104)
58% have taught grades 1-3
46% have taught grade 4
22% have taught grade 5
17% have taught grade 6
### Frequency Distribution Table

**Topics of Interest**

<table>
<thead>
<tr>
<th>TOPICS</th>
<th>N</th>
<th>MOST</th>
<th>MIDDLE</th>
<th>LEAST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How to teach numeration and place value</td>
<td>175</td>
<td>37(21%)</td>
<td>91</td>
<td>47</td>
</tr>
<tr>
<td>2. How to teach the addition, subtraction, multiplication, and division of whole numbers at your grade level</td>
<td>175</td>
<td>57(33%)</td>
<td>82</td>
<td>36</td>
</tr>
<tr>
<td>3. How to teach measurement, including the metric system</td>
<td>173</td>
<td>34(20%)</td>
<td>101</td>
<td>38</td>
</tr>
<tr>
<td>4. How to teach fractions, basic concepts and operations</td>
<td>166</td>
<td>125(75%)</td>
<td>41</td>
<td>8</td>
</tr>
<tr>
<td>5. How to teach geometry at your grade level</td>
<td>173</td>
<td>62(36%)</td>
<td>90</td>
<td>21</td>
</tr>
<tr>
<td>6. How to teach decimals; basic concepts and operations</td>
<td>175</td>
<td>72(41%)</td>
<td>81</td>
<td>22</td>
</tr>
<tr>
<td>7. How to teach graphing, probability, and statistics at your grade level</td>
<td>172</td>
<td>51(30%)</td>
<td>100</td>
<td>21</td>
</tr>
<tr>
<td>8. How to teach problem solving</td>
<td>175</td>
<td>128(73%)</td>
<td>35</td>
<td>12</td>
</tr>
<tr>
<td>9. How to utilize calculators in the teaching of math at your grade level</td>
<td>172</td>
<td>79(46%)</td>
<td>61</td>
<td>32</td>
</tr>
<tr>
<td>10. How to utilize computer technology in the teaching of math at your grade level</td>
<td>172</td>
<td>103(60%)</td>
<td>34</td>
<td>35</td>
</tr>
<tr>
<td>11. How to utilize manipulatives in the teaching of math at your grade level</td>
<td>174</td>
<td>138(79%)</td>
<td>30</td>
<td>6</td>
</tr>
<tr>
<td>12. How to design and construct math center materials</td>
<td>177</td>
<td>146(82%)</td>
<td>26</td>
<td>5</td>
</tr>
<tr>
<td>13. How to decrease students' anxiety towards math and improve their attitudes</td>
<td>176</td>
<td>126(72%)</td>
<td>43</td>
<td>7</td>
</tr>
<tr>
<td>14. How to assess error patterns and instruct for their correction</td>
<td>177</td>
<td>135(76%)</td>
<td>38</td>
<td>4</td>
</tr>
</tbody>
</table>
PART 3

Time and Number of Day Options

3.1 Time Options

0% ---> on Saturdays
0% ---> after school
68% ---> during the summer (April-May)
22% ---> during the first semester break (October)
10% ---> no answer

3.2 Number of Days

13% ---> 1-2 days
34% ---> 3 days
48% ---> 4-5 days
5% ---> no answer
PART 4

Frequency Distribution Table
Preferred Inservice Agent

N = 178

<table>
<thead>
<tr>
<th>Inservice agent</th>
<th>Most</th>
<th>Middle</th>
<th>Least</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. An experienced teacher in your cluster</td>
<td>37(21%)</td>
<td>65</td>
<td>40</td>
</tr>
<tr>
<td>2. An experienced teacher from another cluster</td>
<td>43(24%)</td>
<td>66</td>
<td>36</td>
</tr>
<tr>
<td>3. An in-province content specialist</td>
<td>46(26%)</td>
<td>68</td>
<td>32</td>
</tr>
<tr>
<td>4. An out-of-province content specialist</td>
<td>29(16%)</td>
<td>79</td>
<td>32</td>
</tr>
<tr>
<td>5. A university professor who has direct experiences in elementary school</td>
<td>164(92%)</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>6. A university professor who has no direct experiences in elementary school</td>
<td>16(9%)</td>
<td>54</td>
<td>64</td>
</tr>
<tr>
<td>7. A curriculum or textbook specialist</td>
<td>92(52%)</td>
<td>43</td>
<td>24</td>
</tr>
</tbody>
</table>

PART 5

Volunteer of Need Incentive

74% ---> would volunteer
26% ---> need cluster incentive
APPENDIX T

Missouri Model for Teaching Mathematics Effectively
PLEASE NOTE:

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These consist of pages: 192-195
APPENDIX U

Implementing Cooperative Groups

I. Establishing Groups (3-5 students)
   A. Student self select group
   B. Teacher randomly assigns students to group
   C. Teacher purposefully assigns students to create heterogeneous groups
      1. high- low achievers
      2. males - females
      3. whites - nonwhites
      4. leaders - followers
      5. best friends generally should not be grouped together

II. Establish Rules
   A. Everyone in group gets same grade on assignment
   B. Assign responsibilities
      1. Leader - Keeps everyone on task
      2. Supplier - Secure worksheets, manipulatives, materials, etc.
      3. Recorder - Records work to be turned-in
      4. Timer - Watches clock to keep group on time
      5. Submitter - Sees that all group members have signed an assignment sheet and submits it to the teacher
   C. Students must stay in their own group
   D. Teams cannot work together
   E. Each person in a group must say something to every other person in the group during the working period
   F. Only ask the teacher questions as a last resort, ask team members first
   G. If the teacher is consulted, everyone in the group must raise their hand
   H. If the solution process to the problem has many steps, each person in the group must contribute a step to the procedure
   I. The teacher can select anyone from the group to discuss the group's solution

III. Rewards
   A. If a team member presents a correct solution, the team gets "a point" added to the grade for this learning experience
   B. Each team member gets same credit for written work submitted
   C. Students work individually on examinations; but every time the group's average improves each member of the group gets "X" extra points added to the examination grade; or,
   D. When an individual's test average improves, each member of the group gets "X" extra points added to the examination grade
APPENDIX V

INSERVICE TRAINING PROGRAM IN MATHEMATICS EDUCATION
FOR THAI ELEMENTARY SCHOOL TEACHERS

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
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<tr>
<td>1. NON INSTRUCTIONAL</td>
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<td>1.3 Setting the example</td>
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<td>1.4 Distributing materials</td>
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<td>1.5 Clean-up/step-up materials</td>
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<td>1.6 Role playing</td>
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<td>2.1 Review of the day</td>
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<td>2.2 Exercise</td>
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<td>2.3 Check homework</td>
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<td>2.4 Mental computation</td>
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<td>2.5 Estimation</td>
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<td>3. LESSON DEVELOPMENT</td>
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<td>3.1 Teacher lead</td>
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<td>3.2 Teacher task</td>
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<td>3.3 Student task</td>
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<td>3.4 Student read</td>
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<td>3.5 Demonstration (teacher)</td>
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<td>3.6 Questioning</td>
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<td>3.7 Class task</td>
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<td>3.8 Use of manipulatives/lab (students)</td>
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<td>3.9 Write sheets/guided practice</td>
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<td>4. INSTRUCTIONAL ORGANIZATION</td>
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<td>4.1 Individual</td>
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<td>4.2 Small group</td>
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<td>4.3 Whole class</td>
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<td>5. WRAP-UP (teacher)</td>
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<td>6. SEAT WORK (teacher)</td>
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<tr>
<td>7. HOMEWORK ASSIGNMENT</td>
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<td>7.1 Number of problems</td>
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<td>7.2 Type of activity sheets</td>
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</tbody>
</table>

Designed by committee for use in the "Mathematics-Science Specialist Project" at Louisiana State University funded by the National Science Foundation, 1989. (Dr. Loretta Diane Miller, Project Director)
### APPENDIX W

Inservice Training Program in Mathematics Education for Thai Elementary School Teachers

Classroom Observation Summary Sheet (Monday)

<table>
<thead>
<tr>
<th>SCHOOL:</th>
<th>TEACHER:</th>
<th>GRADE:</th>
<th>M/D/Y:</th>
<th>OBSERVER:</th>
</tr>
</thead>
</table>

#### ACTIVITIES

<table>
<thead>
<tr>
<th>Activities</th>
<th>GOOD</th>
<th>FAIR</th>
<th>UNSATISFACTORY</th>
<th>POOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>28-15*</td>
<td>14-7</td>
<td>6-1</td>
<td>0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>10-6</td>
<td>5-3</td>
<td>2-1</td>
<td>0</td>
</tr>
<tr>
<td>Seat Work</td>
<td>10-6</td>
<td>5-3</td>
<td>2-1</td>
<td>0</td>
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<tr>
<td>Conclusion</td>
<td>2</td>
<td>1</td>
<td>1/2</td>
<td>0</td>
</tr>
</tbody>
</table>

**COMMENTS:**

* minutes used in the classroom
APPENDIX X

Inservice Training Program in Mathematics Education
for Thai Elementary School Teachers
Classroom Observation Summary Sheet
(Tuesday–Friday)

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>GOOD</th>
<th>FAIR</th>
<th>UNSATISFACTORY</th>
<th>POOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>8–6*</td>
<td>5–3</td>
<td>2–1</td>
<td>0</td>
</tr>
<tr>
<td>Lesson Development</td>
<td>25–15</td>
<td>14–8</td>
<td>7–1</td>
<td>0</td>
</tr>
<tr>
<td>Seat Work</td>
<td>15–11</td>
<td>10–6</td>
<td>5–1</td>
<td>0</td>
</tr>
<tr>
<td>Conclusion</td>
<td>2</td>
<td>1</td>
<td>1/2</td>
<td>0</td>
</tr>
</tbody>
</table>

COMMENTS:  

* minutes used in the classroom
APPENDIX Y

A Sample Unit on Calculators
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These consist of pages: 201-240
APPENDIX Z
A Record of Service

School: ........................................ Grade Taught: ..............
Semester: ...................................... Name: ..........................
Present position: .................................................................

<table>
<thead>
<tr>
<th>M/D/Y</th>
<th>TYPE OF SERVICE</th>
<th>LOCATION</th>
<th>REQUESTED BY</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>
APPENDIX AA

A Suggested Daily Lesson Plan of
Inservice Training Program in Mathematics Education
for Thai Elementary School Teachers
Second Year

SUGGESTED TIME:

08:30 a.m. - 11:30 a.m. MORNING SESSION

11:30 a.m. - 12:30 p.m. LUNCH

12:30 p.m. - 01:00 p.m. RECREATIONAL ACTIVITIES

01:00 a.m. - 04:00 p.m. AFTERNOON SESSION

SUGGESTED TOPIC: FRACTIONS

SUGGESTED SEQUENCE OF ACTIVITIES:

- Discuss and answer all questions teachers may have.
- Lecture in large group, small group, and individual.
- Workshop activities and demonstration.
- Construct a variety of teaching materials to teach fractions.
- Allow time for teachers to take turn demonstrating a lesson on fractions to the whole class. This can be done individually or in a small group. Teachers are asked to submit a copy of a lesson plan including a list of sources where they acquire information and/or materials.
- Share ideas/list with colleagues.
- Put together a bibliography or list of instructional resources.
- Allow teachers to make copies of ideas/list to take back to their school.

- Ask teachers to seek opportunities to implement the suggested activities in their classroom and/or demonstrate them to their fellow teachers in their school. Teachers are also asked to keep a record of their service.
APPENDIX BB

A Record of Inservice Activities

School: ......................... Grade Taught: ................
Semester: ................. Name: ......................
Present position: ........................................

<table>
<thead>
<tr>
<th>M/D/Y</th>
<th>TYPE OF INSERVICE ACTIVITIES</th>
<th>LOCATION</th>
<th>REQUESTED BY</th>
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APPENDIX CC

A Suggested Daily Lesson Plan of Inservice Training Program in Mathematics Education for Thai Elementary School Teachers Third Year

SUGGESTED TIME:

08:30 a.m. - 11:30 a.m. MORNING SESSION
11:30 a.m. - 12:30 p.m. LUNCH
12:30 p.m. - 01:00 p.m. RECREATIONAL ACTIVITIES
01:00 a.m. - 04:00 p.m. AFTERNOON SESSION

SUGGESTED SEQUENCE OF ACTIVITIES:

- Discuss and answer all questions teachers may have.
- Group teachers in four groups of 7-8 teachers in each group.
- Allow each group to select a topic of interest suggested in UNIT 1-7 in Table 2.
- Provide ample time for teachers to construct a complete inservice training lesson plan. This includes a lesson plan, transparencies, hand outs, and other materials necessary to conduct an inservice session on the selected topic.
- Have each group try out their lesson plan with their fellow teachers.
- Encourage teachers to offer input.
- Have each group revise the plan based on teachers' recommendations.

- Allow teachers to make copies of the lesson plans to take back to their schools.

- Ask teachers to implement suggested activities to their fellow teachers in their school cluster. Teachers are also asked to keep a record of inservice and share the record during the inservice sessions.
APPENDIX DD
Research Results on Cooperative Groups

ATTITUDES

A consistent finding in student interaction studies is the positive affect associated with working cooperatively (Johnson and Johnson, 1987).

Students in cooperative groups view mathematics as less difficult than students in competitive and individualistic conditions, and perceive themselves as having more peer support (Johnson and Johnson, 1981).

Students in cooperative groups feel more teacher support and encouragement, tend to feel more relaxed and comfortable in mathematics class, and tend to view the tasks as shorter, easier and more enjoyable than students in the competitive and individualistic conditions (Slavin, 1983).

Students in cooperative groups perceive mathematics assignments to be less difficult and are more motivated to be on task than students in the other two conditions (Johnson and Johnson, 1981).

Students in cooperative groups tend to feel more positive about each other, the teacher and mathematics class than students who are completing or working individualistically (Johnson and Johnson, 1981).

ACCEPTANCE OF DIFFERENCES

Cooperative learning experiences in mathematics tend to promote more motivation to be a part of a learning group with persons who are different sexually, ethnically, and culturally, with the expectation that the heterogeneity will increase the learning and enjoyment of the class (Armstrong, Johnson, and Balow, 1981).

Studies indicate that learning mathematics in a classroom that uses cooperative learning groups often can build an acceptance of differences among students so that they cannot work effectively in a mixed ability group, a mixed sexually group, a group that includes different ethnic backgrounds or mainstreamed handicapped students, but that they gain an appreciation for the differences that exist and select to interact heterogeneously beyond mathematics class (Johnson and Johnson, 1981).
ACHIEVEMENT

Having students work cooperatively will result in higher achievement than having students work individualistically or competitively (Johnson, Maruyama, Johnson, Nelson, and Skon, 1981).

There seems to be a stronger relationship between cooperation and problem solving tasks than cooperation and very simple drill-review (Johnson, Johnson, and Skon, 1979).

There is also evidence that on problem solving tasks, not only low ability and middle ability students do better in cooperative groups, but high ability students in cooperative groups achieve significantly higher than high ability students working alone, and less errors are made by students working in cooperative groups (Johnson, Skon, and Johnson, 1980).

REFERENCES


APPENDIX EE

Evaluation Scale for Using a Manipulative in Teaching Elementary Mathematics

<table>
<thead>
<tr>
<th>SCHOOL:</th>
<th>GRADE:</th>
</tr>
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<tbody>
<tr>
<td>EVALUATOR:</td>
<td>DATE:</td>
</tr>
<tr>
<td>CONCEPT BEING TAUGHT:</td>
<td></td>
</tr>
<tr>
<td>MANIPULATIVE BEING USED:</td>
<td></td>
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</tbody>
</table>

INSTRUCTIONS: List the rating you wish to make for each criterion: 3—Excellent, 2—Good, 1—fair, 0—Not Good. Add all the ratings and determine the overall rating by using the following scale:

<table>
<thead>
<tr>
<th>36-45</th>
<th>26-35</th>
<th>16-25</th>
<th>0-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent!</td>
<td>Good!</td>
<td>Fair!</td>
<td>Poor!</td>
</tr>
<tr>
<td>Highly recommended for use in teaching this concept</td>
<td>Recommended for use with some reservations (see comments)</td>
<td>Not recommended for use by this evaluator</td>
<td>Not considered useful by this evaluator</td>
</tr>
</tbody>
</table>

CRITERIA

1. Appropriately embodies principle being taught
2. Multigrade-level use
3. Availability (Commercial product vs teacher-made product - cost)
4. Durability (Strong enough to withstand normal use by children)
5. Practicability (Practically serves the teacher's purpose in the mathematics lesson)
6. Simplicity (Simple for students to operate or manipulate)
7. Compatibility with text being used
8. Appropriate for teacher demonstration
9. Appropriate for student use, either individually or in small groups
10. Allows for individual differences
11. Appealing/attractive/motivating to students
12. Easily stored
13. Easily distributed for classroom use
14. Provided a basis for abstraction
15. Is manipulative truly a learning device or is it being used to keep children busy?

TOTAL RATING

RECOMMENDATION: .................................................................

Loretta Diane Miller, Department of Curriculum & Instruction, Louisiana State University, Baton Rouge, LA 70803-4728
APPENDIX FF

East Baton Rouge Parish School System
Generalized Survey Form

1. The organization of the workshop was  
   Poor:  Excellent

2. This activity met my needs  
   Not at all:  Very Well

3. The role of the consultant was  
   Poor:  Excellent

4. The workshop objectives were  
   Vague:  Clearly evident

5. How much of the activity was appropriate?  
   None:  Almost all or all

6. How well prepared was this activity?  
   Very Poorly:  Very well

7. I acquired many new and worthwhile skills  
   Disagree:  Agree

8. The presentation made me want to use what I learned  
   Disagree:  Agree

9. How much of the content will you be able to apply?  
   None:  Almost all or all

10. Rapport between you and the workshop leader was  
    Ineffective:  Very effective

11. The scope (coverage) of the workshop was  
    Inadequate:  Very adequate

12. Overall, I consider this workshop  
    Poor:  Excellent
VITA

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HIGHER EDUCATION:

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DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate  CHIRAPORN SIRITHAVEE

Major Field:  CURRICULUM & INSTRUCTION

Title of Dissertation  AN INSERVICE TRAINING PROGRAM IN MATHEMATICS EDUCATION FOR THAI ELEMENTARY SCHOOL TEACHERS: A PROPOSED MODEL

Approved

Major Professor and Chairman

Dean of the Graduate School

EXAMINING COMMITTEE

Date of Examination:
JULY 21, 1989