A DESCRIPTIVE CASE STUDY OF AN ELEMENTARY TEACHER EDUCATION PROGRAM OF SCIENCE, MATHEMATICS, AND READING FOR EXPERIENCED TEACHERS

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ABSTRACT

A DESCRIPTIVE CASE STUDY OF AN ELEMENTARY TEACHER EDUCATION PROGRAM OF SCIENCE, MATHEMATICS, AND READING FOR EXPERIENCED TEACHERS

by Evan Alton Sweetser

Problem

This descriptive study was designed to identify and interpret the role of the twenty-three Experienced Teacher Fellowship Program (EXTFP) participants in the subjects of science, mathematics and reading when they returned to their school systems following the 1966-67 Experienced Teacher Fellowship Program an Michigan State University. In addition, the study sought the EXTFP participants' evaluation of the Program with respect to their roles in science, mathematics and reading.

Specifically, the problem had two phases. Phase I investigated the EXTFP participants' perception of their own expected, desired and actual roles in science education in their 1967-68 education position. Areas of involvement were: assisting in science in-service education, helping other teachers obtain and use science equipment and materials; providing leadership and acting as

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change agents in innovation of science curriculum and teaching techniques; continuing their professional growth.

The second phase of the problem was a case study of the EXTFP participants' actual role in science, mathematics and reading in the above mentioned activities (e.g. in-service education, leadership and innovation, equipment and materials use, professional growth). In Phase II of this study the participants' roles in science, mathematics and reading, as seen by their administrative superiors and co-workers, were recorded. Interviews by the investigator at the EXTFP participants' schools with the above persons constituted the basis of the case studies.

Findings

Prior to the Program, twenty-two of the participants were classroom teachers and one was a helping teacher. Following the Program, fifteen were classroom teachers, and eight were non-teachers (principals or supervisors).

All EXTFP participants acknowledged that promotions to their new positions, or their specific activities were the direct result of the EXTFP. They all indicated that they had helped fellow teachers informally and shared equipment and materials developed in the EXTFP.

The EXTFP participants rated their expected role higher than their desired role which in turn was rated high

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higher than their actual role in science. In general they found their in-service activities limited. All participants were pleased with the Program, which had changed their instruction from the didactic method to the inductive method of teaching.

Conclusions and Implications

The Experienced Teacher Fellowship Program was successful in meeting its goals of improving the teaching skills and knowledge of the participants and influencing change in the EXTFP participants' schools. This conclusion is based upon the fact that all who returned to be classroom teachers noted an improvement in their teaching and all EXTFP participants had shared their knowledge and EXTFP resources with fellow teachers.

The Program had a major influence on the EXTFP participants' role because nineteen were promoted to new or additional educational positions which varied from chairman of the district mathematics or science committee to the position of principal.

The schools' administrations were not utilizing fully the leadership and resource potential of the EXTFP participants. While the Program cannot be expected to change the total organizational climate of a school, it might influence the use of the EXTFP participants' roles in

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in such a climate by providing additional communications between the Program and the schools' administrations.

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By

Evan Alton Sweetser

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The twenty-three Experienced Teacher Fellowship Program Participants; their school administrators; and the elementary teachers involved in the interviews are recognized for their contributions. This study could not have been made without the funds provided by the United States Office of Education in the program grant for The Experienced Teacher Fellowship Program. Finally, my wife is acknowledged for her contributions, encouragement, and patience throughout the doctoral study, research, and the writing of this thesis.

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CHAPTER I

PROBLEM AND ORGANIZATION OF THE STUDY

Statement of the Problem

This descriptive study was designed to identify and interpret the role of the Experienced Teacher Fellowship Program (EXTFP) participants in the subjects of science, mathematics and reading when they returned to their school systems following the 1966-67 Experienced Teacher Fellowship Program at Michigan State University.[1] In addition, the study sought the EXTFP participants' evaluation of the Program with respect to their roles in science, mathematics and reading.

Specifically, the problem had two phases. Phase I investigated the EXTFP participants' perception of their own expected, desired and actual roles in science education in their 1967-68 education position. Areas of involvement were: assisting in science in-service education; helping other teachers obtain and use science equipment and materials; providing leadership and acting

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[1]The term EXTFP will be used throughout the study as an abbreviation for the Experienced Teacher Fellowship Program.

as change agents in innovation of science curriculum and teaching techniques; continuing their professional growth.

The second phase of the problem was a case study of the EXTFP participants' actual role in science, mathematics and reading in the above mentioned activities (e.g. in-service education, leadership and innovation, equipment and materials use, professional growth). In Phase II of this study the participants' roles in science, mathematics and reading, as seen by their administrative superiors and co-workers, were recorded.

Background of the Problem

Updating an experienced elementary teacher's knowledge and techniques is becoming increasingly necessary because of the changing elementary curriculum. The science and mathematics curriculum, which has changed extensively in the last few years, requires a well trained elementary teacher for effective implementation of the new programs. In the past such teachers have sought the renewal of content and techniques through local in-service workshops, and courses offered by colleges or universities. Most programs have been financed by teacher tuition, local school grants, or a grant from some foundation or federal agency. Programs have varied in length from the one week workshop to the intensive year-long institutes. One such year-long program has been the Experienced Teacher

Fellowship Program (EXTFP) initiated in 1966 and funded by the United States Office of Education (USOE).

If the purpose of such programs is to increase the competencies of the teacher and improve his instruction at the local school level, then one would expect a change in the teacher's role at the local level. This change might not only be in his own teaching, but might result also in his influence on other teachers and the school curriculum in the areas of his special training. Knowledge gains and certain techniques can be measured at the close of in-service programs. Most programs are directed towards a transition of the teacher's teaching behavior, the subsequent improvement of the instructional program, and an increased learning on the part of pupils. Through the study of these facets of the teacher's role, an in-service education program's impact can be evaluated.

During the 1966-67 academic year, under a grant from the United States Office of Education, Michigan State University conducted an Experienced Teacher Fellowship Program with a program emphasis in science, mathematics and reading for upper elementary school teachers. The follow-up study reported here was undertaken as part of the evaluation of the Michigan State University 1966-67 Experienced Teacher Fellowship Program.

The Experienced Teacher Fellowship Program is under Title V, Part C, of the Higher Education Act of 1965.

Fifty programs were funded by the United State Office of Education during the 1966-67 academic year, enabling just over a thousand experienced teachers to spend a year in full-time graduate study. One of the fifty Programs was held at Michigan State University during the 1966-67 academic year in the subject areas of science, mathematics and reading. Twenty-five participants were selected. Twenty finished four terms of graduate study.

The Program objectives were to provide the group of experienced elementary teachers with both increased subject matter competence and experience in instructional techniques representing the best educational thought and practice in the areas of science, mathematics and reading.

Because the participant was expected to return to his original school system, a further objective was that the participant was expected to act as a master teacher, r resource teacher, and show leadership in the areas of cience, mathematics and reading.

Criteria for selection as given in the EXTFP nouncement were that a candidate must:

1. Have earned the Bachelor's Degree and be currently employed as a certified elementary teacher grades 4-6, or as an elementary supervisor, and plan to return to teaching at the conclusion of the program.

. Have a minimum of three years of teaching experience and at least five years teaching time prior to retirement.

Provide a recommendation from the administration

of the school where presently employed which gave evidence that the candidate is a competent teacher and include any evidence which may exist that the candidate may be used in a position of leadership upon return to the school system.

4. Give evidence of an aptitude for scholarship which would provide eligibility for admission to the graduate school of Michigan State University at the Master's Degree level.

5. Be available on the Michigan State University campus between June 20, 1966 and August 30, 1967.[2]

Course term credits available for EXTFP participants were: physical science, 16 hours; biological science, 12 hours; mathematics, 15 hours; reading, 9 hours; seminar, 8 hours; and intern teaching, 3 hours. The lead subject for the Program was science.

The physical science experience consisted of integrated descriptive courses, with laboratories. Here participants investigated fundamental concepts of physics, chemistry, astronomy and earth science. A methods course in teaching physical science was an integrated part of the course sequence. The participants examined the nature of science and educational objectives addition to studying physical concepts common to newer elementary school science programs.

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[2]T. Wayne Taylor, "Experienced Teacher Fellowship ram in the Areas of Science, Mathematics and Reading Fourth, Fifth and Sixth Grade Teachers: Report of irector." Michigan State University, 1968, p. 14. ographed).

The biological science courses placed emphasis on life processes and showed the nature of biological science in both its empirical and conceptual aspects. In the laboratory phase the participant examined animal and plant physiological processes and primary attention was given to important ecological concepts. Here, too, participants were given a methods course designed to enable them to teach biological concepts in the elementary school.

Courses in reading included basic aspects of ability to read, desirable reading attitudes, habits and skills. The participant worked in a clinic practice with individual remedial reading cases. A seminar in reading provided culminating methodological experience for the participant.

Integrated experiences for the EXTFP were provided in seminars and intern teaching. During seminars the articipants examined the various current elementary cience and mathematics projects and developed ways of plementing a selected curriculum project upon their turn to their local schools. The two week internship vided the participants an opportunity to try out new rimental curriculum topics in local schools under the ction of local master teachers and members of the gan State University Science and Mathematics Teaching r staff.

The central theme of the science and mathematics portion of the EXTFP was learning about, and how to teach, inductive, discovery-inquiry science and mathematics in the elementary school. A basic tenet was that such an elementary program should involve active student investigation and individual or small group activities.

Need for the Program

The need for an Experienced Teacher Fellowship Program for elementary teachers in science, mathematics and reading is shown by examining curriculum trends and current training level of teachers. Blackwood, in a United States Office of Education survey indicates, "Science is taught most frequently, by far, by the classroom teacher with no help from a science specialist."[3] Part of the reason may be that less than half of the public elementary schools have science consultants available.[4] Approximately half of the schools indicated the lack of in-service opportunities as a barrier to effective science teaching.[5] If most teachers do not have the help of consultants and there is a lack of in-service opportunities in science, then there is a need for a

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[3]Paul E. Blackwood, "Science Teaching in the Elementary School: A Survey of Practices," Journal of Research in Science Teaching, III (No. 3, 1965), p. 185.

[4]Ibid., p. 187.

[5]Ibid., p. 195.

program such as the Experienced Teacher Fellowship Program which can develop a well trained master teacher or resource teacher who in turn can help other teachers within his school.

The NASDTEC - AAAS Guidelines for elementary teachers urges fifth and sixth year programs of study in science and mathematics for teachers who have special responsibilities in a team teaching plan.[6] The Guidelines further state that:

> For fuller realization of a program of science and mathematics in an elementary school, the use of a science and mathematics specialist should be considered . . . a specialist may be a consultant, special teacher, resource person, supervisor or coordinator.[7]

If the study of Gallentine and Buell is typical of the science preparation of teachers, then they do need more science. In surveying the science and mathematics background of applicants to National Science Foundation (NSF) Institutes in Ohio they found, "the total number of hours in all sciences and mathematics ranges from 0 to 35 hours with a mean of 14.9"[8]

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[6]National Association of State Directors of Teacher Education and Certification and the American Association for the Advancement of Science, Guidelines for Science and Mathematics Preparation Programs for Elementary Teachers (Washington, D. C.: The Associations, 1963), p. 14.

[7]Ibid.

[8]Jerry L. Gallentine and Robert R. Buell, "A Study of Science Preparation of Ohio Elementary School Teachers Applying for NSF Institutes," School Science and Mathematics, LXVI (June, 1966), p. 573.

Teachers with limited backgrounds need additional in-service training. A program like the EXTFP could provide the training or could train individuals who would return to their schools and assist with in-service education.

Elementary school mathematics also has undergone a transition since the nineteen-fifties, resulting in increased demands upon the teachers and teacher preparation institutions. The Committee on the Undergraduate Program in Mathematics (CUPM) has made certain recommendations for a minimal mathematics program. In a CUPM survey of colleges involved in teacher education, it was found that fifty per cent of the institutions, as of January 1966, required five or more semester hours of mathematics of elementary education majors, whereas only thirty-one per cent required that much mathematics four years ago.[9] Certainly increased pre-service mathematics intensifies in-service teachers' need for special training so they can meet the same high standards.

The science and mathematics curriculum revolution is evidenced by the twenty-four projects listed as experimental and under development in the United States in

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[9]Committee on the Undergraduate Program in Mathematics, "Preparation in Mathematics for Elementary School Teachers," The Arithmetic Teacher, XIV (March, 1967), p. 199.

1966.[10] Today's teachers will need additional education to adopt effectively these programs.

Some writers predict curriculum trends and teaching activities expected in the future. In mathematics Kane predicts:

> Five years from now, most elementary school students ("most" meaning substantially all of them) will be using first generation "modern" mathematics textbooks; moreover, it is likely that a healthy 25 per cent or so of the students in these grades will be spending at least some of their time with what I call second-generation materials. Second-generation materials include those revisions of first-generation books that are beginning to occur now and will be occuring over the next few years.[11]

In the sciences, Jacobson makes a prediction extending to 1980. Teaching demands, he indicates, will require that the elementary teacher will need to return for a full year of training every five years. This teacher of the future will use technological devices, participate in team teaching, and will have mastered a wide range of approaches to teaching so that he can lead children into learning science by inquiry.[12]

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[10] J. David Lockard, Report of the International Clearinghouse on Science and Mathematics Curricular Developments (College Park, Maryland: University of Maryland, 1966), pp. xii-xiv.

[11] Robert B. Kane, "School Mathematics--Where to Now?" The Arithmetic Teacher, XIV (February, 1967), p. 129.

[12] Willard J. Jacobson, "Teacher Education and Elementary School Science--1980," Journal of Research in Science Teaching, V, No. 1, pp. 73-74.

Clearly there is, and will continue to be, a great need for specialized, year-long education of elementary teachers in both the content and methods of science and mathematics. Similar events and demands occur in reading. The curriculum demand of the Initial Teaching Alphabet (i.t.a.), for example, presents the teacher with a new method of teaching reading which requires learning a new alphabet.[13] The debate stirred by Chall in the phonics versus the basal reader method of reading, unquestionably will require more in-depth education for the elementary teacher if he is to act effectively as a curriculum leader for reading in his school.[14]

Today there is a need for an elementary science supervisor, resource teacher, or curriculum leader. Stotler illustrates this in the Fifty-ninth Yearbook of the National Society for the Study of Education.

> Elementary science is being increasingly introduced in many parts of the country, and the preparation of the elementary teachers to teach with confidence in that field is one of the primary aims of elementary education today. Since many school principals are not science specialists and many elementary teachers have

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[13]John Downing, "What's Wrong With i.t.a.?" Phi Delta Kappan, XLVIII (February, 1967), pp. 262-265.

[14]Jean Chall, Learning to Read--The Great Debate (New York: McGraw-Hill Book Company, Inc., 1967).

little or no background in science, the problem of adequate supervision becomes a formidable one.[15]

Science training, in increased amounts, is needed by principals, teachers, and supervisors. While the EXTFP at Michigan State University was aimed at the classroom teacher, it was hoped that such a teacher would become a resource teacher or master teacher in his school and provide in-service aid and leadership in science, mathematics and reading.

Need for the Study

Since there are approximately one million elementary school teachers in the United States, the training of one thousand elementary teachers through the national programs of the Experienced Teacher Fellowship Program (EXTFP) would have little impact on the national program unless these teachers returned to their schools and had an influence on other teachers.[16] In other words, if these elementary teachers are to have a national influence on elementary school education, they should return to their schools and exhibit roles in leadership, curriculum and in-

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[15]Donald Stotler, "The Supervision of the Science Program," Rethinking Science Education, Fifty-ninth Yearbook of the National Society for the Study of Education, Part I (Chicago: The University of Chicago Press, 1960), p. 221.

[16]Alvin Renetzky, ed., Standard Education Almanac (Los Angeles: Academic Media, Inc., 1968), p. 162.

service education similar to that of a supervisor. The Michigan State University Experienced Teacher Fellowship Program was in science, mathematics and reading; therefore, the EXTFP participant's role would be in those areas. This study was conducted to ascertain how the EXTFP participant exhibited his role.

The Experienced Teacher Fellowship Program nationally was evaluated by the Consortium of Professional Associations for the Study of Special Teacher Improvement (CONPASS) an organization funded by the U.S.O.E. This group evaluated the 1966-67 EXTFP, during the 1966-67 Academic Year, by submitting questionnaires to a select number of participants, instructors and directors.[17] In addition, thirty-one of the Programs were visited during their operation by a team of evaluators.[18] The CONPASS preliminary report on the EXTFP suggested that it will be important to examine, in the future, actual career patterns of the EXTFP participants. To this extent CONPASS proposes to study the 1967-68 EXTFP participants in three institutions as they return to their home school in 1968-69.[19]

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[17]Walter H. Crocket, Joseph C. Bentley, and James D. Laird, Report on the Experienced Teacher Fellowship Program, 1966-67 (Worcester, Massachusetts: by first author, Clark University, 1968), pp. 3-4.

[18]*Ibid*.

[19]*Ibid*., p. 3.

Definitions and Objectives

The following are definitions, statements, or assumptions as they are used in this dissertation.

Role is defined by Good as those "Behavior patterns or functions expected of or carried out by an individual in a given societal context."[20]

Actual behaviors are those behaviors performed by the EXTFP participant in his educational position.

Desired behaviors are those behaviors that the EXTFP participant would like to exhibit in his educational position.

Expected behaviors are those behaviors that the EXTFP participant expected to be able to exhibit in his educational position.

Leadership is defined by Good as "The ability and readiness to inspire, guide, direct, or manage others."[21]

Professional growth is defined by Good as the "increase in subject matter knowledge, teaching skill and efficiency, and insight into educational problems, with a concomitant increase in success as a teacher."[22]

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[20] Carter V. Good, Dictionary of Education (New York: McGraw-Hill Book Company, Inc., 1959), p. 471.

[21] Ibid., p. 313.

[22] Ibid., p. 258.

Innovation according to Rogers "is an idea perceived as new by the individual."[23]

Change agent is defined by Rogers as "a professional person who attempts to influence adoption decisions in a direction that he feels is desirable."[24]

Objectives

The purposes of this study were:

1. To identify and interpret how the EXTFP participants' perceived, expected, desired and actual behaviors differed.
2. To identify and interpret the EXTFP participants' administrative superiors' perceptions of the benefits to the schools because of the Program.
3. To identify and interpret the EXTFP participants' fellow teachers' (or co-workers') perceptions of their and the schools' benefits due to the EXTFP participants.
4. To identify and interpret the EXTFP participants' perceptions of how they have helped their schools and their fellow teachers due to the Program.
5. To elicit the EXTFP participants' evaluations of the Program.

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[23]Everett M. Rogers, Diffusion of Innovations (New York: The Free Press, 1962), p. 13.

[24]Ibid., p. 17.

Overview of Procedure

This study was designed as a descriptive case study of the participants in the 1966-67 Michigan State University Experienced Teacher Fellowship Program (EXTFP). Responses to some parts of the Phase I questionnaires were marked on International Business Machine (IBM) response sheets. Data process cards were punched directly from the response sheets with mark sensing equipment, and the analyses were achieved through the use of the Control Data Corporation 3600 Computer.

The Phase I Role Questionnaire was based, in part, upon the questionnaire developed by Berkheimer to study the science supervisor's role in the selection and use of science curriculum materials.[25] Questionnaire items were selected from the Berkheimer study which would depict the EXTFP participants' roles in: assisting in science in-service education; helping other teachers obtain and use science equipment and materials; providing leadership and acting as change agents in innovation of science curriculum and teaching techniques; continuing their professional growth. In the first form of the questionnaire of Phase I the EXTFP participants were asked to respond to two re-

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[25] Glenn D. Berkheimer, "An Analysis of the Science Supervisors' Role in the Selection and Use of Science Curriculum Materials" (unpublished Ed. D. dissertation, Michigan State University, 1966), pp. 152-155.

sponses: the first indicated their expected behavior upon return to their educational positions; the second indicated their desired behavior. A second form of the questionnaire was constructed using the same activity statements as indicated above. However, this second form had one response, that of actual behavior. All responses were made on a five-point scale. The first form of the questionnaire was administered to the EXTFP participants at the close of the Program. The second form (actual role) was completed by the EXTFP participants during the winter term at their school.

Phase I also included the administration of a questionnaire eliciting the EXTFP participants' evaluations and projected use of the content of the Program.

During Phase II of the study, the investigator visited the EXTFP participants at their 1967-68 educational positions and interviewed them, their administrative superiors, and one or two of their fellow teachers (or co-workers). A series of basic interview questions were asked with additional subquestions as appropriate. The interviews were tape recorded and transcribed at a later date. These interviews and visits to the EXTFP participants' 1967-68 educational positions constituted the bases of the case studies.

Delimitations of the Study

1. This study was limited to the twenty-three partic-

ipants of the 1966-67 Michigan State University Experienced Teacher Fellowship Program.

2. The study did not attempt to assess the effectiveness of the Program in changing the characteristics of pupils taught by the EXTFP participants.
3. The study did not attempt to assess the science, reading, mathematics or educational content acquired by the EXTFP participants as a result of the Program.
4. This study did not attempt to measure or assess the rate or types of innovations.
5. This study did not attempt to present inferential statistical treatment but was limited to the descriptive reporting of questionnaire responses and the case studies from the interviews.

Assumptions and Limitations

In conducting this study it was assumed that: a rationale for an elementary resource teacher can be derived from the role functions of teachers, principals, and supervisors in the elementary school; the respondents answered the questionnaire and interview questions honestly; the interviewer's perception of interviewees' roles in the oral interview was not distorted.

Role Questionnaire items were selected from an instrument developed by Berkheimer for science supervision;

ever, there was an element of subjectivity in the judgt of the investigator in determining the items includ-[26] This subjectivity is a limitation to the study. investigator developed additional items based upon the le of a resource teacher. Further, the study is limited judgment of the investigator in selecting interview estions which he perceived to be similar to the role unction of a supervisor.

It is recognized that the investigator may have performed a role similar to that of a change agent when he visited the schools to interview the EXTFP participants, their administrative superiors and co-workers. The interaction between interviewer and interviewees is a limitation of the study.

The role behaviors of the EXTFP participants' were developed after the Program and therefore were not the specific focus of the Program. This <u>ex post facto</u> delineation of the EXTFP participants' role functions is a limitation of the study due to the design of the Program.

Organization of the Thesis

Presented in this chapter was the statement of the problem, the background of the problem, definitions and objectives, overview of procedure, delimitations of the

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[26] Ibid.

dy, and assumptions and limitations which underlie the dy.

Chapter II contains: the review of the literature ncerning role function, leadership role, the role of the acher as a resource or master teacher, and the similar le of the supervisor. From this was developed a ratio- ale for specially trained teachers in select subject reas, and the expected role functions of such specialists master teacher or resource teacher). The literature on he role of the change agent in innovation in education is reviewed and subsequent rationale developed for the re- source or master teacher as being a change agent. Also reviewed are related studies on the role of the supervisor and related studies on the evaluation of in-service education and special training institutes.

Procedure and design of the study described in Chapter III includes: the selection of questionnaire questions, the development of case study interview questions, procedures for collection of data, population definition, and methods of reporting data.

Chapter IV contains the personal characteristics of the EXTFP participants, questionnaire findings, EXTFP participants' case studies, and interview findings.

Finally, in Chapter V, are the summary of the findings, the implications and conclusions, and recommendations for future research.

CHAPTER II

REVIEW OF THE LITERATURE

The literature on the role of an educational specialist reveals that most authors agree on the broad, general functions of the elementary specialist, but differ on the specific activities, duties, or tasks to be used in carrying out these functions. In this chapter some of the various views which reflect the specialist's role (the resource teacher, or supervisor) are examined.

In this chapter are, in four major sections, the reviews of the literature that are related to the design of the study and construction of the questionnaire used in the study. In the first section, literature on role function was reviewed in relation to the recommended supervisor's or consultant's activities. As part of the first section, some basic leadership role literature was reviewed. Teacher's role is the second major section. In that section the professional opinions as to the general role and the change agent role of the teacher are examined. In addition, the role of the special resource teacher or the consultant was reviewed. The third section presents the expected activities of the EXTFP participant as an

educational specialist such as a resource teacher, or a master teacher. This list of expected activities is based upon the review of the literature in the preceding sections. Within the fourth section is the review of the related studies on science supervision, follow-up studies on workshops and institutes, and the evaluation study of the 1966-67 Experienced Teacher Fellowship Program.

Role Function

To clarify the meaning of role as used in this study, it is helpful to consider briefly role theory. Sarbin indicates role behavior is related to the structure of society. He says that:

> In sum, all societies are organized around positions and the persons who occupy these positions perform specialized actions or roles. These roles are linked with the position and not with the person who is temporarily occupying the position.[1]

The relation of person to position in the school is illustrated by Berkheimer who states that:

> Role theory postulates that a school system is a miniature society with administrators, supervisors, teachers, and pupils representing positions or offices within the system. Certain rights and duties are associated with each position, and actions appro-

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[1]Theodore R. Sarbin, "Role Theory," in Handbook of Social Psychology, Vol. 1, ed. by Gordon Lindzey (2 vols. Reading, Massachusetts: Addison-Wesley Publishing Company, Inc., 1954), p. 224.

priate to the position are defined as roles.[2] Role theory has been encumbered with at least three operationally quite separate meanings as indicated by Sweitzer. He notes them as "(a) organizational role demands . . . (b) personal role definitions . . . (c) actual role-behavior . . . "[3]

For the purpose of this study, the role definition according to Good is accepted. He defines role as those "behavior patterns or functions expected of or carried out by an individual in a given societal context."[4]

One would expect that the EXTFP participant's role would be affected by his behavior, by the expectations that others have for his behavior, and the social environment in which he finds himself. The advantage of role theory is that one can determine the role function of the EXTFP participants as master teachers, or resource teachers, by determining the consensus on the expectations for their behavior.

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[2]Glenn D. Berkheimer, "An Analysis of the Supervisors' Role in the Selection and Use of Science Curriculum Materials" (unpublished Ed.D. dissertation, Michigan State University, 1966), p. 18.

[3]Robert E. Sweitzer, et al. Role Expectations and Perceptions of School Principals (Stillwater, Oklahoma: Oklahoma State University, 1963), p. 15.

[4]Carter V. Good, Dictionary of Education (New York: McGraw-Hill Book Company, Inc., 1959), p. 471.

One facet of his role is that of leadership. To better understand this role, it is necessary to examine leadership in general, prior to any specific leadership function that one might expect of the EXTFP participant in his role.

The definition of leadership by Good is accepted for this study. He says leadership is "the ability and readiness to inspire, guide, direct or manage others."[5]

Leadership implies that there are those who follow. Gibbs has highlighted this when he said, "Whenever two or more persons interact in pursuit of a common goal, the relation of leadership and followship soon becomes evident."[6] He contends that research has not shown any consistent pattern of traits of leaders but such traits vary in any particular situation.[7] This lack of identifying criteria for leaders is also reinforced by Thurman's statement:

> At present there is no specific criterion supported by research which can be used to predict in advance whether or not a person will be an effective supervisor.[8]

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[5]Good, op. cit., p. 313.

[6]Cecil A. Gibb, "Leadership," in Handbook of Social Psychology, Vol. II, ed. by Gardner Lindzey (2 vols. Reading, Massachusetts: Addison-Wesley Publishing Company, Inc., 1954), p. 880.

[7]Ibid., p. 889.

[8]Robert S. Thurman, "Identifying Potential Leaders for Supervision and Curriculum Work," Educational Leadership, XXIII (April, 1966), p. 587.

Gibb points out that "there is abundant evidence that member personalities do make a difference to group performance, and . . . behavior to which leadership concept applies."[9] Applying this to the leadership role of the EXTFP participant, it appears that the participant's role would vary depending upon the type of group of which he is a member. While organizational structure may affect the leadership role, the effect may differ, as Weber and Weber have indicated. They see leadership as either autocratic or democratic, varying with the situations.[10] Etzioni, too, has shown in his book, Modern Organizations, the multiform leadership patterns in different organizational structures. In the classical organizational structure the leadership authority is hierarchical and results in a pyramid of control.[11] The normal structure of a school with a superintendent, principal and teachers would represent such a pyramid of control. In spite of this there may be effective leadership at the lower levels, as illustrated by Weber and Weber. They state:

> In the schools of the nation actual leadership may come from a classroom teacher, from a parent, from a principal, from a supervisor, from a superintendent

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[9] Gibb, loc. cit.

[10] C. A. Weber and Mary E. Weber, Fundamentals of Educational Leadership (New York: McGraw-Hill Book Company, Inc., 1955), pp. 61-65.

[11] Amitai Etzioni, Modern Organizations (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1964), pp. 20-25.

> of schools, from a board member, or from a layman in the community. Administrators may or may not be responsible for the introductions of new ideas; in fact, in many situations the administrator's leadership role may be that of encouraging others to make contributions to the problem.[12]

Here then there is indication that the teacher may not only be a leader for change, but that, under certain conditions, he should be encouraged to contribute to change. In the above mentioned roles, the teacher could be considered as a change agent. What are other role functions of teachers? In the next section various teacher roles are examined.

Teacher's Role

Professional opinion varies on the role of the teacher. Some perceive the teacher's role as limited by a bureaucratic system.

> The role of teachers in most school systems may be viewed as that of a functionary in a bureaucratic system. As such, the role is meaningful in terms of the particular school system of which he is a part. This system is so organized as to set specific limitations on what the individual teacher may do if he is to fit in with the system.[13]

Miles, too, observes the teacher's role as limited:

> In the elementary school in particular, there appears to be little division of labor in carrying out work

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[12]Weber and Weber, op. cit., p. 73.

[13]Sloan R. Wayland, "The Teacher as Decision-Maker," in Curriculum Crossroads, ed. by A. Harry Passow (New York: Teachers College, Columbia University, 1962), p. 51.

> operations: a teacher is a teacher is a teacher. Upward mobility within the teacher role is relatively infrequent.[14]

There are others who discern a change in the role of the teacher. One major trend is the differentiated teaching staff. In such a plan there is a hierarchy within the teaching staff. Yet the teachers still teach children in addition to special duties. The teacher on the top of the hierarchy is the teaching research--curriculum associate who is the "self-renewal" unit of the organization.[15] Such a person is responsible for translating research into instructional programs at the school level. He is also a part-time classroom teacher.

Other members of the differentiated teaching staff are: the senior teacher, the staff teacher, the academic assistant, and the educational technician. "The senior teacher is an acknowledged master practitioner, a learning engineer, a skilled diagnostician of the learning process. He is the teacher's teacher."[16] He would spend at least one-half of his day teaching pupils. The staff teacher

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[14]Matthew B. Miles, "Some Properties of Schools as Social Systems," in Change in School Systems, ed. by Dorothy Mial (Washington, D. C.: The National Training Laboratory and the National Education Association, 1967), p. 9.

[15]M. John Rand and Fenwick English, "Towards a Differentiated Teaching Staff," Phi Delta Kappan, XLIX January, 1968), p. 265.

[16]Ibid.

would spend all of his time teaching pupils, with semi-professional and clerical duties being completed by the assistant.[17]

Denemark indicates that auxiliary personnel are needed so the teacher can teach more effectively. Denemark's illustration of differentiation in the teacher's role is:

> A subject-matter specialty, long established in the secondary school, is now being viewed as useful in the elementary school as well. In some schools, elementary teachers with special interest and competence in science, language arts, social studies, or other curriculum areas are providing on-the-spot resource assistance for fellow teachers who wish to improve their effectiveness in those fields.[18]

A slightly different description of the resource teacher is given by Peters. He described a resource teacher as a generalist rather than a specialist in one subject area. These resource teachers' responsibilities would be to assist the classroom teacher.

> This assistance may be provided to classroom teachers individually or in groups. Areas of help include: classroom organization; short-term and long-term planning; demonstration teaching; effective use of pupil records and test results; selection and use of instructional materials and equipment; identification of needs of children and adoption of the curriculum to meet these needs; and stimulating an awareness of current research and curriculum developments.

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[17] Ibid.

[18] George W. Denemark, "The Teacher and His Staff," NEA Journal, LV (December, 1966), p. 19.

> A second responsibility is to aid principals in providing over-all leadership to the instructional program. . . . They also aid the principal in providing in-service training programs. Finally, they participate in staff development activities related to the resource teaching program and assist the county, as needed, in writing curriculum guides.[19]

Another enumeration of the duties of the resource teacher is given in the NASDTEC-AAAS Guidelines:

> A specialist may be a consultant, special teacher, resource person, supervisor, or coordinator. The functions of mathematics and science specialists may include: preparing instructional materials and coordinating resources available from the immediate community; assisting in the selection of equipment, facilities and instructional materials; developing in-service programs, facilitating articulation of K-12 programs in science and mathematics; providing liaison with college, university and state department personnel in science and mathematics; interpreting new developments in research and teaching to administrators and the public; teaching demonstration lessons; and, provide leadership for evaluation of science and mathematics programs.[20]

Gottlieb and Brookover portray the elementary teacher's role as being comprised of three role sectors, the "classroom role sector, organizational role sector, and professional role sector."[21] Examples of the class-

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[19]Thomas R. Peters, "A Resource Teacher Helps Improve Instruction," The Instructor, LXXVIII (December, 1966), p. 19.

[20]National Association of State Directors of Teacher Education and Certification, and the American Association for the Advancement of Science, Guidelines for Science and Mathematics Preparation Programs for Elementary Teachers (Washington, D. C.: The Association, 1963), p. 14.

[21]David Gottlieb and Wilbur B. Brookover, Acceptance of New Educational Practices by Elementary School Teachers (East Lansing, Michigan: College of Education, Michigan State University, 1966), pp. 23-24.

room role sector might be presenting material, or grading tests. The organizational role sector might include committee work and teachers' meetings. In the professional role sector, professional meetings and professional office duties could be representative examples.[22]

Which duties dealing with the role of the supervisor are most prominent in the literature? The quoting of many authors dealing with supervisors would be repetitious and unnecessary. A few representative examples will be sufficient to illustrate the recommended supervisory and consultant activities found in the literature. For the purpose of this study the emphasis is on the consultant resource activities because the EXTFP participants were not expected to return to their school systems to be supervisors, but were expected to return to be resource teachers or master teachers. The term supervisor connotes one who is hierarchically over and controls another individual. This is not the expected case on the part of the EXTFP participants.

Wiles notes, "Supervision is not limited to any one person or individual. Any member of the school staff may assist teachers to provide a better learning environment for pupils. Probably most supervision is provided

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[22]<u>Ibid</u>., p. 24.

by teachers for other teachers."[23]

What is a supervisor? Wiles lists numerous activities such as: help establish communications, stimulate staff members to look at the extent to which new resources are being shared, listen to individuals discuss their problems and to recommend other resources, bring to individual teachers appropriate suggestions of materials, and provide expertness in group operations.[24]

"The supervisor's role has become supporting, sharing, and assisting."[25] Lucio and McNeil portray the supervisor as having six kinds of duties: (1) planning, (2) administrative, (3) supervision, (4) curriculum development, (5) demonstration teaching, (6) research.[26] Lucio and McNeil have noted certain limitations on the role of the supervisor.

> The position of a supervisor can be described in terms of the action expected of him and the action he expects of others. One can not enact the supervisory role if he lacks the necessary role expectations. These expectations are learned both through intentional instruction and through incidental means. The ability to learn a supervisory role is probably

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[23]Kimball Wiles, Supervision for Better Schools 3rd edition (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1967), p. 9.

[24]Ibid., p. 10.

[25]Ibid.

[26]William H. Lucio, and John D. McNeil, Supervision a Synthesis of Thought and Action (New York: McGraw-Hill Book Company, Inc., 1962), pp. 25-26.

> limited by a view of self as well as by previous experiences.[27]

Berkheimer summarized the current literature in the role of the general supervisor. He indicated that the supervisor's responsibilities are:

> . . . in the areas of curriculum, leadership, in-service programs, self-growth, public relations, selection and use of curriculum materials, evaluation, and research.[28]

One aspect of the specialist or resource teacher needs further explanation. The Webers indicated that a teacher may give leadership in new ideas.[29] Denemark stated that the subject matter specialist can provide ". . . on-the-spot resource for fellow teachers who wish to improve their effectiveness in those fields."[30] And Peters says the resource teacher helps other teachers by ". . . stimulating an awareness of current research and curriculum developments."[31]

Each of these authors has described an aspect in the role of a change agent in innovation. According to Rogers, "a change agent is a professional person who attempts to influence adoption decisions in a direction

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[27] _Ibid._, p. 30.

[28] Berkheimer, _op. cit._, p. 74.

[29] Weber and Weber, _loc. cit._

[30] Denemark, _loc. cit._

[31] Peters, _loc. cit._

that he feels is desirable."[32] So, prior to the development of the role functions of the resource or master teacher, it is necessary to examine facets of innovations in education and the functions of a change agent.

Innovation and the Change Agent

Innovation is defined by Rogers as "an idea perceived as new by the individual."[33] The elements of diffusion or adoption of an innovation are: communication, the social system, and time.[34] The change agent is a channel of communicating new ideas to those who would adopt the ideas. Prior to examining this role it is necessary to clarify the adoption process. According to Rogers:

> Adoption is a decision to continue full use of an innovation. . . . The adoption process is the mental process through which an individual passes from first hearing about an innovation to final adoption. Five stages in the adoption process are: awareness, interest, evaluation, trial and adoption. The adoption process differs from the diffusion process in that the adoption process deals with adoption of a new idea by one individual while the diffusion process deals with spread of new ideas in a social system, or with the spread of innovations between social systems or societies.[35]

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[32]Everett M. Rogers, Diffusion of Innovations (New York: The Free Press, 1962), p. 17.

[33]Ibid., p. 13.

[34]Ibid., p. 12-18.

[35]Ibid., pp. 17-18.

The change agent functions as a member of society or as some segment of it. In the case of the elementary teacher this segment of society is the elementary school. Miles has observed that there is low interdependence in the elementary school and teachers are in relative isolation from each other.[36] He states how this may affect the innovation process:

> It is important to note that a low degree of interdependence ordinarily makes a system much more difficult to alter, since if changes occur in one part (e.g. in one teacher's practices), there are no meaningful channels or linkages by which they can travel to other parts of the system. This state of affairs may lead to internal integration problems centering around teacher morale; feelings of isolation, depression, and non-confirmation of peers.[37]

The school is a social system. It has a hierarchical structure of superintendent, principal, consultants or supervisors, and teachers. This social system is the one in which the classroom teachers and the resource teachers must operate. In studying the organizational climate of schools, Halpin categorized six climates varying from openness to closeness.[38] The climate of school can affect the functioning of its members. The school climate consists of both the human and non-human environment. The human environment is the rela-

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[36]Miles, *op. cit.*, p. 12.

[37]*Ibid.*

[38]Andrew W. Halpin, *Theory and Research in Administration* (New York: The MacMillan Company, 1966) pp. 174-181.

tionship between members of the school society. Chesler and Fox express this aspect in the relation to innovation:

> Research on change in educational systems, however, points to the importance of a series of interpersonal relationships in the educational process, starting with the pupil's peer groups and the teacher-pupil relationship and continuing through faculty relationships, teacher-principal relationships, school board-local school relationships, school board-local association relationships, and school community relationships.[39]

They further note that research has demonstrated that teachers need to share ideas about change through both formal and informal association with colleagues.[40]

The non-human elements of the school are the physical facilities which in turn are the result of tax supported revenues. These facilities are not only the school building but include also instructional supplies and equipment. Rogers claims there is a high relationship between the financial resources of a school system and its innovativeness.[41]

For a greater understanding of innovation one needs to examine such questions as: What are innovators

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[39]Mark Chesler and Robert Fox, "Teacher's Peer Relations and Educational Change," NEA Journal, LVI (May, 1967), p. 25.

[40]*Ibid.*, p. 26.

[41]Everett M. Rogers, "What are Innovators Like," in Change Processes in the Public Schools, ed. by Richard O. Carlson (Eugene, Oregon: University of Oregon, 1965), p. 61.

like? What are the inhibiting aspects of innovation? How can innovation be accelerated?

Rogers characterizes innovators as: being young, having a high social status in terms of education and income, cosmopolite, exerting opinion leadership, and sometimes being viewed as deviates by their peers.[42]

Carlson has stated several aspects to the barriers to change in the public school. These include lack of a change agent, a weak knowledge base, and the organizational characteristic of the public schools.[43] Miller lists similar factors inhibiting educational change: rut of experiences, administrative reticence, educational bureaucracy, insufficient finances, community indifference and resistance, and inadequate teacher education programs.[44]

Corey says change can be facilitated by providing "resources -- material, services, consultation, and time -- that may be needed for change . . ."[45] Rogers indicates that communications in a formal organization may be distort-

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[42]Rogers, "What are Innovators Like," pp. 58-59.

[43]Richard O. Carlson, "Barriers to Change in Public Schools," in Change Processes in the Public Schools, ed. by Richard O. Carlson (Eugene, Oregon: University of Oregon, 1965), pp. 3-8.

[44]Richard I. Miller, "Overview of Educational Change," in Perspectives on Educational Change, ed. by Richard I. Miller (New York: Appleton-Century-Crofts, 1967), pp. 10-18.

[45]Stephen M. Corey, Helping Other People Change (Columbus, Ohio: Ohio State University Press, 1963), p. 44.

ed, filtered or lost.[46] He proposed a strategy for planned change which would consist of a hierarchy of: (1) researchers (the source of innovations); (2) liaison experts; (3) change agents; and (4) practitioners.[47] This schema for planned change represents a method of disseminating innovations from their source to the practitioner, the teacher. Rogers likens the liaison expert to the member of the extension agent in agriculture who communicates the innovation from the researcher to the county agent (the change agent). The county agent then communicates the idea to the practitioner, the farmer.[48] In education there is a need for similar persons who would provide communications between the researchers and the teachers.

How does the role of change agent compare to the expected function of the EXTFP participant upon his return to his school? To answer this it is necessary to examine the other roles that the EXTFP participant might exhibit. In the following section the resource teacher's role is summarized and projected as expected behavior of the EXTFP participant upon return to his school system.

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[46]Everett M. Rogers, "Developing a Strategy for Planned Change," (paper presented at the Symposium on the Application of System Analysis and Management Techniques to Educational Planning in California, Orange, California, June 12-13, 1967), p. 5.

[47]Ibid., pp. 7-8.

[48]Ibid.

Resource Teacher's Role Expected of the EXTFP Participant

On the basis of role theory it is possible to derive role functions based upon determining the consensus of behavior for a given role function.[49] The expected behavior of the EXTFP participant, therefore, can be described as based upon the review of the literature in the preceding sections.

A limiting parameter on the role function of a resource teacher can be the organizational structure of the school.[50] Additional limiting parameters can be imposed by the organizational climate of the school.[51] For the purpose of classification of the role functions, the role sectors of classroom, organizations, and profession will be used.[52]

Classroom Role Sector

Because a resource teacher or master teacher would be expected to be teaching pupils, he would have many of the duties associated with working with pupils.[53] Among

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[49]Berkheimer, op. cit., p. 19.

[50]*Ibid.*, p. 18.

[51]Halpin, op. cit., pp. 174-181.

[52]Gottlieb and Brookover, op. cit., pp. 23-24.

[53]Denemark, op. cit., p. 17.

those activities related to the classroom that one would expect to influence or help other teachers would be:

1. plan with students and fellow teachers.[54]
2. prepare instructional materials and coordinate resources available from the immediate community.[55]
3. teach demonstration lessons.[56]
4. experiment with different content, methods, and materials and keep systematic records of such studies.[57]
5. conduct short-term and long-term planning.[58]
6. identify the needs of the pupils and recommend adaptation of the curriculum to meet these needs.[59]
7. provide effective use of pupil records and test results.[60]

Organizational Role Sector

Organizational role sector includes those functions which result because of the organizational structure of the

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[54] *Ibid.*

[55] NASDTEC-AAAS, *op. cit.*, p. 14.

[56] *Ibid.*

[57] Denemark, *op. cit.*, p. 17.

[58] Peters, *op. cit.*, p. 19.

[59] *Ibid.*

[60] *Ibid.*

school. In general they are required or influenced by administrative policy. Examples of organizational role sector activities that may interrelate teacher's influence are:

1. work with curriculum committees.[61]
2. orient and assist beginning teachers.[62]
3. provide on-the-spot resource assistance for fellow teachers who wish to improve their effectiveness in those fields.[63]
4. provide leadership for evaluation of science and mathematics programs.[64]
5. interpret new developments in research and teaching to administrators and the public.[65]
6. assist in the selection of equipment, facilities and instructional materials.[66]
7. facilitate articulation of K-12 programs in science and mathematics.[67]
8. introduce new ideas.[68]

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[61] Denemark, *op. cit.*, p. 17.

[62] *Ibid.*

[63] *Ibid.*, p. 19.

[64] NASDTEC-AAAS, *op. cit.*, p. 14.

[65] *Ibid.*

[66] *Ibid.*

[67] *Ibid.*

[68] Weber and Weber, *op. cit.*, p. 73.

9. stimulate an awareness of current research and curriculum developments.[69]

10. aid principal in providing in-service training programs.[70]

11. participate in staff development activities related to the resource teaching program.[71]

12. aid the principal in providing overall leadership to the instructional program.[72]

13. attend teachers' meetings.[73]

Professional Role Sector

The professional role sector is focused on self-growth and the individual acting in a professional manner. The definition of professional growth given by Good is: "increase in subject-matter knowledge, teaching skill and efficiency, and insight into educational problems, with a concomitant increase in success as a teacher."[74] Cogan contends that "there is, however, a widespread conviction that profession cannot exist apart from formal associa-

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[69]Peters, *op. cit.*, p. 19.

[70]*Ibid.*

[71]*Ibid.*

[72]*Ibid.*

[73]Gottlieb and Brookover, *op. cit.*, p. 24.

[74]Good, *op. cit.*, p. 258.

tion."[75] This would imply that part of the professional role would be membership and active leadership in a professional organization.

Examples of professional activities or role functions one might expect of a resource teacher in the professional role sector are:

1. be a continuing student of the educational process and keep current with respect to innovations in teaching methods and materials.[76]
2. maintain membership and leadership participation in professional organizations.[77]
3. attend professional meetings.[78]
4. conduct professional office duties.[79]
5. participate in public relations.[80]

The preceding role functions listed under the three role sectors served as the basis for the development of the questionnaires described in Chapter Three of this study. The following section on related studies was also used in questionnaire development.

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[75]Morris L. Cogan, "Toward a Definition of a Profession," Harvard Educational Review, XXXIII (Winter, 1953), p. 42.

[76]Denemark, op. cit., p. 17.

[77]Ibid.

[78]Gottlieb and Brookover, op. cit., p. 24.

[79]Ibid.

[80]Berkheimer, op. cit., p. 74.

Related Studies

The studies in the previous section dealt with the role of supervisors and change agents and were used as bases for developing the role functions of a resource teacher. This review of related studies is confined to the studies related to the role of the science supervisor and follow-up studies or evaluations of in-service workshops and institutes.

Berkheimer conducted a statistical study which determined and analyzed the role of the science supervisor in the selection and use of science curriculum materials as viewed by the science supervisor and teachers involved.[81] He contrasted the implementation of the National Science Foundation (NSF) sponsored science project materials with the implementation of commercial science curriculum materials. His problem consisted of two parts: first, he determined how the science supervisors' and teachers' views differed on the importance of certain characteristics of science curriculum materials; secondly, he determined how the two groups differed in their responses to actual and recommended behaviors of the science supervisor in implementing programs. He developed a questionnaire based upon the role of a science supervisor

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[81] Berkheimer, op. cit.

and the objectives of science education. His questionnaire, structured to obtain a response on a five-point scale, was mailed to a national sample of 464 science supervisors and 306 members of the Association for the Education of Teachers of Science.[82]

With a percentage of questionnaires returned greater than eighty-two per cent, he treated the data using Chi square, intra-class correlations, and Spearman rank correlation coefficients. Among the responses which he found to be significant were: the professional group using commercial materials placed greater importance on: teacher demonstrations, science content units, qualitative observations, and science facts and principles; the professionals who used NSF sponsored materials placed greater importance on the individual laboratory approach to teaching and learning, the use of the laboratory experiences as a primary source of information, and the use of the quantitative approach to science education.[83]

The follow-up studies on in-service workshops or institutes have tended to focus on participating teachers' characteristics or the evaluation of the pupils taught by the participating teachers.

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[82]Ibid., pp. 76-93.

[83]Ibid., pp. 94-124.

Heideman evaluated the 1956-59 Academic Year Institutes (A.Y.I.) at the University of Wisconsin. His principle evaluation instrument administered to 147 teachers who participated, consisted of a semi-structured questionnaire. He sought information concerning: (1) the effects of the A.Y.I. as evidenced one to three years after the program; (2) certain characteristics of the science and mathematics teachers involved in the program; (3) the occupational potential and mobility of the participants; (4) whether the objectives of the A.Y.I. were achieved.[84]

He found that the participants had: greatly increased their ability to originate new ideas, developed favorable changes in attitude toward their profession, and increased the effectiveness of their laboratory techniques. The participants indicated the most favorable aspects of the program were that they: obtained a higher degree; upgraded their backgrounds in subject matter; and learned new techniques and concepts.[85]

Yon studied the changes in participants in an

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[84]Robert G. Heideman, "National Science Foundation Academic Year Institutes for Secondary School Teachers of Science and Mathematics held at the University of Wisconsin 1956-57 through 1958-59 -- An Evaluation of the Background, Training, Placement, and Occupational Mobility of Participants," Dissertation Abstracts, XXIII (1963), p. 2025.

[85]*Ibid.*

Academic Year Institute (A.Y.I.).[86] He identified changes produced in the participating teachers and whether their objectives had been realized. He administered a series of questionnaires to members of the A.Y.I. at the beginning of the program, at the end of the program, and at the end of the following year in their classrooms. In addition, questionnaires were sent to their principals. Further information was obtained by interview of one-third of the participants.

Personal gains by the participants were: advancement in professional status, gain in prestige, improvement of mathematics and science background, and greater satisfaction with their teaching role.

Benefits to the science and mathematics programs in the school which were identified as being promoted by the teachers were: organizing science and engineering clubs, fostering curriculum revision, explaining the results of the Institute to fellow teachers, communicating to the public changes in science and mathematics curriculum, and promoting science fairs.[87]

Bradberry also conducted a follow-up study of

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[86] John F. Yon, "The Academic Year Institute for High School Teachers of Science and Mathematics at the Pennsylvania State University during the 1957-58 Term," Dissertation Abstracts, XX (1959), p. 558.

[87] Ibid.

Academic Year Institutes.[88]

> The main areas of the study were stated changes the teachers had made since attending the institute; value of the program as viewed by the participant and his principal; and recommendations for improvement of the institute program.[89]

She found the following results among the participating teachers: 71 per cent had revised their course content to include more up-to-date subject matter, 80 per cent were using more varied methods of presentation, 72 per cent were using more extensively the problem-solving approach, and 58 per cent were using more demonstrations. Since the Institute two-thirds of the teachers had been assigned non-teaching duties such as chairman of the department or curriculum coordinator.[90]

Irby conducted a follow-up study of Academic Year Institute (A.Y.I.) participants which related academic and professional status of the A.Y.I. participants before, during, and after completing the Institute.[91] His semi-

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88 Helon Styles Bradberry, "A Study of the Participants in the 1959-60 and 1960-61 Academic Year Institute Sponsored by the National Science Foundation at Six Southeastern Universities," Dissertation Abstracts, XXVIII (1968), p. 2114-A.

89 Ibid.

90 Ibid.

91 Bobby Newell Irby, "A Follow-up Study of the Participants of the National Science Foundation Academic Year Institute for High School Teachers of Science and Mathematics Held at the University of Mississippi, 1961-66," Dissertation Abstracts, XXVIII (1968), p. 2120-A.

structured questionnaire was administered to 151 participants. From the data he concluded that: the increased knowledge of subject matter increased the effectiveness of the participant as a teacher, the professional attitude of the teacher was improved, Institute curriculum was suitable for upgrading participants with inadequate or inefficient academic training, and the degree emphasis placed on the Institute program tended to prevent achievement of the program's maximum potential.[92]

Fowler studied participants of a six-week institute designed to train elementary school science resource teachers.[93] The 45 participants consisted of 24 teachers, 16 principals, and 5 supervisors or consultants or helping teachers. Prior to the program the participants listed the professional societies, either educational or scientific, to which they belonged. The range was from 0 to 11 with a mean of 3.3. The mean number of journals they read was 3.9 and their mean-total science and mathematics courses was 29.9 semester hours of college credit. The objective of the Institute was to prepare persons to accept the responsibilities of a "Science Resource Teacher"

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[92] Ibid.

[93] H. Seymour Fowler, "Evaluation of an Institute for the Training of Elementary-School Science Resource Teachers," Journal of Educational Research, LIII (May, 1960), pp. 358-359.

in their home schools.[94] Some of the expected activities of such a person were to: provide leadership in science curriculum planning; conduct in-service training; give aid to individual teachers of their systems; identify school needs in terms of equipment and materials; provide leadership in maintaining science materials.[95] To evaluate the instructional gains of the Institute, Fowler administered the Reed General Science Test form AM as a pretest and form BM as a posttest. By employing the "t" test he determined the participants had made significant gain in the achievement in general science.[96] One might question whether this gain could be attributed to the instruction of the program or whether there was a stimulation factor for the participant in being in the program.

Karbal uses the term "key teacher" in his study on the effectiveness of a workshop.[97] The two week workshop was designed to train participating elementary teachers to be "key teachers" in language arts in their schools. Data were collected on the thirty-seven participants during the program, a month after school started, mid-year and in

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[94] Ibid.

[95] Ibid.

[96] Ibid.

[97] Harold T. Karbal, "The Effectiveness of a Workshop as a Means of In-service Education of Teachers," Dissertation Abstracts, XXV (1964), pp. 1771-1772.

June. Principals and co-workers of the participants also contributed to the evaluation of the program. Gains noted in the participants were: improved competence professionally, greater vocal participation in school committees, extended help to new teachers, and a broader view of the entire school program.[98]

The summary of the review of the literature by Brandou related to in-service programs for elementary teachers indicated that: elementary teachers can benefit from a variety of in-service programs in science such as workshops, college classes, institutes, and conventions; the pupils of the in-service participants are favorably affected; planning conferences for in-service programs should be in an informal atmosphere; and in-service programs are most effective if they concern the classroom problems with which teachers are involved.[99] Brandou studied the effectiveness of a pilot program of the Elementary Science In-service Conference (ESISC). This was a four week conference of sixteen selected participants who were experienced high school science teachers.[100] They

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[98] _Ibid._

[99] Julian R. Brandou, "A Study of an Experimental Program for the In-service Science Education of Elementary School Teachers" (unpublished Ph. D. dissertation, Michigan State University, 1963), pp. 23-24.

[100] _Ibid._, pp. 29-47.

had obtained permission from their superintendent of schools to return from the conference and conduct in-service programs in science for elementary teachers. The conference provided special units for the participants on elementary science. The participants prepared materials and <u>Topic Guides</u> as outlines for subsequent in-service programs for elementary teachers in their school systems.[101]

The major evaluation instruments used on the participants were: the <u>Edwards Personal Preference Schedule</u>, the <u>Minnesota Teacher Attitude Inventory</u>, Conference evaluation forms, and biweekly report forms.[102] The elementary teachers, who participated in in-service education programs conducted by the conference participants, completed an elementary teacher questionnaire developed by Brandou. He found that the more experienced secondary science teachers may be more effective in-service instructors than those with less experience.[103] From the elementary in-service programs conducted by the sixteen secondary teachers, he concluded that such programs were most effective for elementary teachers of grades three through six.[104]

Crockett, Bentley and Laird, under the auspices of

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[101] <u>Ibid</u>.

[102] <u>Ibid</u>., pp. 24-25.

[103] <u>Ibid</u>., p. 135.

[104] <u>Ibid</u>.

CONPASS, directed the evaluation of all the 1966-67 Experienced Teacher Fellowship Programs.[105] In 1966-67 there were 50 Experienced Teacher Fellowship Programs supported by grants from the United States Office of Education attended by over one thousand elementary and secondary teachers of all subject areas. Most programs were a full academic year; many included an additional summer program. Questionnaires were administered to all participants in the fifty programs. In addition, a team of evaluators visited thirty-one of the fifty programs.[106] These investigators found that: 82 per cent of the participants found the programs interesting and stimulating; there was a high degree of solidarity and morale among participants; the amount of work assigned was heavy, and inversely related to the effectiveness and satisfaction; programs that built upon the participant's background were more effective; there was effective interdepartment cooperation with the programs; the program's success relies in good part upon establishment of _esprit de corps_ among partici-

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[105]CONPASS is the abbreviation for the Consortium of Professional Associations for the Study of Special Teacher Improvement Programs and is supported by the U.S. Office of Education.

[106]Walter H. Crockett, Joseph C. Bentley, and James D. Laird, _Report on the Experienced Teacher Fellowship Program, 1966-67_ (Worcester, Massachusetts: by first author, Clark University, 1968), pp. 3-4.

pants.[107]

In this section related research studies on the supervisor's role and follow-up studies on in-service workshops or institutes have been reviewed. The summary of these studies and other related literature with an explanation of how they relate to this study is given in the next section.

Summary of Related Literature

In this chapter some of the current literature has been reviewed on: role function, leadership, resource teachers' and supervisors' roles, innovation, the role of the change agent, and related follow-up studies of workshops and institutes.

Based upon role theory, it was possible to examine the consensus of opinion on the role of a resource teacher and to derive a basic list of expected role functions. This derived list of a resource teacher's role was classified into three sections: classroom role sector, organizational role sector, and professional role sector. Some of the major roles expected of a resource teacher are to: assist in in-service education; help other teachers obtain and use equipment and materials; act as a change agent in

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[107] *Ibid.*, pp. 5-8.

innovation of curriculum and teaching techniques; communicate new science and mathematics programs to the public; continue professional growth through active participation in professional organizations, and be a continuing student of the educational process.

A related study on the role of the science supervisor contained a questionnaire on the expected role function of a science supervisor. This questionnaire served as a basis for the questionnaire used in the present study; it is described in Chapter Three.

Related studies on in-service institutes and workshops have shown that participants: made significant academic gains in the subjects taught; greatly increased their ability to originate new ideas; gained in professional status and prestige; fostered curriculum revision; explained the results of the institute to fellow teachers; expected to have some non-teaching duties such as part-time supervision or resource teacher; and could conduct in-service workshops in their home school after such an institute. The above role functions of participants returning to their schools after an in-service workshop or institute provided the bases to develop questionnaires and interview questions which are explained in Chapter Three.

CHAPTER III

PROCEDURE AND DESIGN

This chapter includes: (1) the design of the study, (2) the selection of the population, (3) the development of the questionnaires and interview questions, (4) the procedures for the collection of data, and (5) the procedures for the analyses of data.

Design of the Study

This study was designed to identify and interpret the role of the Experienced Teacher Fellowship Program (EXTFP) participants upon their return to their schools following the 1966-67 Experienced Teacher Fellowship Program at Michigan State University.[1] Based upon the objectives of the Program and the review of the literature on the role of a resource teacher, the EXTFP participants were expected to exhibit the role of resource teachers in the subjects of science, mathematics and reading. It should be noted that delineation of the role of the EXTFP

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[1]The term EXTFP is used throughout this study as an abbreviation for the Experienced Teacher Fellowship Program.

participants is ex post facto to the objectives of the Program.

Some of the questions which this descriptive case study tried to answer were: How do the EXTFP participants perceive their expected, desired, and actual roles in science education by: assisting in science in-service education; helping other teachers obtain and use science equipment and materials; providing leadership and acting as change agents in innovation of science curriculum and teaching techniques; continuing their professional growth? Further questions investigated by this study were: How do the EXTFP participants, their principals (or administrative superiors) and their fellow teachers (or co-workers) perceive the participants' role in the above mentioned role functions for the subjects of science, mathematics and reading? Other answers were sought from the participants: How has the Experienced Teacher Fellowship Program helped your professional advancement; which parts of the Program were of most and least value to you and how could the Program be altered to provide more help?

The study was designed as a descriptive case study with one phase concerned with the EXTFP participants' perceived roles as resource teachers in science education. The second phase was the case study interviews at the participants' schools which investigated the participants' actual roles as resource teachers in science, mathematics

and reading.

The case study was selected as the most effective design to meet the objectives of the study. This study uses Good and Scates' definition as an operational definition for a case study.

> The essential procedure of the case-study method is to take account of all pertinent aspects of one thing or situation, employing as a unit for study an individual, an institution, a community, or any group considered as a unit. The case consists of the data relating to some phase of the life history of the unit or relating to the entire life process, whether the unit is an individual, a family, a social group, an institution, or a community. The complex situation and combination of factors involved in the given behavior are examined to determine the existing status and to identify the causal factors operating.[2]

Selection of the Population

The population for this study was the twenty-three participants who finished three or four terms in the 1966-67 Michigan State University Experienced Teacher Fellowship Program (EXTFP). This Program was one of fifty such programs in the United States supported by a grant from the United States Office of Education under Title V, Part C. of the Higher Education Act of 1965. The Michigan State University EXTFP participants were fourth, fifth, or sixth grade teachers. The selected EXTFP participants' teaching

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[2]Carter V. Good, and Douglas E. Scates, Methods of Research -- Educational, Psychological, Sociological (New York: Appleton-Century-Crofts, Inc., 1954), p. 726.

experience ranged from 3 to 22 years and their ages ranged from 26 to 51 years. There were 8 women and 15 men in the EXTFP group. Geographically, 15 EXTFP participants were from the state of Michigan and one each from the following states: Maryland, Massachusetts, New Jersey, Oregon, Pennsylvania, Virginia, Washington, and Wisconsin.

Development of Questionnaires and Interview Questions

Phase I

The EXTFP participants responded to the Phase I four-part questionnaire during their final seminar at Michigan State University. The Expected-Desired Role Questionnaire (Part I of the Phase I questionnaire) elicited the EXTFP participants' science education role which they expected and desired upon return to their school systems. To fifty structured behavioral statements of this role questionnaire, the EXTFP participants responded on a five-point scale (does not apply, almost never, infrequently, frequently, very frequently). This part of the Phase I questionnaire was based almost exclusively on the questionnaire developed by Berkheimer in his study of the role of science supervisors in implementing science curriculum materials.[3]

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[3]Glenn D. Berkheimer, "An Analysis of the Science Supervisors' Role in the Selection and Use of Science Curriculum Materials" (unpublished Ed. D. dissertation, Michigan State University, 1966), pp. 152-155.

Part II of the Phase I questionnaire consisted of a series of structured questions pertaining to the participants': future position, evaluation of the Program's facilities, and the Program's operation in general. Part III of the Phase I questionnaire was an unstructured questionnaire on which the EXTFP participants evaluated the Program and answered questions about their expected 1966-67 educational positions. Part IV of the Phase I questionnaire asked the EXTFP participants to evaluate the courses of the Program. Copies of the questionnaires of Phase I are presented in Appendix A. Except for the open response questions of Part III, all responses of the Phase I questionnaires were recorded on an International Business Machine (IBM) response sheet. Data process cards were punched directly from the response sheets with mark sensing equipment, thereby avoiding introduction of keypunch errors in the data transfer process.

Phase II

In Phase II of the study, during the Winter Term, 1967-68, EXTFP participants responded to the Actual Role Questionnaire and were interviewed at their school by the investigator. The EXTFP participants' principals (or administrative superiors) and one or two fellow teachers (or co-workers) were also interviewed during the school visits. The Actual Role Questionnaire was basically the

same questionnaire as the Expected-Desired Role Questionnaire, but for Phase II the response was changed to actual role. A copy of the Actual Role Questionnaire is presented in Appendix A.

The interview questions for Phase II of the study were open response. The questions were based upon the expected role function of a resource teacher as derived from the review of the literature. The questions categorized under Backstrom's classification were: fact questions, opinion and attitude questions, and information questions.[4] The questions explored the EXTFP participants' roles in: assisting in in-service education, helping other teachers obtain and use equipment and materials, acting as change agents in innovation of curriculum and teaching techniques, and continuing their professional growth.

In May, following the interview visitations, the participants and their principals were sent one page questionnaires which sought additional information on the participants' activities, as outlined above, and asked the participants' assignments in the 1968-69 school year. Copies of these questionnaires are also presented in Appendix A.

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[4]Charles H. Backstrom and Gerald D. Hursh, Survey Research (Evanston: Northwest University Press, 1963), pp. 70-72.

Procedures for Collection of Data

Phase I

The twenty EXTFP participants who finished all four terms completed a four part Phase I questionnaire during their final term seminar in August, 1966, at Michigan State University. Three of the four parts were structured responses to which the participants replied on an International Business Machine (IBM) response sheet. Data process cards were punched directly from the response sheets thereby eliminating possible introduction of errors due to keypunching. Analysis was achieved through the use of the Control Data Corporation 3600 Computer.

Phase II

The twenty EXTFP participants who completed the Phase I questionnaire were mailed the Actual Role Questionnaire and IBM response sheet during the 1967-68 Winter Term. The response sheet was collected by the investigator during his visitation to their schools in Winter Term.

During the 1967-68 Winter Term, the investigator visited all twenty-three of the EXTFP participants at their schools, which were located in nine states. The investigator interviewed the participants, the participants' principals (or administrative superiors) and one or two of their fellow teachers (or co-workers). Interviews were

tape recorded, then transcribed at a later date. The basic questions asked the interviewees are presented in Appendix A. In May, 1968, one page follow-up questionnaires were mailed to the EXTFP participants and their principals (or administrative superiors). These questionnaires sought information on the participants' activities following the interview and their expected assignments for the 1968-69 school year. Copies of these questionnaires are also exhibited in Appendix A.

Procedure for Analysis of Data

By examining the EXTFP participants' application forms, it was possible to determine their prior background in science and mathematics, their years of teaching, and age range. The above data were summarized and are reported as means and medians in Chapter Four.

The questionnaire responses reported by the EXTFP participants on IBM response sheets during Phase I and Phase II were processed directly to punch cards and analyzed on the Control Data Corporation 3600 (CDC 3600).

The Expected-Desired-Actual Role Instruments had a five response scale. While the "does not apply" appeared on the questionnaire as foil five, for analysis purposes this is mapped onto zero, therefore the response scale for analytical purposes becomes: 0, does not apply; 1, almost never; 2, infrequently; 3, frequently; 4, very

frequently. This is an ordinal scale with an order of increasing importance of frequency from 0 to 4. The statistic most appropriate for describing the central tendency of the responses in an ordinal scale is the median.[5]

The procedures for calculating the median were those reported by Downie and Heath.[6] By definition the median is the point where fifty per cent of the cases are below it and fifty per cent of the cases are above it. For the Role Questionnaires N = 20, therefore fifty per cent of the cases would be ten. The number of cases were counted in each foil from 0 to 4 until ten cases were found. If the number of cases in the foil, when added to the cases in the previous foil, exceeded ten, then that portion (fraction) of the foil was calculated to add to the previous foil to give a total of ten.

For the purposes of this study, the expected, desired, and actual roles were compared using the median of the response to the behavioral statements in the Role Questionnaires.

The open response questionnaires were reported as a summary of the noteworthy replies.

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[5] Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill Book Company, Inc., 1956), pp. 24-25.

[6] N. M. Downie and R. W. Heath, Basic Statistical Methods, 2nd ed. (New York: Harper and Row, 1965), pp. 18-20.

Interviews with the participants, their principals (or administrative superiors) and one or two of their fellow teachers (or co-workers) were reported as case studies for each of the twenty-three EXTFP participants.

Interview findings were extracted from the case study interviews and reported under various categories such as: participants' accomplishments, participants' problems, participants' evaluation of the Program and recommendations for improvement, and participants' role activities.

Summary

Questionnaires were developed and administered to the EXTFP participants prior to their completion of the Program; additional questionnaires were completed by the participants while they were at their 1967-68 educational positions (all questionnaires are exhibited in Appendix A).

The investigator visited all twenty-three EXTFP participants at their schools in 1967-68. During these school site visits, the investigator interviewed the EXTFP participants, their principals (or administrative superiors), and one or two of their fellow teachers (or co-workers). Interviews were tape recorded and transcribed at a later date. Implication of the findings and suggested future studies are presented in Chapter Five.

CHAPTER IV

ANALYSIS OF DATA, CASE STUDIES, AND SUMMARY OF FINDINGS

The data collected by the procedures described in Chapter Three are presented in this chapter together with the results of analyses. The chapter is divided into five sections: (1) personal characteristics of the Experienced Teacher Fellowship Program (EXTFP) participants; (2) questionnaire findings; (3) case studies; (4) interview findings; and (5) summary.[1]

Personal Characteristics

Prior to the Program twenty-two of the twenty-three EXTFP participants were classroom teachers; the other participant was a helping teacher (one who helps other teachers). Their ages ranged from 26 years to 51 years with a mean age of 37 years. Their teaching experiences ranged from 3 years to 22 years with a mean teaching experience of 8.7 years.

The academic training of the EXTFP participants

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[1]The abbreviation EXTFP will be used in this study for the Experienced Teacher Fellowship Program.

varied greatly as shown in Table 1. While one person had 15 quarter hours of mathematics, two persons had no mathematics and two persons had had only 2 quarter hours of mathematics. Only one participant had never had any science prior to the Program. By contrast, sixteen participants had never had an earth science course prior to the Program.

TABLE 1

EXTFP PARTICIPANTS' QUARTER HOURS OF CREDIT IN SCIENCE, MATHEMATICS, AND READING PRIOR TO THE PROGRAM

Subject	Quarter Hours Credit		
	Range	Mean	Median
Physical Science	0-16	3.3	2.12
Biological Sciences	0-16	5.1	5.50
Earth Science	0- 9	1.3	.13
General Science	0-10	1.4	.14
All Sciences	0-32	11.1	11.10
All Mathematics	0-15	6	5.27

Educational Assignments Following the Program

Following the Experienced Teacher Fellowship Program, the participants had the following assignments: four were elementary school principles; two were full time elementary school coordinators; one became a state education department mathematics specialist; one a junior-senior high school reading specialist; two were junior high school science teachers; thirteen were elementary teachers.

Of the elementary classroom teachers, nine taught all subjects in self-contained classrooms. The others were either teaching one subject such as mathematics, or two subjects such as mathematics and science, or mathematics and language arts.

So, from the above diversity of assignments following the Program it is evident that the Program affected many of the EXTFP participants' professional assignments.

Expected-Desired-Actual Role in Science Education

The Expected-Desired Questionnaire and the Actual Role Questionnaire were administered to the twenty participants who completed all four terms of the Program (three participants completed only three terms of the Program). These questionnaires consisted of fifty behavioral statements on the role of a science supervisor or resource teacher and were based on a questionnaire developed by Berkheimer.[2]

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[2]Glenn D. Berkheimer, "An Analysis of the Science Supervisors' Role in the Selection and Use of Science Curriculum Materials" (unpublished Ed.D. dissertation, Michigan State University, 1966), pp. 152-155.

The EXTFP participants responded on a five-response scale: (1) almost never, (2) infrequently, (3) frequently, (4) very frequently, (5) does not apply. The "does not apply" was mapped onto zero for the statistical analysis, so the scale becomes an ordinal scale 0, 1, 2, 3, 4. For statistical comparison the median was computed for each questionnaire function (expected, desired, and actual role). Table 2 is a comparison of these medians. The item response data for the Role Questionnaires are presented in Appendix B.

The behavioral statements represented four role categories in which a resource teacher or supervisor would be expected to function. The four role categories are: (1) assist in science in-service education, (2) help other teachers obtain and use science equipment and materials, (3) provide leadership and act as a change agent in innovation of science curriculum and teaching techniques, (4) continue his professional growth. For simplicity of the discussion and tables to follow, the key words will be used to indicate each category as follows: (1) in-service education, (2) science equipment and materials, (3) leadership and innovation, (4) professional growth.

To illustrate the EXTFP participants' perceived role in the above categories, Table 2 presents the behavioral statements with the median of the participants' responses.

TABLE 2

ITEMS DESCRIBING EXPECTED BEHAVIOR OF A RESOURCE TEACHER WITH MEDIAN RESPONSE OF EXTFP PARTICIPANTS TO THEIR PERCEIVED EXPECTED, DESIRED, AND ACTUAL ROLES, N = 20

Questionnaire Item	Median		
	Desired	Expected	Actual
<u>In-service Education</u>			
The EXTFP participant would:			
*13. conduct or arrange for workshops or conferences on the effective use of equipment and supplies in the teaching of science.	2.83	1.50	0.62
16. conduct meetings to coordinate the science program through several grade levels.	2.50	1.38	.50
17. arrange for in-service programs that are directly related to the curriculum used with pupils.	2.79	2.00	.70
18. conduct in-service programs through the use of T.V., radio and/or motion picture film.	1.20	1.07	.33
19. arrange for demonstration lessons to illustrate recommended methods of teaching science.	2.94	1.50	.50

*Item numbers correspond to those on the questionnaire presented in Appendix A.

TABLE 2--Continued

Questionnaire Item	Median Desired	Median Expected	Median Actual
*20. conduct in-service meetings on the effective use of equipment and supplies.	2.79	1.50	.67
21. arrange for released time to enable teachers to attend in-service programs.	2.79	1.38	.41
25. conduct or arrange for workshops or conferences in science content.	2.77	1.67	.50
28. obtain consultants who conduct in-service activities.	2.60	1.38	.41
46. conduct demonstration lessons to illustrate recommended methods of teaching science.	2.64	1.67	.75
Science Equipment and Materials			
The EXTFP participant would:			
3. assist in plans for constructing or remodeling science laboratories or science facilities.	3.28	2.36	.70
4. work with the administration to obtain an adequate budget for equipment and supplies.	3.33	2.25	1.00

*Item numbers correspond to those on the questionnaire presented in Appendix A.

TABLE 2--Continued

Questionnaire Item	Median Desired	Median Expected	Median Actual
* 5. arrange for equipment and supplies appropriate for the curriculum being used.	3.38	2.50	1.67
7. arrange for adequate science facilities and furniture suitable for experimentation by pupils.	3.20	2.50	1.50
8. arrange for equipment and supplies in necessary quantities for sufficient individual pupil laboratory experiences.	3.22	2.10	1.75
26. conduct or arrange for workshops or conferences in the effective use of instructional materials.	2.72	1.79	.50
37. arrange for teachers to evaluate films, filmstrips and other instructional aids.	2.83	1.90	.73
38. meet with teachers to plan for changes in equipment, supplies, and resources to correspond to changes in the curriculum.	3.12	2.17	1.67
39. aid teachers in arranging storage of laboratory equipment and supplies.	2.79	2.38	1.90

*Item numbers correspond to those on the questionnaire presented in Appendix A.

TABLE 2--Continued

Questionnaire Item	Median		
	Desired	Expected	Actual
*40. provide assistance to teachers in the repair and maintenance of equipment.	2.79	2.17	1.5
41. conduct or arrange for workshops or conferences on the effective use of equipment and supplies in the teaching of science.	2.64	1.39	.41
43. construct science demonstration devices.	3.50	2.25	2.5
Leadership and Innovation			
The EXTFP participant would:			
1. encourage teachers to experiment with new ideas and practices in teaching science.	3.59	3.38	2.62
2. give support to teachers who try new curriculum materials.	3.79	3.59	2.95
6. encourage teachers to use science demonstrations.	3.10	2.70	1.83
9. encourage individual project activity as a regular part of science courses.	3.73	3.28	2.73

*Item numbers correspond to those on the questionnaire presented in Appendix A.

TABLE 2--Continued

Questionnaire Item	Median		
	Desired	Expected	Actual
*10. work as an active member of committees or groups in determining local objectives of science education.	3.38	2.50	1.10
11. meet with teachers to develop criteria for selecting science curriculum materials.	3.17	2.22	.83
12. meet with teachers to evaluate current curriculum materials on the basis of developed criteria.	3.07	2.00	.75
14. organize committees for curriculum study.	2.28	1.72	.88
15. propose curriculum changes.	2.93	2.17	2.90
22. arrange for extra pay for teachers who attend in-service meetings.	2.25	1.20	.33
23. arrange for extra pay or reduced load for teachers who work with science-incentive programs.	2.75	1.16	.27
24. arrange for teachers to observe classroom teaching and individual laboratory experiences guided by another teacher.	2.50	1.28	.75

*Item numbers correspond to those on the questionnaire presented in Appendix A.

TABLE 2--Continued

Questionnaire Item	Median		
	Desired	Expected	Actual
*27. conduct parent meetings to explain the local science program.	2.39	1.67	.50
29. arrange for consultant help in the selection of science curriculum materials.	2.5	1.28	.41
32. provide or write a newsletter or bulletin to inform teachers of new developments in science education.	1.64	1.04	.62
34. encourage teachers to do research related to science instruction.	3.00	2.88	.90
36. help teachers design tests and use test results.	2.68	1.50	1.00
42. use individual pupil laboratory experiences.	3.50	2.62	3.1
44. experiment with new ideas and practices in teaching science.	3.67	3.07	3.00
45. use demonstrations in teaching science.	3.07	2.62	2.25
48. use some of the new experimental science curriculum projects.	3.25	1.50	2.50
49. accept leadership roles in science education in your school, district, or state.	3.00	1.83	1.30

*Item numbers correspond to those on the questionnaire presented in Appendix A.

TABLE 2--Continued

Questionnaire Item	Median**		
	Desired	Expected	Actual
Professional Growth			
The EXTFP participant would:			
*30. select specific articles from the professional literature and recommend them to teachers.	3.22	2.64	2.17
31. collect, analyze and interpret research findings in science education and inform the teachers of pertinent conclusions drawn from this research.	1.67	2.62	.93
33. report to teachers after attending a professional meeting.	3.07	2.88	2.10
35. be actively involved in educational research.	1.75	1.70	1.07
47. read professional science and science education journals.	3.67	3.50	3.36
50. attend state or national science education conferences.	3.33	1.50	1.30

*Item numbers correspond to those on the questionnaire presented in Appendix A.

**The scale is: 0 = does not apply; 1 = almost never; 2 = infrequently; 3 = frequently; 4 = very frequently.

Calculation of Table 2

The integral limits of a number for frequency data range from .50 below the number up to .50 above a number.[3] So that the response range would be only positive numbers, 0.50 was added to the calculated median. The median was calculated according to procedures outlined by Downie and Heath.[4] Under this transitional median, one can interpret the activity levels as follows: from 0 up to 1 = does not apply; from 1 up to 2 = almost never; from 2 up to 3 = infrequently; from 3 up to 4 = frequently; from 4 up to 5 = very frequently.

Interpretation of Table 2--EXTFP Participants' Role

In-Service Education Role of EXTFP Participants

The median of the EXTFP participants' actual role was that in-service education activities did not apply. Except for item 17, they expected almost never to be involved in in-service education activities. Item 17 indicates that they did infrequently expect to arrange for in-service activities. The EXTFP participants' desired role

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[3]N. M. Downie and R. W. Heath, *Basic Statistical Methods*, 2nd ed. (New York: Harper and Row, 1965), pp. 18-20.

[4]*Ibid.*, pp. 31-32.

was that they wanted to be involved infrequently with in-service education activities. All ten behavioral activities related to the in-service education role were rated in a decreasing level of activity from desired, to expected, to actual.

<u>Role of EXTFP Participants in Science Equipment and Materials</u>

In seven of the twelve science equipment and materials behavioral statements, the median rated activity level of EXTFP participants under <u>desired role</u> was that they frequently would desire to participate in the stated behavioral functions. The median of their ratings of the other six behavioral statements was that they infrequently desired to do them.

Under their <u>expected role</u> their median ratings were that they infrequently would exhibit nine of the behaviors and almost never exhibit three of the stated behaviors. The <u>actual role</u> of the participants in equipment and materials indicates that they did not consider four of the twelve behavioral statements as applying to their role, but they thought they would almost never display seven of the stated behaviors and that they infrequently would show the behavior of item 43. They infrequently did construct demonstration devices.

Again it should be noted that for use of equipment

and materials the median rated behavior ranged from frequently in the desired role to does not apply in the actual role.

The EXTFP Participants' Leadership and Innovation Role

In the leadership and innovation role category, the EXTFP participants' median response under desired role was that they frequently desired to express thirteen behaviors, infrequently exhibit eight behaviors, and almost never show one of the stated behaviors; they almost never desired to write a newsletter or bulletin to inform teachers of new developments in science education.

To their expected role they rated four behavioral statements as frequently, eight as infrequently, and ten as almost never.

In their actual role in leadership and innovation the median of their response rated only two behavioral activities as being performed frequently. They frequently did use individual pupil laboratory experiences and experimented with new ideas and practices in teaching science. The median response for six of the behavioral statements was that they actually exhibited such a behavior only infrequently. Four behaviors were shown as almost never being performed. Finally, some nine behavioral statements for leadership and innovation had a median rating indicating the behavior did not apply to the actual role of the

EXTFP participants in their present positions. These were items 11, 12, 14, 22, 23, 24, 27, 29, and 34. These behavioral activities included: meeting with teachers on curriculum, arranging for extra pay for in-service education, arranging classroom observations, arranging for consultant help with equipment and materials, conducting parent meetings, and encouraging teachers to do research.

The EXTFP Participants' Professional Growth

Six behavioral activities described professional growth activities of the resource teacher. The EXTFP participants desired to do four of these frequently, and two almost never. They expected to do only one frequently and expected to do three infrequently. They almost never expected to do two activities.

Their actual role indicated that they frequently read professional journals (item 47) and infrequently recommended specific articles to teachers or reported to them following a professional meeting (items 30 and 33). They were almost never involved in research (item 35), and they considered that item 31 did not apply to their positions. That item indicated the behavior of analyzing and interpreting research findings in science education and informing the teachers of pertinent conclusions drawn from the research.

Summary of Role Questionnaires

By considering the median response of the EXTFP participants, it has been possible to categorize their responses on a five point scale: (0) does not apply; (1) almost never; (2) infrequently; (3) frequently; (4) very frequently. The integral limits were established as from one integer to the next integer. For example, any median from 1 up to 2 would be considered as "almost never". In general their desired activity was higher than their expected activity which in turn was higher than their actual activity. The two exceptions to this generalization were items 42 and 31 where their expected activity was rated higher than their desired activity. In item 42 they expected to use more individual pupil laboratory experiences than they desired to do. In item 31 their expectations were greater than their desires in collecting, analyzing and interpreting research findings.

In general, they rated their in-service activities lower than the other categories. In their actual role they indicated that none of the in-service behavioral activities applied to them. Only four out of twelve equipment and materials activities were rated as not applying to their actual role. Seven of the twenty-two leadership and innovation activities were rated as not applying to their situations. The only professional growth activity

they thought did not apply to their actual role was item 31, which pertained to reviewing, and interpreting research findings for other teachers.

Analysis of the Actual Role of the Subpopulation

Because all EXTFP participants were not involved with science and the fact that the Role Questionnaires were focused on the participants' science education role, the subpopulations of the EXTFP participants who did have positions involving science were selected and their responses to the Actual Role Questionnaire were analyzed. Two subpopulations with science duties were identified: (1) those eleven classroom teachers who taught science, and (2) the four principals and one general elementary curriculum consultant, with duties in science. The median response to the fifty item Actual Role Questionnaire was calculated for each of these groups. The medians for these groups are reported in Appendix C.

Classroom Teachers of Science -- Actual Role The median response of the eleven classroom teachers who actually taught science indicated in the Actual Role Questionnaire that: twenty-seven of the behavioral statements "did not apply" (items 3, 4, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 34, 35, 36, 37, 41, 46); eleven were performed "almost never"

(items 1, 6, 10, 11, 30, 33, 38, 39, 40, 49, 50); five were performed "infrequently" (items 2, 5, 7, 8, 15); six were performed "frequently" (items 9, 42, 43, 44, 47, 48); one was performed "very frequently" (45).

Inspecting the behavioral statements one finds the participants "very frequently" (45) used demonstrations in teaching science.

They "frequently": (42) used individual pupil laboratory experiences; (43) constructed science demonstration devices; (44) experimented with new ideas and practices in teaching science; (47) read professional science and science education journals; (48) used some of the new experimental science curriculum projects; (9) encouraged individual project activity as a part of science courses.

They "infrequently": (2) gave support to teachers who tried new curriculum materials; (5) arranged for equipment and supplies appropriate for the curriculum being used; (7) arranged for adequate science facilities and furniture suitable for experimentation by pupils; (8) arranged for equipment and supplies necessary in quantities for sufficient individual pupil laboratory experiences; (15) proposed curriculum changes.

The EXTFP participants who were classroom teachers of science indicated that they performed "almost never" those behaviors involving: working with fellow teachers in science, leadership roles in science education, or

attending state or national science education conferences.

In the "does not apply" category for the classroom teachers of science one finds the behaviors involving helping teachers in new curriculum, in-service education, leadership duties, and research related activities.

Elementary Principals and Curriculum Coordinator The median response on the Actual Role Questionnaire of the five EXTFP participants who became elementary principals or a general elementary curriculum coordinator is categorized as follows: None of the behavioral statements were considered as "does not apply"; three were performed "almost never" (items 18, 22, 32); twenty-six were performed "infrequently" (items 3, 8, 11, 12, 13, 14, 16, 17, 19, 21, 23, 25, 27, 29, 31, 33, 34, 36, 37, 41, 42, 43, 44, 45, 48, 50); seventeen were performed "frequently" (items 4, 5, 6, 7, 10, 15, 20, 24, 26, 28, 30, 35, 38, 39, 40, 46, 47); four were performed "very frequently" (items 1, 2, 9, 49).

The principals or supervisor "very frequently" performed activities which the classroom teachers of science indicated either "did not apply" or "almost never" performed. These activities included: (1) encouraged teacher to experiment with new ideas and practices in teaching science; (2) gave support to teachers who tried new curriculum materials; (49) accepted leadership roles

in science education in school, district, or state. Only item (9) was also rated high (frequently) by the classroom teacher; that is, encouraged individual project activity as a regular part of science courses. It should be noted that the majority of the behavioral statements were rated as "does not apply" by the classroom teachers of science but none were thus rated by the principals or the coordinator. A majority of the items were rated as being performed "infrequently" by the principals and the coordinator.

Program Evaluation by EXTFP Participants

The questionnaire administered to the EXTFP participants in Phase I contained two sections concerned with the evaluation of the Program. One section was a series of structured questions and the other section consisted of unstructured, open response questions.

Only five per cent of the participants thought the general information describing the Program was inadequate. Some ten per cent felt the objectives of the Program were not made clear in descriptive information sent to them prior to the Program. Ninety-five per cent thought there was very close or some agreement between the stated objectives of the Program and its conduct.

All the participants indicated that they felt welcome to seek help from the Program Director.

Some of the phases of the Program that the participants felt were most useful were the: course content, intern phase, preparation of materials for internship, counseling by the staff, examination of equipment and philosophy of new science and mathematics programs, along with the use of the Science Materials Center.

The phases of the Program which they felt were of little value to them were the reading clinic and the geometry course.

Listed below are the major suggestions by the participants for the improvement of the Program:

1. Have the courses developed around actual elementary classroom needs.
2. Use the seminars to relate the courses.
3. Have the courses more practical and involve less theory.
4. Be more flexible on electives.
5. Not require all participants to take all basic courses if they have a good background in a given course.
6. Add more methods courses.
7. During the first terms the pace should be more gradual.

In rating the administrative services the participants all found these to be adequate or very adequate. Ninety-five to one hundred per cent of the participants

found Science and Mathematics Teaching Center--Materials Center to be adequate or very adequate and ninety per cent made extensive or very extensive use of the facilities.

The EXTFP Participants' Evaluation of EXTFP Courses

The EXTFP participants evaluated the EXTFP courses on a structured questionnaire section of the Phase I questionnaire. (A copy of the questionnaire is presented in Appendix A).

They responded to a five point scale, with the response "not enrolled" recorded as foil five.

Over fifty per cent of the EXTFP participants rated fair or poor, their level of preparation for the first two reading courses. More than seventy-five per cent rated their prior preparation for the physical science courses fair or poor. Similar ratings were found in the other introductory courses. But when their experiences increased with each subsequent course, they rated the prior preparation better.

The quality of instruction for most courses was rated good or excellent by seventy per cent to one hundred per cent of the participants. Elementary reading and geometry were rated fair or poor by sixty-five per cent to eighty per cent of the participants.

The degree of use the participants expected during 1967-68 to make of content, ideas and concepts taught in

the courses was rated good or excellent by sixty-five per cent to ninety-five per cent of the participants for most of the courses. Elementary reading and biological science for teachers were courses that fifty per cent to seventy-five per cent felt would make fair or poor use of the content, concepts and ideas. The degree of motivation developed by the course was rated good or excellent by seventy-five per cent to ninety per cent for all the courses except geometry and introduction to physical science. They were rated fair or poor by fifty per cent to seventy-five per cent of the participants.

In summary it can be said that the rated quality of instruction, motivation developed by the course, future use to be made of the content, and ideas developed by the course were rated good or excellent by nearly all of the participants.

Case Studies

In this section individual case studies are reported on all twenty-three EXTFP participants. As a basis for the case studies, the investigator visited each of the EXTFP participants in their educational positions of 1967-68. The participants, their principals (or administrative superiors) and one or two of his fellow teachers (or co-workers) were interviewed. Most interviews were tape recorded and transcribed at a later date. The basic ques-

tions asked are presented in Appendix A. To protect individuals and schools, the case studies were randomly assigned a letter and do not contain personal names.

Case Study A

Prior to the EXTFP, Mr. A had thirteen years of teaching experience and had completed a Master of Arts degree; his educational background included twelve quarter hours of science and nine quarter hours in mathematics. He did not complete the requirements for a second masters degree during the Program because he only completed three of a possible four terms. To become a supervisor was his projected professional plan upon entering the Program. Benefits envisioned included helping fellow teachers when he returned to his school.

The school system to which Mr. A returned was a relatively affluent suburban system which employed specialists in each of the areas of science, mathematics and reading. New duties, that of grade level chairman in a different building, were his reward following the Program.

He assessed the most valuable part of the EXTFP was the science and mathematics courses. Discussing the Program's value he said:

> The reading was not of as much value. I think mainly because it stressed individual attention and individual problems which you do not have an opportunity to do in the classroom.

His comment on the in-depth sequence of EXTFP

courses was:

> The one thing I liked very much was the fact that individual attention was to be given to the youngster; at the time I wondered how can you do that, and yet, now that I am back in the classroom my whole science program is taught that way with the individual child in mind . . . . at the time I thought it was impossible.

Mr. A's impression of the intern phase of the Program indicated that he benefited from it. He was assigned an inner city school which was a new type of experience. Here, he had a group of slow children, a new encounter for him. His general impression of the internship:

> As part of the Program it is a valuable part. It gives you a chance. I think two weeks is too short a period. It gives you a chance to get out and try some of the things you are doing.

He expressed concern that more prior planning of the internship could have been beneficial. He made only one visit prior to the internship; this in his opinion should have been three or more visits so that he could have learned more of what the children were doing.

A problem seems to exist in informing the EXTFP participant's school of the potential role of the participant. Mr. A expressed disappointment that his school was uninformed about his training even though he had been on a sabbatical leave. He indicated that it should not be the job of the university to inform the school. But the participant should disseminate the purpose of the Program to his school. He suggested a newsletter would suffice to tell the performance and achievements of the partici-

pant and to point out his newly acquired capabilities.

Mr. A's principal voiced a similar view in regard to the coordination of the participant's return to the school system. When he learned that Mr. A was returning from a year long program, he assumed the EXTFP participant had been studying in a routine program and did not realize that the EXTFP participant was expected to act as anything but a regular classroom teacher. Actually the principal was quite unaware of the depth of the Program until he received a telephone call from the investigator indicating that there would be a school visitation by the investigator. The need for communications between the university and the school's administration is aptly stated by Mr. A's principal.

> If I had had some material as communication; it could have been written or a phone call stating that this is what he has been doing and this is where, we found from our experience, he could be of help to new people coming in or people who have been in the classroom a long while; I would have moved a lot faster in using a person with the participant's background, with my own staff and also offering it to other principals. Frankly I can see that the superintendent, with his busy life, would dismiss this as just another routine program, unless something hit him right smack in the face and said, this is vital, it's going to help your instructional program -- do something about it.

Because he was the sixth grade chairman (master teacher or resource teacher) the EXTFP participant had worked with the school librarian, upon his return from the EXTFP. In this position, it is his duty in coordination with the other sixth grade teachers, to compile lists of

books, equipment, and materials. Such lists are submitted to the librarian or materials center coordinator of his building. He found his experience in the EXTFP helpful in providing resource lists and ideas. In reply to the question, "What additional facilities would you like?" he stated:

> I think the EXTFP spoiled us in that you had what you wanted to teach and you went down to the shop and got what you wanted or someone would have it for you in a few days.

He expressed the opinion that he lacked equipment in his present situation, but would like to set up a resource center where all the teachers could share in whatever is on hand.

The EXTFP participant had helped his fellow sixth grade teachers. In mathematics, he had helped them in the use of various teaching materials. Some Madison Project materials, which he developed at the EXTFP, were passed on to his fellow teachers. In his classroom he had developed an index file of supplementary mathematics activities which the children used when they finished their basic work; these resource ideas were also passed along to his fellow teachers. In science, he had furnished his fellow teachers with ideas from the Program gleaned from his fellow EXTFP participants. The method of hatching eggs in the classroom is an example. This he did for his class; then the idea and the equipment and materials were

utilized by other sixth grade teachers.

The fellow teachers reported on help received from Mr. A, the EXTFP participant. One indicated that it was easier to work with him rather than the science supervisor. "He is out to help you rather than out to evaluate you." Another fellow teacher said she had received help in mathematics and that the EXTFP participant had lent her charts and graphs to illustrate positive and negative numbers. She expressed the need for more time to work with him.

The interviewees indicated that the school had benefited by having an EXTFP participant. The participant indicated that he worked with the mathematics coordinator and had gone into an eighth grade class to demonstrate long division. In the opinion of the principal they had benefited by having an EXTFP participant.

> From the time of his return we have had a resource person that we can call upon almost anytime for staff meetings and individual help for teachers. As grade level chairman he can hold regular grade level meetings and work with his fellow sixth grade teachers.

Case Study B

After nine years teaching experience, Mrs. B entered the EXTFP with twenty-one quarter hours of science and five hours of mathematics. Her projected plans were to become a better elementary classroom teacher but not to be an administrator. When she returned to the school sys-

tem following the EXTFP she was assigned to junior high school science. According to the principal, in that small community, this occured because her science training was better than other available teachers.

Although isolated from fellow elementary teachers, Mrs. B was able to help them informally. She gave an example of her help.

> The remedial reading teacher will run across a real problem child that she cannot meet his needs. . . . I will tell her how we started with a child writing his own stories . . . this was how we did it in the reading clinic and the reading seminar.

She helped other teachers in the elementary school in which she formerly taught. She found greater difficulty in communicating ideas to her fellow junior high school teachers.

> But here in this school there has been very little communication. I just felt that everybody had accepted me as an elementary teacher.

Part of the communication problem in the junior high school was that neither the science nor mathematics staff held departmental meetings. Further complications were caused because Mrs. B's science room was in a different wing of the building than the other junior high science room.

Because the school did not have a librarian, Mrs. B was unable to make suggestions on library materials.

A fellow teacher's reaction to obtaining help from Mrs. B was:

> I have felt in the past that maybe the school itself should handle this, rather than have the individual teacher herself having to go to ask for help . . . well perhaps at the beginning of the year something could be set up.

It was apparent that the teacher looked for administrative structure to share ideas. But the principal indicated that he told the teachers at the first faculty meeting that Mrs. B had this special training and they should seek her help on their own. The two fellow teachers interviewed intimated that they did not know about the EXTFP nor specifically Mrs. B's training. Even the principal admitted that he only became aware of the scope of the Program, when the investigator visited the school.

The principal declared that the greatest benefit resulting from an EXTFP participant in his school was her manner of teaching. She involved the pupils in individual or small group investigations and had some working on science fair projects.

When asked how the intern phase of the EXTFP was of value to her, Mrs. B said:

> The intern program was of value to me because I learned what it is like to work with lots of equipment and everything I needed, but this caused some problems because I came back to my school and attempted to teach the same kinds of things to this group with very little equipment . . . it was a handicap, but it was an experience to compare what really happens when you have equipment and materials to do it.

Yet some of the new science curriculum projects and physical science laboratories had been modified and used by Mrs.

B in her classroom.

Her current professional plans were to move back to the elementary school. In her long range plans she hoped to return to college in five years. She reported, at the close of the school year, her appointment to teach the second grade in 1968-69.

While she had not attended any professional meetings since the EXTFP, influenced by the Program, she did subscribe to *Science and Children*, *The Arithmetic Teacher*, and *Scientific American*.

When the principal was asked how he might like to use the EXTFP participant he said:

> Personally if our system was big enough I would hope she could be placed in a position to help other teachers.

Case Study C

Already having earned a masters degree prior to the EXTFP, Mrs. C chose not to complete the requirements for a second masters degree during the Program. With twelve years of teaching experience, she had only eight quarter hours of science and zero mathematics credits. Her professional plans were to continue teaching and to become an elementary coordinator in science and mathematics.

Because of personal reasons, Mrs. C chose to return to her former elementary school only for the first semester, the second semester she was in a different school

district and taught junior high school science and mathematics. This case study has reviewed the EXTFP participant's role in each of these situations.

In her elementary school the first semester the participant was assigned as a substitute teacher. For the first few weeks, when there was little demand for a substitute, she reported to her former school building and inventoried and organized the equipment in the science carts. A complete index was made of all of the science resources in her school building. Noting the need she requested the purchase of equipment. As a substitute teacher, she found that it was almost impossible to use science investigations; there was no time for preplanning and many of the schools had inadequate science equipment. She brought simple apparatus to the classroom which promoted the inquiry method and thoughtful questions.

For the first semester while working at the elementary level, she thought her greatest contribution was organizing the science equipment and helping the teachers use it. Fellow teacher interviewees and the principal concurred on this contribution. They all agreed that it was a waste of her talent to have been a substitute teacher. She should have been placed in the role of helping or resource teacher, they thought.

The principal was asked how the Science and Mathematics Teaching Center of the EXTFP should assist the re-

turning EXTFP participant; she replied:

> Mainly by working with the principal. If the principal is interested, then you get all the cooperation you need. If he is not interested, then everything drops.

The principal suggested that it would be helpful when the EXTFP participant is selected to give the principal more information, or to give the principal more information during the course of the year of the Program.

The participant viewed the physical science course of the Program as of most value and the first reading course as least valuable. She suggested that the degree aspect of the Program should be omitted and there should be a greater balance between methods and content. The Program helped her in working with fellow teachers by substantiating her confidence as an authority on science.

She had not worked on curriculum committees because none were functioning within the district. But she had talked informally with her fellow teachers about various mathematics and science texts and the new curriculum project, thus preparing them for the time when a committee would be formed to study possible text adoptions.

Mrs. C was a life member of the National Science Teachers Association (NSTA), a regular member of the National Council for the Teachers of Mathematics, and has attended two NSTA national conventions. The Program did not influence her professional reading, because she was already subscribing to the major journals in elementary

science and mathematics.

When asked, during the first semester at her elementary school, if she would again participate in such an EXTFP, she indicated that she would not because of the extreme pressure.

For the second semester, the EXTFP participant was in a junior high school in another district. Here she taught science and mathematics. The science was Introduction to Physical Science (IPS) and the mathematics was designed for slow learners.

She viewed her contributions to that school as having helped organize the IPS equipment, assisted in ordering additional equipment, and helped fellow teachers in the use of the equipment. Because of her experience in elementary mathematics, she was able to present mathematics at a meaningful level to the slow students, many of whom were operating at the fifth grade achievement level. When asked how the EXTFP had helped her she said, "I could not have done it without the EXTFP!"

In science she had adapted many of the EXTFP laboratories to the junior high science, but she suggested EXTFP could be improved by having more laboratory experiences. She recognized that the goal of the EXTFP was not the improvement of junior high school science competency.

The principal perceived the contributions of the participant as meeting the needs of the pupils, and help-

ing organize the science equipment. He admitted not taking advantage of her special training because he did not know about the scope of the Program. The principal thought she could not be expected to serve as a resource teacher in addition to her excessive classroom demands due to the low achieving pupils and her arrival in the school at mid-year.

For the 1968-69 school year she expected to be teaching in the American International School, New Delhi, India.

Case Study D

As a helping teacher with a masters degree prior to the EXTFP, Mrs. D had eighteen years of teaching experience. In spite of this level of achievement she had zero quarter hours of science and six hours of mathematics. She did not choose to enroll for a second masters degree during the EXTFP so she left the Program at the end of three terms.

Following the EXTFP, she became an intern consultant and assisted in supervising intern teachers. This satisfied her vocational objective to work with classroom teachers. As an intern consultant she visited the interns' classes and was able to aid them in science, mathematics and reading instructions.

Commenting on how the EXTFP had helped her she said:

> The main benefit of the Program last year was that it gave me more breadth and depth so that when I am teaching there is more to pull from. Before I would study, work with our director of science and teach what I knew. Now I feel there is more there than what I'm teaching. In case a youngster has a question, it gives you a more secure feeling.

She was asked how the EXTFP could better train participants to help other teachers. She felt strongly the necessity for intern experience, either simulated or real, in working with another teacher who does not have an extensive background in science and mathematics.

Mrs. D's reaction to the in-depth science courses was that the first term of undergraduate courses was as tough as the other terms. She attributed that to her poor background in science. She questioned whether such depth in chemistry was necessary for an elementary teacher. The intern phase of the Program, lacking in organization, could have been improved, she thought, by better coordination of the existing equipment and more visits to the school before the internship.

A fellow intern consultant told that it had been enlightening to learn more about some of the new science curriculum projects by watching Mrs. D give demonstration lessons and to discuss such programs with her. As an intern consultant Mrs. D had given several demonstration lessons. Mrs. D declared that some of the demonstration lessons have involved new curriculum projects. She took science apparatus, filmloop, and microprojectors to the

school for such lessons.

Although not a consultant to any individual school, she said the principals, in many cases, have been intrigued with such items as filmloops in the science lesson. She is confident that such demonstrations will affect the school's science program. She reported that she had met with several principals to offer new ideas and projects in science education.

Her supervisor indicated that he had not made any special use of her EXTFP training, but that he had encouraged the other intern consultants to consult with her.

Case Study E

Mr. E was a classroom teacher with twelve years of teaching experience prior to the Program. With twenty-quarter hours of mathematics, his academic background was better than the majority of entering EXTFP participants.

After the EXTFP, Mr. E returned to his school district to become an elementary school principal with additional duties: as the coordinator of computer curriculum development project, as a member of the district science curriculum committee, and occasionally a consultant to their Regional Educational Laboratory.

He viewed one of his greatest contributions to the school was the establishment of a new instructional media center (IMC), to replace an unorganized library. The new

IMC included audio tapes and discs, study carrells, slide filmstrip projectors, and filmloop projectors. After determining the teaching units the teacher would be using, he would order audio-visual materials from the district IMC for his school's IMC. The reaction to this multimedia approach and individualizing of instruction, was both positive and negative. The part-time librarian complained that all that equipment was cluttering the library and the children were noisy using it. But the classroom teachers and school administrators were enthusiastic. One primary teacher found that the boys learned to read more rapidly using filmloop, audio-tapes, and books. She had been using the IMC for combined reading and science lessons. Mr. E, the EXTFP participant, said he could never have established such an instructional media center without his EXTFP experience.

Another benefit of the EXTFP was his study of computerized instruction. He believes more electives should be offered in the EXTFP because he had to take the computerized instruction course as an overload.

There seemed to have been a lack of communications with the school district regarding the specific training the EXTFP participant had experienced. Interviews with the assistant superintendent of the school and the participant confirmed this. The superintendent said that intensive curriculum training such as the EXTFP participant re-

ceived was good training for the position of an elementary principal. To him, one of the greatest roles a principal exhibits is the role of a curriculum resource person.

Summarizing his thoughts about the Program, the EXTFP participant reiterated the need for training in interpersonal relations. Conveying aspects of the Program to the teachers is important, he emphasized; "Anything you can bring back that is concrete is helpful."

Case Study F

The professional plan of Mr. F, was to be the best teacher he could be. Coming from a suburban school with eight years of teaching experience, he had also completed eighteen quarter hours toward a masters degree at another institution prior to entering the EXTFP. He had eleven quarter hours of science and four quarter hours in mathematics prior to the Program.

When asked what benefits his school had received as the result of his EXTFP experience, he replied he had: improved his classroom instruction, helped teachers informally in science and mathematics, and also organized the science equipment and materials in his building.

Mr. F was a sixth grade teacher in a self-contained classroom. His classroom was adjacent and connected to a small science materials center. When he arrived at the school in September, he found the science center disorgan-

ized. He proceeded to systematize it and to encourage teachers to use the materials.

While no in-service programs had been conducted by the participant, he had given brief comments relative to the Program at faculty meetings and made casual remarks in the faculty lounge.

His school did not have a librarian, but Mr. F was the faculty member in charge of library resources. He said the EXTFP experience had been useful in organizing and requesting library books and materials in science, mathematics and reading.

Outdoor Education was the only curriculum committee on which he held membership. Since being a faculty participant for seven years in outdoor education, he had been appointed to that district committee. When he was with his class at school camp, he had organized seven outdoor science and mathematics projects. These ranged from mapping and map reading to the study of pond life. Other teachers from the school district, who were not science oriented, received science instruction from Mr. F during the school camping session. One elementary teacher, who did not know how to use a microprojector, worked through the unit with him. Mr. F remarked that he wished there had been some consideration of school camping and outdoor education in the science and seminar courses of the Program.

Communications with the local school to explain the operations and goals of the Program were lacking. The principal had learned about the Program from the EXTFP participant, after he had been assigned to the school. The principal declared:

> I would have liked to have been better informed prior to his assignment to my building as to just what he (the EXTFP participant) had done.

The EXTFP participant commented:

> I think there should be some communication from the University letting our school know what we are doing. I think if the EXTFP had communicated with the school superintendent, and let him know what we did all year, and let him know how the participant could be used, then there would be no problem for me to go to the superintendent to say I should be doing thus and so.

Both the participant and the principal thought such communications should go to other persons in the school system in addition to the school superintendent. They noted that in such a large system the superintendent did not have time to be concerned with one teacher on leave to a specific program.

Citing problems upon return to the school, the participant said:

> To get back in the swing of things, I think has been my greatest problem. The EXTFP just really stirred my mind up with all the information and content I received last year, and then trying to get it put back into the classroom where I can use it, and disseminate it out.

Assessing the Program, he declared that he would have preferred less emphasis and pressure on attaining a

masters degree at the conclusion of the Program.

He thought the intern phase of the EXTFP could be longer. He suggested the participants teach only every other day, thereby extending the learning time.

In professional growth he had attended one regional science meeting and in 1966 attended the National Science Teachers Association national convention. He indicated that his professional reading had been expanded by the EXTFP to include Science and Children and The Arithmetic Teacher.

Case Study G

Mr. G was one of the few EXTFP participants who returned to the same school building following the Program. Although he had one masters degree, he earned a second as a result of the EXTFP. He had the strongest mathematics and science background of all of the participants with thirty-two quarter hours of science and twelve quarter hours of mathematics. Upon entering the Program his professional objective was to continue to teach children.

His principal indicated that since Mr. G's return, his classroom instruction had improved. This was supported by a statement by his former master teacher, and Mr. G remarked that he had changed his classroom technique. He was integrating science, mathematics and social studies.

He has tried to have a more logical approach to all his subjects. Moreover, it was the first time he had an activity centered program for pupils.

Before the Program he had been a member of the mathematics district curriculum committee and, to be chosen as the chairman when he came back, he attributed to his association with the EXTFP. He found his EXTFP mathematics useful in relating to fellow committee members, the new concepts of mathematics.

When asked how he had helped fellow teachers in the science and mathematics program of his school, he explained that he inventoried the science equipment and had ordered some filmstrips and science equipment. In mathematics, he had helped fellow teachers in various ways. There had been no organized dissemination of his EXTFP training in the school.

Commenting on the intern phase of the Program he said:

> I thought it was valuable. After three or four months it is nice to have a change from classroom lectures and to try out some of the ideas that we'd been studying. I would like to have this every three or four months. You don't know what you need until you go out and try it.
>
> I did not pay enough attention to how to start one of these experimental courses in the school or how to instill these concepts or processes in the children.

Mr. G's interest in professional growth has been expressed by his attendance at about a dozen professional

meetings each year, his principal reported. And the participant explained that he had gone to conferences on all phases of elementary education, from art to child guidance, but since the Program, he had been selective and only regional meetings in science and reading now held priority. He had attended the 1966 National Science Teachers Association Convention. He mentioned that his professional reading was more meaningful since the EXTFP.

When asked what changes he might suggest in the EXTFP, he told about his involvement with the school's outdoor education program and regretted the omission of some orientation on the role of science and mathematics in outdoor education.

Case Study H

Coming from a large urban school system, Mrs. H had thirteen years of experience. Her academic preparation included ten quarter hours of science and six quarter hours of mathematics. Her professional plans included the desire to remain an elementary teacher, also she considered becoming a mathematics specialist.

Because her school and school district were large, Mrs. H's activities were limited to teaching in the classroom and, at intervals, discussions with faculty in the lounge. She was not on a committee nor had she been asked to present anything to faculty meetings pertaining to the

EXTFP. Because of negotiated contracts, all teachers left the building at 3:30 P.M. so an interchange of ideas after school was curtailed. The contract provided for only one teachers' meeting per term. Therefore, the principal said, the time schedule did not permit teachers to explain about their special training. Various materials developed by the EXTFP participant during the Program have been shared with some of her fellow teachers. Those interviewed stressed the difficulty of communicating with Mrs. H because of their different recess times and lunch periods. One fellow teacher did not think there was anything she could learn from the participant.

When she arrived at her new school assignment, Mrs. H found the science equipment disorderly. She had a greenhouse on one side of her classroom and she spent the first month cleaning and readying it for instructional purposes. She expressed concern over the lack of basic equipment and supplies. She said:

> I have high and mighty ideas and return to school and find that this is reality and that is the way it is.

How much she had learned in the Program, Mrs. H didn't realize until she returned to her school and applied it. She thought the intern phase of the Program was valuable because it allowed her the opportunity to try new teaching techniques. In her own classroom she has changed her teaching from a textbook dominated program to one

which provides more experiments and pupil involvement.

Only since the EXTFP does she read science or mathematics education journals such as; The Arithmetic Teacher, The Mathematics Teacher, and Scientific American. Moreover, she is more prone to read an article about science or mathematics appearing in other publications. She had not attended a science or mathematics meeting in the last three years, even though two regional, and one national, meetings had been held within her city school district.

Case Study I

Mr. I was a teacher with thirteen years in the elementary school. His background included twelve quarter hours of science and seven quarter hours of mathematics. Professional plans outlined on his application were to earn a masters degree; to remain in teaching, and to become a coordinator for his school system.

Following the Program, he returned to a self-contained sixth grade in a rural school system. Initially the school administration did not seem to recognize his potential. But toward the end of the first semester when two primary teachers, using a new science curriculum (with kits), needed help, the principal released Mr. I to them for one half day. As a result, Mr. I was released from his classroom duties several more times during the year to work with these primary teachers. The EXTFP participant

was delighted with this opportunity to help fellow teachers. But his role was unclear. He said:

> Are we expected to work as a science or mathematics coordinator? If we are to come back as a curriculum coordinator, and to steer new ideas in science into the curriculum, and work with teachers, I wish we had had a little bit more training in that field, rather than so much content.

He continued to wonder what processes should be used to set up a curriculum in the school without giving the impression that because he was from the EXTFP he knew it all. The principal expressed concern that he would like to use the EXTFP participant as a coordinator but there was no provision for it in the budget in their small rural district.

During the Program, the EXTFP participant liked the science courses the most and the reading the least. In spite of displeasure with teaching reading, he had coordinated a fifth-sixth grade reading program within his school. His reaction to the in-depth sequence of the Program was:

> I look back at the many things thrown us. So many things came up in the classroom we didn't think we would need, but going to school it seemed like a tough grind and why should we learn this, but now I can see the acceleration of science. This background is very valuable for getting into more depth in sixth grade science teaching.

The EXTFP participant evaluated the intern phase of the Program as needing improvement. His suggestions were, more guidance from the staff, and more discussion in

seminars on the new curriculum projects. When asked how the Program could have better coordinated his return to the school he replied:

> I think maybe a letter from the school (college) stating what we might be qualified to do -- if it is nothing more than that we should be qualified to teach a classroom of science better, then it should be stated, but if we are expected to be qualified to do something more than that then a letter from the school (college) would help an awful lot.

On the topic of helping other teachers, his response was that his fellow fifth and sixth grade teachers didn't ask for much help. What problems had he had working with teachers? He answered:

> Well, techniques of presenting yourself as a resource person; to qualify for it, how could we, through a proper technique show the teachers that we are available, without being overbearing about it?

A fellow teacher pointed out how he had been helped when Mr. I had assisted in setting up science apparatus and had explained its use.

Greatest help was evidenced by the primary teachers who first utilized Mr. I's EXTFP training in the new science curriculum project materials. He gave them confidence, explained how to use some of the materials in the science kits, and helped them with evaluation procedures. One teacher said, "It gives us confidence to know he is there to give help and background information." The type of help envisioned by this fellow teacher would require the participant to teach, set up equipment and materials,

and help in the pupil evaluation.

The EXTFP participant had not been aware of the science and mathematics professional meetings prior to the Program, nor was he familiar with some of the major science and mathematics education journals. Following the Program he subscribed to The Arithmetic Teacher. He reads the school's subscriptions to Science and Children, and School Science and Mathematics. The one professional meeting he had attended following the EXTFP was an outdoor education conference.

During the 1968-69 school year, Mr. I expected to be teaching science and mathematics half days, and then to be available half days to assist elementary teachers (K-6) with science.

Case Study J

Returning to his rural school district to become a reading specialist for grades 6-12, Mr. J had achieved one of his professional goals; by obtaining his masters degree he had achieved his other major goal. With five years teaching experience, he had built in the EXTFP upon his ten quarter hours of science and six quarter hours of mathematics.

As a reading specialist he helped individual pupils with their reading problems, and suggested to teachers how to meet these circumstances. Not being actively

involved in science or mathematics, he has only helped teachers indirectly in those subjects. He found the resource material collected during the EXTFP very helpful in answering fellow teachers' questions. Because of his reading duties, he thinks the science and mathematics parts of the EXTFP were of little value to him. He could have derived more worth from extra reading courses in the EXTFP. He said:

> Personally on a short range deal, I would have profited more by more reading courses, because I'm a reading teacher, rather than the science and mathematics courses as outlined. If every teacher knew what area they were going into, perhaps they ought to be allowed to put the emphasis on these special areas.

He found the intern phase of the Program a refreshing change from the classroom. He declared:

> We got sort of away from teaching and this intern part of the Program put us back into our role and reminded us what teaching is really like.

When asked what part of the EXTFP helped him most in working with fellow teachers he told:

> I can't think of anything except the coffee breaks! It seems to me that the opportunity to meet together and have our bull sessions was an important part of the Program.

He was not serving on a curriculum committee, but hoped he would be able to serve next year on the science text selection committee.

His professional reading included the state education association journal, and <u>National Education Association Journal</u> and the journal of the International Reading

Association. As the president of the local education association, he was in charge of teacher negotiated contracts. In addition this association, with Mr. J's assistance, was planning an in-service workshop. The only professional meeting Mr. J had attended was the local reading association meeting.

The principal and the two fellow teachers, indicated when interviewed that the participant in the role of a reading consultant was executing his responsibilities favorably.

Case Study K

Mr. K had expressed the desire to become a helping teacher, a consultant or a principal. He did not achieve his goal. Returning to his inner city school with his masters degree, he was assigned to the role of mathematics teacher, grades five and six. During the EXTFP he had built upon his undergraduate record of eight quarter hours of science and six quarter hours of mathematics.

The principal, who had been his principal prior to the EXTFP, commented that Mr. K had dimensions of understanding and a sense of direction in mathematics which he did not have prior to his EXTFP experiences.

Communications with the staff of the concepts and objectives of the Program seemed to be lacking. One fellow teacher had received some resource materials from the

participant. The other fellow teacher interviewed had received no help from the EXTFP participant, she exclaimed:

> I am not too sure what his program was. Therefore, if I knew or the staff knew, then we would know the types of questions we could ask.

The EXTFP participant had a similar reaction. He remarked:

> People just don't know I was away in a program like this trying to get material that I can share.

The principal expressed the need for information from the Program. He thought the Program director should tell the school administration what the participant had done and what the participant would be able to do.

The participant had shared materials with the reading specialist in his building and some friends in other schools of the district. He had not made formal presentations to the faculty. But the principal planned to use the participant in a half day workshop sometime during the Spring Term. Prior to the Spring Term the EXTFP participant was in a serious automobile accident and disabled for several months, therefore as a result of the accident he was forced to leave teaching for the year. He expected to be employed in another district following his recovery.

Mr. K claimed the entire Program had been of value to him. He thought it would have been better if there had been less theory and more methods. His teaching has changed as a result of the EXTFP. He remarked:

> I've tried to do a lot of individual instruction. I picked up a lot of ideas in seminar and other classes. My whole ideas have changed . . . I have used a number of the materials that I accumulated.

His professional reading habits have been changed by the Program. He regularly reads four journals which he did not read prior to the Program. He stated:

> There were a lot of things that I read prior to the Program that I considered junk because I didn't read to evaluate them. Now I tend to evaluate things more closely and find that the things I considered junk were extremely valuable.

His professional activities included attending one state mathematics meeting. He was not a member of any curriculum committee of the district.

Case Study L

By returning to his suburban school as a classroom teacher, Mr. L had achieved his major objective to become better trained in science and mathematics and to return to elementary teaching. Since returning to the district he has expressed an interest in both the positions of television science teacher and the elementary science helping teacher position.

Participation in the EXTFP built upon his previous sixteen quarter hours in science and he had zero credit hours in mathematics.

Mr. L was teaching fifth grade in an intermediate-junior high school. Because the junior high school classes changed rooms every period, it was necessary for the

elementary grades to also move. While this enabled Mr. L to teach a science lesson in the science room each day, it also limited to one period the length of any science investigation. He noted that because classes were held in the science room seven or eight periods per day, it was difficult to leave materials out after his science lesson.

His science instruction had changed as a result of the EXTFP; he explained:

> I have a lot more laboratory type science activities. I use the inquiry approach in science a lot. I teach more biology this year than I had before. I find children are extremely interested in that.

He now used demonstrations in his inquiry teaching rather than films.

His role as a leader helping other teachers was limited, he thought, by his role as a teacher. He related:

> When you come back and are put in the position of classroom teacher, you are not really in a position of leadership. You could put yourself in a position of leadership, but this is looked on with a jaundiced eye by the rest of the teachers.

He questioned whether the school district administration would want him to take such leadership.

His principal explained that no formal attempt was made to use Mr. L's training because the fifth and sixth grades were temporarily housed in the new junior high. In addition, the principal said he had been too busy opening the new facilities to spend any time with the elementary teachers. He emphasized that he had not known about the

extent of the Program. He said:

> One problem involved here was that I was not aware of what Mr. L was doing and what the aims were and what the outcome of his Program was supposed to be and what his capabilities would be when he came out. Had I known this earlier in the year, then I might have been able to utilize his talents a little more effectively.

The principal admitted the participant had asked to teach more science classes, but the request had been denied, probably because the fifth and sixth grades were only to be within the junior high complex for the one year.

The EXTFP participant expressed the need for communications from the Program to the school administration. He said:

> It might have been helpful if they (the Program) had sent out a statement to our personnel department stating what sort of program we were in and what you felt our qualifications as a result of that (Program) might be.

In commenting on the Program in general, he thought the science and mathematics courses were of most value. He thought the Program was spread too thin to include science, mathematics and reading. He would have liked more intern time. He suggested that a different subject of concentration such as biology, or physical science be used each succeeding week of the internship.

Mr. L, active in his local education association, served as intermediate school representative to the executive board of the association. For the 1968-69 school year he had been appointed editor of the local associa-

tion's newsletter. He remarked that his association work took most of his out-of-class time.

For the 1968-69 school year he had been appointed chairman of the science department in a new elementary school. In that capacity he expected to be active in an intermediate team-teaching operation.

Case Study M

Mr. M had four years of teaching experience in a suburban community. His academic training was higher than the EXTFP group average, and included twelve quarter hours of science and eight quarter hours of mathematics. Following completion of his masters degree and four terms of the Program, he became a mathematics specialist with a State Education Department and assisted in an experimental mathematics project conducted by the Department. His duties with the project included writing, and assisting five or six schools and four colleges in the implementation of the Department's special mathematics project.

Because his duties primarily encompass mathematics and not science or reading, he thought the mathematics portion of the EXTFP was of most value. However, he found the exposure to the new science curriculum projects also influential in his approach to new mathematics projects. Although not involved in reading, he found the EXTFP experience in reading helpful when he analyzed elementary

mathematics texts. The computer course taken as a supplement to the basic EXTFP courses, proved to be extremely useful to him in the special mathematics project. Even though he had taken additional courses beyond the basic EXTFP courses, he believed that fewer courses should be required.

When asked about his part in teachers' workshops, he said:

> Most of my work has been with teachers on curriculum committees. I will give a presentation on how to structure, how to go through the curriculum work in mathematics rather than how to teach the students.

He credited the EXTFP with providing the background necessary for his present position. The Program raised his professional sights.

> Before I went to the EXTFP I never considered starting a doctoral, now I plan to go back and work full time toward a doctorate.

His professional reading prior to the Program included: The Grade Teacher, The Arithmetic Teacher, and Research in Education. But following the Program it had been expanded to more than twenty publications. While before the Program he had not attended professional meetings at all, since the Program he had attended one state, one regional, and one national meeting.

His administrative superiors indicated that the EXTFP experience alone would not have met their criteria for the position, but because of Mr. M's greater breadth

which included computer application, he was considered and has functioned excellently.

Case Study N

Mrs. N returned to her school district as a fifth grade teacher but was subsequently, three months later, switched to a third grade. This was a new challenge because she had never taught third grade in her thirteen years of teaching experience. Once a secondary music teacher, she had been switched to the upper elementary grades. The EXTFP allowed Mrs. N to build on her ten quarter hours of science and six quarter hours of mathematics.

Her professional objectives on entering the EXTFP were to become a better elementary teacher; however, she had considered becoming a resource teacher or supervisor.

Problems had been created by her change in assignment from fifth to third grade. She indicated that her training was in the upper elementary and not primary and that her lessons and resource materials had been designed for fifth grade. Because of limited facilities, she had made extensive use of some of her EXTFP materials. But at the third grade level many of these materials were not appropriate. Compounding the problem was the necessity of teaching penmanship, and writing which she was not trained to do.

Working with the local science supervisor, she had assisted in a workshop for prospective elementary teachers who were college graduates. She demonstrated some of the materials of the new science projects. In addition, she assisted the science supervisor in a one day workshop in her own school. At that workshop she discussed the science laboratory kits which were supplied to the school. The science supervisor indicated this gave greater confidence to the teachers. She explained:

> The teachers are more willing to accept this from another teacher in the classroom than from someone out of the classroom that has come in.

The science supervisor explained why she would like to use the EXTFP participant in workshops.

> She would be good for teachers' workshops because she has this way of communicating with them and they relate to her. I would like to use her more in teacher training.

The principal saw some limitations in using a classroom teacher as a resource person. He elaborated:

> I don't know just how much you can use a person like her in a regular school building. It is fine if you can find time. Then we would have a wonderful time using her. But it means that you have to establish some after school meetings or something of that sort. Or else she could take over a class (as a demonstration teacher), then someone would have to take over her class. That's where the problem lies. It is the question of scheduling and timing and who is going to take over these other things to release her.

He thought to fully profit from her training, she might serve as the leader in science in a team teaching situation.

The principal cited one realm of coordination between the school and the Program. He thought the participant should have a definite school assignment prior to returning to the school, thus enabling explicit planning for particular teaching during the Program.

The EXTFP participant had been a useful resource to a fellow fifth grade teacher. She had helped him set up an aquarium, a terrarium and provided information on the use of mealworms in a science lesson. Because he was relatively new to teaching, he found it useful to go to Mrs. N for information. He said he would rather go to the EXTFP participant for resources and help than ask the city science supervisor. After the EXTFP participant had been assigned to the third grade in another section of the building, the fellow teacher had not been able to go to her for as much help. He thought it would be best if she had released time to help teachers.

The EXTFP participant thought all phases of the Program were of value to her. She was in favor of the degree aspect of the Program. She stated, "it encourages people who haven't had a chance to go back to school and get a degree." She suggested improving the Program by adding more field trips like the ones in biology and earth science.

In her classroom she had used some of the "Elementary Science Study" materials. She emphasized student in-

volvement.

In 1968-69 she expects to teach a sixth grade in a different school.

Case Study O

On returning to his small school system, Mr. O became a junior high school science teacher. Prior to the EXTFP he had three years experience as an elementary teacher. In completing his masters degree, he had extended his knowledge beyond his previous twelve quarter hours of science and three quarter hours of mathematics.

Since the EXTFP participant knew before he returned to his school that he was expected to teach the new Earth Science Curriculum Project (ESCP) he enrolled in an independent study project to study ESCP, as part of his course work. He felt distinctly that he would never have been able to teach the earth science course without the EXTFP experience. Even the mathematics had been very valuable.

He had cooperated with the junior high mathematics teacher in providing pupil laboratory experiences which were also practical exercises in mathematics. A fellow teacher related how Mr. O had cooperated in the teaching of the powers of ten. The fellow teacher noted that those pupils not concurrently enrolled in science and mathematics did not achieve as well in the mathematics units which had been cooperatively taught with science. Mr. O and his

fellow junior high school science teacher, using the junior high science laboratory, developed a science resource center for elementary and junior high school science teachers. While used extensively by the junior high, it was very slowly accepted by the elementary teachers. Mr. O was instrumental in revising the elementary curriculum guide, and during the 1968-69 school year expected part-time to be coordinating the unit studies for the elementary grades. He expressed limitations on his role as a leader:

> They are young teachers; we have a real young staff for me to come back and try to take over and give them a lot of suggestions. They would rebel.

Because the budget was committed before his arrival in September, he had not been able to order many science materials. He suggested the EXTFP participants should communicate with their schools while in the Program, thus giving them an opportunity to make budget suggestions relative to their future needs. He expressed appreciation for the advantages to develop resources in the Program. In particular, he praised the field trips in geology which had enabled him to acquire a rock-mineral collection for use in his classroom.

Other activities that Mr. O was involved in were: chairman of the local science fair, and a member of the school camping staff.

Case Study P

Completing his masters degree through the EXTFP, Mr. P returned to the same elementary school which he had left. In this small rural school he was teaching fifth and sixth grade pupils in a self-contained classroom. While he originally taught all the subjects, at mid-year he traded pupils part-time with another teacher of grades four and five. He taught mathematics and science, and she social studies and language arts.

Mr. P had thirteen quarter hours of science and two quarter hours of mathematics upon entering the EXTFP. His professional objectives were to remain an elementary teacher, and to work with the educationally deprived children.

His teaching had changed as the result of the EXTFP, he felt. Now he performed fewer demonstrations, talked less and allowed the students to do more individualized investigation in science. Similarly, in mathematics he used more manipulative devices with the children. Resourcefully using materials at hand, he had used small stones of gravel as manipulative devices in teaching base four and base five in mathematics. The pupils were asked to group the stones in clumps of the base under study to achieve a given number. He found the pupils learned base four and five rapidly using such simple manipulative devices.

The principal reported that Mr. P was an exemplary teacher who disseminated ideas and techniques by first using them in his class. An example was Mr. P's use of the microprojector in a unit on crystals. Other teachers saw Mr. P's success and wanted to do the same unit in their classroom. The EXTFP participant helped them set it up. The principal attested that prior to that time many of the teachers had not used the microprojector. Mr. P testified that the number of teachers coming for help and the number of requests for help increased substantially as the school year progressed.

When asked what part of the EXTFP helped him in working with fellow teachers, Mr. P answered:

> Myself, I liked the seminar better than anything else, because we got to share more ideas there than anywhere else.
>
> Some of the things I thought were of little value during the Program, have come in pretty handy.

He commented that he thought the chemistry portion of the physical science sequence was of least value and he would liked to have seen it replaced by another reading course such as "test and measurements in reading."

Discussing the intern phase of the Program he said:

> I think the main value of the intern phase is that it gave us a chance to see what we could do if we had the supplies and equipment and whatever we wanted to do with.

Other helpful phases of the Program were: the reading clinic, and geology field trips.

He related how the specimens collected on the field trips had been used in his classroom and shared with other teachers. More materials developed in the Program had been used in his classroom and shared with other teachers. He cited the "Madison Project" materials used by other teachers.

His professional reading had been expanded by the EXTFP. Before the Program he read only two or three general education journals and none in science or mathematics education. After the Program, he furthered his list with the addition of three science or mathematics journals. Other professional activities included: becoming the president-elect of the local education association, attendance at three state or regional meetings in science, mathematics, or reading.

The principal explained how he would like to use Mr. P.

> We had hopes of getting him as a master teacher -- a teacher who can go into the classroom and do things so another teacher can watch them being done. The assistant principal and I do that but it is not nearly as effective because we have the title of administrator. We make assessments for contract and tenure purposes.

The principal declared that for the school administrators to effectively use an EXTFP participant, they would need to know the Program experiences of the participant. Such information would be needed by April of the Program year if the principal was to effectively plan to use the partic-

ipant during the next school year. Even though Mr. P had returned during the Program year to the school, and visited with the principal, the principal noted he did not comprehend the full scope of the Program until the investigator visited the school.

Case Study Q

When Mr. Q returned to his school system, following the EXTFP, he was appointed principal in one of the district's elementary schools. He credited his EXTFP experience and the completion of his masters degree as major reasons for being selected as the principal. Through the EXTFP he had added to his nine quarter hours of science and two quarter hours of mathematics. Using his seven years teaching experience, in addition to the EXTFP training, he has been able to exert curriculum leadership in science.

The science program of the district has been under study. Mr. Q, as co-chairman of the science committee, had directed investigation of the feasibility of a television workshop for teachers in cooperation with a local university. Two new elementary science projects were being evaluated for possible pilot adoptions by some of the schools. Mr. Q was expecting to become a consultant for the workshops on the new science curriculum projects.

One assistant superintendent of schools acknowl-

edged the reason for Mr. Q's appointment as principal:

> We appointed him principal because we do look upon the principal as the curriculum leader and guide for that school.

> The participant was assigned to the new school purposefully because we expected him to come back with the latest ideas and integrate them into a new school with new staff. We were hoping he would be able to focus on the newer concepts of education.

Another assistant superintendent cited Mr. Q's work with other principals:

> The participant has worked with the elementary principals and has stimulated their thinking. As a result they have gone back to their buildings with new ideas in mathematics and science. Hopefully this has been reflected in the teaching in the individual schools.

The assistant superintendent commented on the lack of communications between the Program and the school.

> It would have helped us had we known more about the kinds of experiences which he had and the type of program he did participate in. I was not aware of it really.

> If possible invite the administrators to the campus for a session for a day and let them observe the seminar; and give them a briefing about the kinds of program being offered -- because it is different. And indicate where you think the participant's strength may be.

> It should be a requirement of the Program that the participant write a letter periodically explaining the Program.

A fellow principal made the following observation about the Program:

> I think a focus of your Program might be to let these people know that their prime responsibility for being selected was to learn things you are going to teach them and then to carry them back to the school system.

The participant's views on the Program's relations to the school were:

> There should be a more definite commitment on the part of the students and the administration of the school systems from which they come, as to where they are going back following the Program.

Mr. Q taught elementary classes the first two months of the school year. This had been in a large multi-grade room and he had operated in a team teaching situation part of the time. This allowed other teachers to see and to share science, mathematics and reading instruction. One of the teachers exclaimed about Mr. Q's contribution to the school:

> It seems that a certain amount of fresh ideas are being transmitted to other teachers.

Another teacher commented:

> In science he has a wealth of knowledge of science materials that a normal classroom teacher is not aware of.
>
> Most importantly his attitude toward children's learning experiences and his attitude toward reading and not relying specifically on the textbook for one thing, which I agree with wholeheartedly.

Mr. Q found all phases of the EXTFP of value to him. He criticized the intern part of the Program. He thought it was too artificial a situation; he suggested that it might be more meaningful to have a four week internship.

Case Study R

Despite the necessity of leaving the Program at

the end of three terms due to poor health, Mr. R was able to complete his masters degree because he had previous graduate work at Michigan State University. Mr. R came to the EXTFP with six years of teaching experience. In his three terms with the Program he extended his course credits beyond his previous four quarter hours of science and six quarter hours of mathematics.

Regaining his health, Mr. R obtained a fifth grade teaching position in a school district different from that which he left for the EXTFP. Here, team teaching became a new experience for him. He wished the EXTFP had provided training in team teaching. His impact or influence on the school was not evident. The principal was not aware that he had been on a special program until he told her. She evaluated his performance as not any better than the other teachers.

One fellow teacher, who occasionally functioned as a member of his team teaching group, indicated she was unaware of any contribution he had made to the school as a result of the Program. She had not received any help from him.

The other fellow team teacher indicated she had received some mathematics materials and resource bibliographies from the EXTFP participant.

The EXTFP participant indicated that the pupils had done only one experiment in science; that was on

plants. Ironically, the one part of the Program he thought was of least value was the biological sciences. One might question his criticism in light of the fact that he had zero credits in biology upon entering the Program. He was pleased with the mathematics courses, which he said enabled him to teach modern mathematics for the first time.

The Program did influence his professional reading. He now subscribes to and reads, The Arithmetic Teacher and Science and Children.

Because of Mr. R's continued limited health, it appears he has not been able to spend the time and effort communicating ideas of the Program. The principal acknowledged Mr. R left immediately every day at the close of school because of his need for rest.

Case Study S

Arriving at the EXTFP with just three years of teaching experience, Mr. S completed his masters degree during the Program and returned to his school system to become an elementary school principal. The EXTFP had provided a means of increasing his previous seven quarter hours of science and six quarter hours of mathematics.

As a principal he was a member of the administrative advisory council. Through this he was able to make suggestions for curriculum changes. Because both the mathematics and science programs were in need of revision,

he had made suggestions that a pilot operation be established to try some of the new curriculum projects. For the 1968-69 school year, one new elementary science project was to be piloted in some of the kindergartens.

Another curriculum suggestion he made was the assignment of a definite time allotment on specific days of the week for science. This would counter some teacher's argument "that they just couldn't find the time for science."

The participant had not conducted or participated in workshops in science, mathematics or reading. At one of his faculty meetings he had given a brief review of some of the "Madison Project" materials and was having the school shop construct some materials for the teachers.

Mr. S was chairman of the district curriculum council which was the central committee for all curriculum operations. The curriculums under study for 1967-68 were social studies and language arts. The EXTFP participant related that his training in working with and planning the establishment of new science and mathematics curriculum projects was translatable to these other areas of curriculum.

He testified that working with teachers was not without its problems.

> The biggest difficulty I've had is how do I really get to these teachers without giving them a negative out-

> look before we even get started in selling some of the ideas that I have been exposed to.

Assessing the valuable aspects of the Program, he concluded the educational theory was the most valuable. He recalled that prior to the EXTFP he had been mostly concerned with teachers' salaries and working conditions. But following the Program, he was mostly concerned with the teaching and learning phases which gave attention to the individual pupil.

He suggested that the laboratories of the Program be changed to include investigating developing concept activities for pupils at various grade levels.

Case Study T

Miss T, with seven years of teaching experience, had completed a masters degree prior to the EXTFP. She did not complete a second masters degree during the EXTFP. Her background included fourteen quarter hours of science and fifteen quarter hours of mathematics. Her professional objective was to return to her school system and become an elementary school science teacher. When she returned to her district for the 1967-68 school year, all science teacher positions were filled, so she was a classroom teacher. Pending budget considerations Miss T expected to become a science teacher in 1968-69.

As a fifth grade classroom teacher, she had been a team leader in the school's modified team teaching pro-

gram. Much of her teaching was within a self-contained classroom.

She explained that the urban school system provided all the equipment and materials necessary for the individualized pupil instruction in science and mathematics. The school was using the newer curriculum projects in both science and mathematics.

Her remarks on helping fellow teachers were:

> In the fifth grade there are two new teachers. . . . I've given them occasional help, but really nothing more than I would have done had I not been in the Program.

A fellow teacher testified whether it was useful to have a classroom teacher as a resource teacher.

> Yes, especially if on the same grade level, because the resource teacher is teaching the same thing but has more time to spend on the specific units than the science coordinator can.

The attitude Miss T exhibited toward the value of the Program seemed caustic. She remarked:

> Other than seeing the new materials it was not of great value. . . . I was familiar with the new programs prior to coming to the Program. The only thing I could say was it increased my background in content areas.

Commenting on the value of the intern phase of the Program she asserted it was of limited value:

> Only to open my eye to what other schools in the country are like, that is the only thing it did for me, because the type of teaching I did is the type I have always done.

Admitting her changed classroom instruction she

said:

> . . . in mathematics I do a little bit more individualized work rather than so much demonstration.

The principal who had been her principal prior to the Program commented on her improved teaching:

> I think there is more pupil participation; this would be a general view. A great deal of her work was teacher controlled, now it is more pupil participation and pupil discovery.
>
> I see more committee work or group work. For instance, in a mathematics lesson that I observed they were doing something on prediction. Rather than teach it from a book each youngster on each committee was given a ball and allowed to drop the ball from set heights and measure how high it would bounce. Prior to her experience in the EXTFP I did not notice this. I think this is the thing we have been aiming for.

The EXTFP participant indicated that the Program had not changed her professional reading because she already subscribed to the three major journals, *Science and Children*, *The Science Teacher*, and *The Arithmetic Teacher*.

She thought the only benefit in attending the Program had been her accumulation of credits so that she was eligible for a science teaching specialist's position within her district.

When asked if she thought teachers with prior masters degrees should be admitted to the Program, she coolly declared, "no." Her reaction to the question if she had it to do over again was, "no, because there was too great a pressure."

Case Study U

Mr. U came to the EXTFP with five years of teaching experience, six quarter hours of science, and six quarter hours of mathematics. After completing his masters degree in the Program, he returned to his school district and became an elementary school principal.

Mr. U had helped teachers only if they had asked questions. He had not given formal presentations at the faculty meetings. One of his teachers had not known what type of program he had been on in the EXTFP nor the subjects of concentration of the Program. When the teacher was told what subjects were the focus of the Program, and asked if she would like help from the principal, she declared that she was an experienced teacher and did not need help.

The EXTFP participant related his reluctance to change things too fast.

> My upper elementary teachers I have not even tried to help much, because, as I've indicated, they are still trying to learn how to teach reading, spelling and simple arithmetic.

Mr. U's greatest contribution in science was his leadership in starting a science club for the upper elementary pupils. The teachers were approvingly enthusiastic about it. He organized, too, the science equipment and instructional media in one central place in the school. He had made no apparent dissemination of the new curriculum proj-

ects; their name, concepts nor materials. The two classroom teachers interviewed did not know about any of the new science or mathematics projects. Mr. U had not shared with these teachers any of the resource material gleaned from his year at the EXTFP.

The elementary curriculum coordinator remarked that Mr. U asked that he not give a certain presentation at a workshop for sixth grade teachers, because he felt he was not a good speaker in front of a large group. The coordinator mused that it was too bad a person can be such a good teacher performing in front of children but not able to give a presentation before an adult audience. She suggested that the EXTFP include experiences for the EXTFP participants in giving presentations before adult groups, not just before fellow participants in seminar, but before groups of teachers or parents.

The EXTFP participant, pleased with the Program in general, did view the intern phase with some reservation.

> This may be the weakest spot in the Program. . . . It added a little support to the things I've been able to say. I've been able to say that somebody in our group tried this in the EXTFP and this was successful or did not work out for him.

The superintendent of the school viewed the principals as instructional leaders.

> I think we should be deploying principals as instructional resource people for the elementary staff for whom they work. Therefore, I think the EXTFP did contribute in my selection of Mr. U for the principalship.

The superintendent was disappointed he had not been able to use Mr. U as a resource person more, but Mr. U was still getting established as an administrator.

The elementary coordinator thought more effective use could be made of the EXTFP participant in the classroom a half day and a helping teacher the other half day, rather than as a principal.

Both the superintendent and the elementary coordinator expressed the need for communication from the Program describing the experiences of the EXTFP participant and suggestions as to what he might be expected to do in the school district. The elementary coordinator noted that such information should go to the elementary supervisor in addition to the superintendent of schools.

Case Study V

While Mrs. V entered the EXTFP with a masters degree she also completed a second masters degree as the result of the Program. She had completed thirteen quarter hours of science and twelve quarter hours of mathematics before entering the Program. With fourteen years of teaching experience, Mrs. V returned to her school system, following the EXTFP, to become a general curriculum teacher (helping teacher). Her duties include: helping teachers, principals, and reading specialists upon request; conducting workshops; assisting on curriculum committees;

giving demonstration lessons; team teaching; coordinating select subjects of the curriculum in certain grade levels. In all of these roles her influence seemed to be effective and well received. She had helped some primary teachers with one of the new science curriculum projects. It was the first year in the project for the teachers and the school system. She had team taught and demonstration taught supplementary units in science. She was a leader in a pilot team-teaching of mathematics for a select group of pupils. She had inspired and coordinated a special reading project, grades four and five, in which reading was taught in conjunction with science and social studies. She had given workshops in mathematics and science.

In commenting on the change in Mrs. V as the result of the Program one principal remarked:

> I'm not too familiar with the Program, I don't know what she went through. I knew her for years before the Program and I think it is to her credit that she was a conscientious teacher but not an inspired teacher. Now she is an inspired teacher; she is a master teacher. I can only attribute it to the training she received.

He mentioned that prior to the Program she was quite reserved in the curriculum committee meetings, but following the Program she participated actively in the discussion. He also observed that she had made the teachers more secure in science.

The EXTFP participant found all of the phases of the Program valuable. She suggested that the geometry

should include more applied situations such as astronomy rather than the abstract concepts.

Her professional advancement, she thinks, is due to the EXTFP. Her professional growth had been continued by attending one regional and two national conferences. While she read the major professional journals in science and mathematics education prior to the Program, following it she read the Scientific American. She is the recording secretary for the local teachers association, and the district representative on the television regional science program committee. The local district has an elementary science fair in which she is active.

The superintendent said the most effective use was being made of the EXTFP participant. In discussing improvement in the EXTFP he saw a need for more training in the group process. He thought the Program might be more effective if the last term was delayed. He explained:

> It might be helpful if you reserved the last term or summer session, defer this portion of the program to follow a year of internship. For example, let's take Mrs. V, you had a full year program for her. It seems to me that it would have been quite beneficial for her to come back to us and still have the summer program, she had last summer, waiting to go to this summer. Then she could have gone through this year of working with us and gone back to you this summer for the deferred summer session and been able to realize some greater benefits because she had gone through the Program. At the same time you would have realized a greater benefit because you would have had these people back and could have talked about their experiences. Essentially you could have treated this year of service as an intern program to determine what kinds of success they have had.

Case Study W

Mrs. W was the eldest member of the Program and had twenty-two years of teaching experience. Prior education included her bachelors degree, twelve term hours of science, three term hours of mathematics and three term hours in reading. As an elementary classroom teacher, she had been teaching modern mathematics and expected the Program would enhance her background and abilities in mathematics.

Her professional objectives upon entering the Program included: improving her classroom teaching, helping fellow teachers, and becoming a mathematics specialist. After the Program, she maintained similar professional goals but added a desire to become associated with a junior college as a mathematics education instructor. She realized her need for more mathematics training and was to attend a summer institute in mathematics in 1968.

She returned to the same school building from which she left for the Program. Her principal detected her new outlook on teaching as bubbling with enthusiasm. As grade level chairman, she helped other teachers with their science, mathematics or reading problems and questions. Because the participant's major duty was teaching fourth grade mathematics, the principal thought the EXTFP should have allowed her to concentrate more in that area, rather than study science which she didn't teach. Mrs. W

who enjoyed teaching mathematics, expressed an interest in teaching science because of her exposure to it during the Program.

Mrs. W had given four formal presentations about the Program, these included; to the school board, to a civic group, to the junior high mathematics club, and to the elementary teachers of the district. Almost seventy teachers saw her slides and heard her explain the intent and consequences of the EXTFP. A display was included of equipment and materials she had made or used during the Program.

A fellow teacher expressed interest in her display and in the topics covered by the EXTFP. He had sought her counsel numerous times on science topics and solicited her evaluation of science equipment for some of his science units.

Another teacher explained she had consulted only briefly with the EXTFP participant. This fellow teacher said of the participant:

> She has given me some things that you can use in class for demonstration. She has been very willing. If I would go to her more I probably could get some ideas more than I have actually been able to do. . . . I have not actually conferred with the participant on reading although perhaps I should have because I have the lower group. . . . Probably if I had time to work with her I might be able to find some techniques myself.

Time to work with the EXTFP participant seemed to be a problem. The principal encouraged the upper elementary

teachers to work together. He scheduled their lunch hour together, and as many of their free periods as possible. Other fellow teachers and the participant, herself, expressed the need for time to get together.

Mrs. W was participating in the incentive merit salary program. Her principal evaluated her several times per month. When the school year ended she indicated she had qualified for the merit raise. She said she would never have attempted to try for the incentive merit pay if she had not been in the EXTFP.

The school was planning the adoption of a new elementary mathematics text and Mrs. W was chairman of the mathematics text evaluation committee. She said that many members of the committee did not know about some of the newer mathematics terms and concepts. When the problem arose during committee discussion, she could explain the new concept and terms to her fellow committee members.

The EXTFP participant liked all of the Program. She said, "from my own point of view, I think I didn't realize the full value of what I got until I got back home." She felt the reading and mathematics were of most value to her. The reading program enlightened her on how to develop questions on reading comprehension. She wondered how she could have taught reading for more than twenty years without knowing the things explained in the reading course. Jolting was her first reaction to the in-

depth courses of the Program.

> I just couldn't see why as a fourth grade teacher I needed this subject material in such depth, but I see the value of it now.

Her comment about the intern phase of the Program was:

> It was very good. It was the selling point of the Program. You know you can tell people about the modern teaching techniques, using the discovery method for instance, allowing students to find out things themselves, but you are not sold on it until you try it yourself.

She indicated her teaching techniques had changed as a result of the Program.

> I use a lot more of the manipulative materials. I try to allow the children to make discoveries on their own. And I think they like it.

When asked what coordination should exist between the Program and her school, she indicated that just having a follow-up study with someone visiting the school was good.

Summary of Interview Findings

Interview findings were used as the major basis for the case study section. Specific activities of the EXTFP participants and noteworthy quotations of interviewees were given in the case studies. The follow-up questionnaire responses were also incorporated into the case studies. Abstracted in this interview findings section are summaries based upon the major responses of the interviewees.

The EXTFP Participant

Role Activities and Accomplishments The EXTFP participants returned to the following types of educational positions following the Program: four became principals, one was a reading consultant, two were elementary coordinators, one was a mathematics specialist with a state education department, two were junior high science teachers, and thirteen were elementary teachers.

Their activities were commensurate with their position. In general, the classroom teachers were mostly concerned with their own classroom. They gave help only if asked and disseminated the concepts of the EXTFP mostly on an informal basis. Only if the administrative hierarchy had provided specific dissemination sessions, did the EXTFP participant give a formal presentation.

When the participant was grade level chairman (four participants were), he worked closely with the fellow teachers on their grade level. One classroom teacher was asked to be a resource teacher for primary teachers with one half day released from his classroom duties. Two EXTFP participants who were classroom teachers also participated in team teaching.

Participants' activities outside their own classrooms were varied. Two participants, as classroom teachers, were active in outdoor education programs. Only one participant indicated giving a presentation about the EXTFP

to non-teacher groups. One classroom teacher assisted in two science workshops. One coordinator had assisted in both a mathematics and a science workshop. One principal, two coordinators, and one classroom teacher had taught demonstration classes while other teachers observed.

The EXTFP participants seemed to have a very limited effect on their schools' curriculums. If the school system had active curriculum committees in science and mathematics then they were on one of the committees. Six participants served in this capacity; three of these were chairmen of such a committee. Only one participant had established a new science club, but three were active in an existing science fair program.

Seven EXTFP participants had, cooperatively with fellow teachers or individually, inventoried and organized the science and mathematics resources of their building and established a limited science and mathematics resource center. Sometimes this was just a modest closet. But the most ambitious undertaking was the incorporation of a complete Instructional Material Center (IMC) in place of the school's unorganized library. This IMC contained study carrells, filmloop projectors, slide-filmstrip projectors, and audio stations for discs and tapes. Such an IMC was only possible because the school had been allocated a budget for a library, and the participant, as principal, capitalized on the opportunity. It should be noted that

in all cases, the fellow teachers were enthusiastic about the inventoried and organized science and mathematics equipment.

All participants had developed resource materials during the Program. Examples of resource materials developed are as follows: mimeographed pupil activities, bibliographies; and pupil manipulative devices such as "Madison Project" materials, pan balances, and number balances. These were shared with, and were enthusiastically received by, their fellow teachers. All interviewees agreed that it would be nice if the EXTFP participants could bring more materials back to the school for the benefit of the staff and the pupils.

Not to be overlooked is the change in instruction, accomplished by all of the EXTFP participants who were classroom teachers. In all cases the participant and his principal noted that the participant was focused on inductive individualized instruction and pupil oriented activities. In the few cases where the principal was the participant's former principal, he recalled that the participant did not extensively use the individualized approach prior to the EXTFP.

Problems All participants concerned directly with instruction indicated some degree of frustration primarily because they were not able to conduct classes with the

liberal amount of equipment they had had in the EXTFP. They were pleased with the resources and equipment they had produced in the EXTFP. They found such items as "Madison Project" materials, or pan balances which they made, very useful and well received when shared with their fellow teachers. They would have liked more materials from some of the new science and mathematics projects to use in their own classrooms and to share with their fellow teachers.

Communicating the Program's benefits to fellow teachers was the next major frustration of all of the participants. They did not know the best means. None of the EXTFP participants who were principals had conducted formal meetings on any of the basic aspects of the Program.

<u>Professional Growth</u> Except for two participants who arrived at the EXTFP with a masters degree, all of the other participants acknowledged a growth in the number of professional journals read in science, mathematics and reading. Most declared the mathematics course which required they subscribe to <u>The Arithmetic Teacher</u> had been a major motivating factor in their reading. Most renewed their subscription to it if their educational position involved elementary school mathematics.

About a third of the EXTFP participants indicated increased attendance at professional meetings, and that

such attendance had been motivated by the Program. However, about a third reported they had not attended any professional meeting since the EXTFP.

Program Evaluation and Suggested Improvements In general, the EXTFP participants were very pleased with the Program. When they suggested a course was of least value, it was because they were not involved in teaching that specific subject.

Some of the suggested improvements were: more practical laboratories related to the concepts children learn in the elementary school; inclusion of some phases of team teaching; incorporation of outdoor education into the Program; the addition of interpersonal relations and how to work with teachers upon return to their school; more earth science; more coordination of the intern phase; the addition of more weeks of internship, either concurrently or two separate intern sessions; more communications during the Program with their schools.

All superintendents of schools had granted a leave of absence to their EXTFP participants. In addition, the superintendents made commitments indicating they would effectively use the EXTFP participants' special training upon return to the school districts. Many superintendents did not communicate to their principals or assistant superintendents the potential use of the EXTFP participants.

Of the twenty-three participants, six returned to serve under new superintendents. Only six participants returned to serve under the same principal. This lack of continuity contributed to the EXTFP participants' difficulty in communicating the goals of the Program.

Because superintendents and principals may leave their position after the beginning of the Program, any communication should go to several levels of administration. A superintendent in a very large system, such as Detroit for example, cannot be actively concerned that one of his teachers is on an educational leave. So, it was suggested that any communication from the Program director during the EXTFP should go to the superintendent, the assistant superintendent of instruction or elementary education, and to the principal of the building from which the EXTFP participant came.

One administrator suggested that the participant should also communicate with his school district by writing a monthly or bimonthly letter to his principal and the assistant superintendent in charge of instruction in the elementary school.

The other forms of communications suggested by several principals were newsletters and possibly slides with audio-tapes. The school building staff could, in this way, be informed about the EXTFP participant's potential role.

Several administrative superiors made suggestions for Program change. They included: developmental work on interpersonal relations, the need for team teaching experiences, the inclusion of public speaking opportunities to enable participants to speak effectively to an adult audience, and the delaying of the last term of the EXTFP until after the participant had returned to his school for one year.

Fellow Teachers (Co-workers)

A majority of the fellow teachers interviewed did not know anything about the Program. Some knew that Mr. Z had been away a year studying, but they did not know the subject of concentration.

A majority of the fellow teacher interviewees did not know about any of the newer science or mathematics projects.

A majority of the fellow teachers were enthusiastic about the opportunity to gain information from the EXTFP participant, and wished for more time to work with him.

Summary

The Role Questionnaire eliciting the EXTFP participants' actual, expected and desired role was administered to the twenty participants who completed all four terms of the Program. The median for the response on a five point scale was calculated (0 to 1 = does not apply; 1 to 2 =

almost never; 2 to 3 = infrequently; 3 to 4 = frequently; 4 to 5 = very frequently). Based upon the median of responses, the EXTFP participants exhibited a greater frequency for desired behavior than they did for expected behavior which in turn had a greater frequency than their actual behavior. The role functions were categorized into four types of behavior: in-service education activities, use of equipment and materials, leadership and innovation activities, and professional growth activities. All in-service activities were rated as "does not apply" to their actual role. In general, those activities under the other categories which were administrative oriented or involved meeting with other teachers were rated by the participant as "does not apply" to their actual role.

The Actual Role Questionnaire responses of two subpopulations with actual duties in science were further analyzed. These groups were: (1) eleven classroom teachers, and (2) five non-teachers (four principals and one elementary coordinator). A distinct difference in the median response for the two groups was discovered. The teachers rated a majority (27 items) as "does not apply", the non-teachers rated a majority (26 items) as performed "infrequently". The teachers only performed six activities "frequently", and the non-teachers performed seventeen activities "frequently". None of the behaviors were rated as "does not apply" by the non-teachers.

All twenty-three EXTFP participants, their administrative superiors and one or two of their co-workers were interviewed at their schools in 1967-68. Interview findings indicated that the participants were most pleased with those aspects of the Program which they used in their educational positions.

The participants reported a problem of the lack of equipment to teach science and mathematics and the difficulty in adapting the individualized instruction approach learned in the EXTFP to the more conventional programs taught by their schools.

Only five participants presented material at an in-service workshop. Two participants had given demonstration lessons for fellow teachers. Most participants helped fellow teachers informally and shared the equipment and materials they had developed and made in the EXTFP.

Communications seemed to be a problem. Participants had difficulty in communicating the scope and concepts of the Program to the administrators and fellow teachers. Suggestions by interviewees for the improvement of the Program included: providing communication between the Program and the participants' school administrations during the Program year, providing interpersonal relations experience by having the participants work with teachers during the Program, and delay the final term of the Pro-

gram until the participants have returned to their schools for one year.

CHAPTER V

SUMMARY AND CONCLUSIONS

This study was designed to identify and interpret the role of the Experienced Teacher Fellowship Program (EXTFP) participants in their educational positions in 1967-68 following the Experienced Teacher Fellowship Program at Michigan State University in 1966-67. Specifically, this descriptive case study sought answers to the following. How do the EXTFP participants perceive their expected, desired, and actual role in science education by: assisting in science in-service education; helping other teachers obtain and use science equipment and materials; providing leadership and acting as change agents in innovation of science curriculum and teaching techniques; continuing their professional growth? It should be noted that the delineation of these roles was made at the conclusion of the Program and were among the objectives but were not the specific foci of the Program.

Another phase of this study is the impact of the Program, as evidenced by responses from the participants in the areas of science, mathematics and reading, and by the administrative superiors and the co-workers. These

expressions were recorded during interviews at the participants' school locations. In addition, the participants' evaluation of the Program were elicited. A case study for each participant was completed based upon his application, the above mentioned interviews and one page follow-up questionnaires sent to the participants and their administrative superiors following the interviews.

Summary of Findings

Personal Information

Twenty-three elementary teachers of fourth, fifth, or sixth grades were selected as participants for the 1966-67 Experienced Teacher Fellowship Program at Michigan State University. Three completed only three terms, while twenty completed all four terms of the Program.

Their educational assignments following the Program were: four, principals; two, elementary coordinators; one, a reading consultant; one, mathematics specialist with a state education department; two, junior high science teachers; and thirteen, elementary school teachers.

Role Questionnaires

The Role Questionnaires elicited the EXTFP participants' actual, expected and desired role. For each role the median of the responses on a five-point scale was calculated (0 to 1 = does not apply; 1 to 2 = almost

never; 2 to 3 = infrequently; 3 to 4 = frequently; 4 to 5 = very frequently).

When the responses of the twenty participants completing the questionnaires were compared it was found that their desired role was greater than their expected role which in turn was greater than their actual role. The role functions were categorized into four types of behavior: in-service education activities, use of equipment and materials, leadership and innovation in curriculum, and professional growth activities.

All ten in-service education activities were rated as "does not apply" to their actual role. In general, those activities under the other categories which were administratively oriented, or involved meeting with other teachers were rated by the participant as "does not apply" to their actual role.

Because the Actual Role Questionnaire was focused on the science education role, and only sixteen participants had roles dealing with science, it was necessary to reanalyze the median response of two subpopulations: (1) eleven classroom teachers, and (2) five non-teachers (four principals and one elementary coordinator). A distinct difference in the median actual role response for the two groups was discovered. The teachers rated a majority (27 items) as "does not apply", the non-teachers rated a majority (26 items) as performed "infrequently."

The teachers performed six activities "frequently" whereas the non-teachers performed seventeen activities "frequently." None of the behaviors were rated as "does not apply" by the non-teachers.

Program Evaluation Questionnaire

Some of the parts of the Program the participants thought to be most useful were the: course content, intern phase, preparation of material for internship, counseling by the staff, examination of equipment and philosophy of new science and mathematics programs, use of the Science Material Center.

These are some of the participants' suggestions for the improvement of the Program.

1. Have the courses developed around actual elementary classroom needs.
2. Use the seminars to relate the courses.
3. Have the courses more practical and involve less theory.
4. Be more flexible on electives.
5. During the first term the pace should be more gradual.

Course Evaluation Questionnaire

Over fifty per cent of the EXTFP participants rated fair or poor their level of preparation for the first

two reading courses. More than seventy-five per cent rated their prior preparation for the physical science courses fair to poor. Similar ratings were found in the other introductory courses. But when their experience increased with each subsequent course, they rated the prior preparation better.

Their expectation for 1967-68, in using the content, ideas and concepts taught in the courses was rated good or excellent by sixty-five per cent to ninety-five per cent of the participants. The degree of motivation developed by the courses was rated good or excellent by seventy-five per cent to ninety per cent for all except two of the courses, which were rated fair or poor by fifty per cent to seventy-five per cent.

The participants' role in dissemination of the EXTFP ideas and methods varied. Most participants had shared some of their EXTFP ideas and resource materials with fellow staff members. Those who were grade level chairmen were able to disseminate more of the EXTFP ideas and concepts than those who were classroom teachers. One participant indicated she had given presentations about the EXTFP to two non-teacher groups in addition to a presentation to all elementary teachers in her district. One classroom teacher assisted in two science workshops. One coordinator had assisted in both a mathematics and a science workshop. One principal, two coordinators, and one

classroom teacher had taught demonstration classes while other teachers observed. One classroom teacher was being used as a resource teacher for primary teachers on an occasional half-day released-time basis.

If the school system had an active committee in science or mathematics, then a participant served on it, but only six participants served on such committees. One participant had established a new science club, and three were active in the existing science fair program.

Seven EXTFP participants had either cooperatively with other teachers or individually, inventoried and organized the science and mathematics resources of their building and established a limited science and mathematics resource center. Sometimes this was only a modest closet or in conjunction with the buildings' science rooms, but in one case it became a section of the Instructional Media Center of the building.

All EXTFP classroom teachers and coordinators, and their administrative superiors noted that the EXTFP participants' instruction was now focused on individualized science and mathematics instruction, and pupil oriented activities. In the six cases where the principals were the participants' former principals, they recalled that the participants did not extensively use that approach prior to the EXTFP.

All participants concerned directly with instruc-

tion indicated some degree of frustration, primarily because they were not able to conduct classes with the liberal amount of equipment they had had available in the EXTFP.

Except for two participants with a masters degree prior to the EXTFP, all participants acknowledged a growth in both the number and comprehension of professional journals read in science, mathematics and reading.

All participants and their administrative superiors expressed the need for greater communications between the Program and the school district. Suggestions were made that such communications should go periodically to the superintendent of schools, the assistant superintendent in charge of elementary instruction, and the EXTFP participant's former principal. Such communication should come from both the Program and the participant and should include descriptions of the Program and suggestions for the potential use of the participant in the school. Administrative superiors indicated that such early communications would enable them to plan more effectively the use of the participants.

While all superintendents had recommended the participants for the Program, and had indicated they would make effective use of the participants' training, five EXTFP participants did not have any special duties or assignments beyond their own classroom.

It is apparent that the EXTFP participant was actually functioning in a greater leadership and innovative role if he was not a classroom teacher; however, the case studies show that persons with an inclination to work with fellow teachers did in fact work with them.

Conclusions and Implications

The Experienced Teacher Fellowship Program was successful in meeting its goals of improving the teaching skills and knowledge of the participants and influencing change in the EXTFP participants' schools. This conclusion is based on the fact that all who returned to be classroom teachers noted an improvement in their teaching and all EXTFP participants had shared their knowledge and EXTFP resources with some of their fellow teachers. In addition, the Program was successful in changing the pattern of instruction of the EXTFP participants' from the regular more didactic method to a discovery or inductive method of teaching. This was evident in interviews with the EXTFP participants and their principals.

The Program had a major influence on the EXTFP participants' actual role because nineteen were promoted to new or additional educational positions which varied from chairman of the district mathematics or science committee to the position of principal.

The organizational climate of the school seemed to

be a limiting factor in the attempt of the EXTFP participant to be influential in his school. Where the participant had no assigned role beyond his own classroom he was restricted to informal chats with fellow teachers as a means of disseminating the Program's information.

Administrative reticence, educational bureaucracy, and administrative indifference to the Program resulted in the lack of exploitation of the EXTFP participants' training. By assigning the EXTFP participant to a classroom to teach science, mathematics or reading, many administrators believed that they had met the schools' obligation to the Program, which was to make effective use of the participants' training. These administrators failed to recognize the EXTFP participants as curriculum leaders and resource persons.

Special emphasis during the Program appears to be needed on interpersonal relationship and the role of a change agent in innovation if the participants are to return to their school districts and capitalize on the concepts presented in the Program. The EXTFP participants need to exhibit the initiative in leadership and innovation.

Miles has observed that the elementary teachers are relatively isolated, thereby obstructing innovations

in the elementary classroom.[1] Such observation was supported by this study, because the EXTFP participants who were elementary classroom teachers found limited time and access to work with fellow teachers.

Perhaps to influence strongly a school system, a training program should provide specific and direct links between the training situation and the school district. Most EXTFP participants felt frustrated because of the lack of equipment in their school setting, thus reducing their opportunities to apply concepts learned in the Program. In addition, they reported that this lack of equipment limited their communication of new ideas to fellow teachers. They acknowledged that the materials they had developed and produced during the EXTFP had been very useful, but they lacked the common science and mathematics instructional materials which were available to them during the Program. One possible tie with the schools, through an agreement between the schools and the Program on the participants' role, might be to have the Program furnish a limited amount of equipment to the participants. This is not without precedence, since many National Science Foundation supported Radiobiology Institutes and the Traveling

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[1]Matthew B. Miles, "Some Properties of Schools as Social Systems," in Change in School Systems, ed. by Dorothy Mial (Washington, D.C.: The National Training Laboratory and The National Education Association, 1967), p. 12.

Science Teacher Programs have supplied related equipment to the Institute participants' schools. Such a supply of resources, according to Corey, could facilitate change.[2]

While the Program cannot be expected to change the organizational climate of a school, it might influence the EXTFP participants' roles by providing additional communications between the Program and the schools' administrations during, and following the Program. This might be accomplished by letters, newsletters, telephone calls, personal contact by a liaison expert, or some combination of these methods. Rogers suggests that a liaison expert is needed for planned change.[3] The investigator, by visiting the schools, acted as both a change agent and a liaison expert between the Program and the schools. The members of the schools' staffs were delighted to have interest shown in their needs by the Program sponsoring such visitations. Certainly future programs should consider the addition of a liaison expert between the Program and the schools.

The Program's focus was on the individual partici-

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[2] Stephen M. Corey, Helping Other People Change (Columbus, Ohio: Ohio State University Press, 1963), p. 44.

[3] Everett M. Rogers, "Developing a Strategy for Planned Change," (paper presented at the Symposium on The Application of System Analysis and Management Techniques to Educational Planning in California, Orange, California, June 12-13, 1967), pp. 7-8.

pant, for it was he who made application, not the school. Perhaps, it may be necessary to require institutional application rather than, or in addition to, the individual teacher. Under such a system the school districts would make application stating why they needed such trained persons and exactly how the participants would be used. Such prior involvement of the school districts would provide greater assurance of effective use of the participants.

Implications for Future Research

All ramifications of the Program have not been explored. This study has shown the need for additional investigations. Some of the possible research studies on this or a future EXTFP might be:

1. What are the characteristics of the school in which the EXTFP participant functions most effectively in leadership and innovation of science and mathematics curriculum?
2. What is the effect of the EXTFP on the participant's teaching behavior as measured in pre and post Program observations?
3. What is the effect of the EXTFP on the leadership ability of the participant?
4. What aspect does the EXTFP participant's personality play in his leadership role upon return to his school system?

5. Could the <u>Desired Role Questionnaire</u> be modified to identify leadership potential of the EXTFP participants?
6. What are the effects of the EXTFP participant on his school curriculum and acquisition of equipment and materials, two or three years after the EXTFP?
7. What is the participant's knowledge acquisition as measured by pre and post test?
8. What is the effect of the EXTFP participant upon pupil achievement?
9. Would the concentration of the Program on the implementation of a specific science curriculum affect the participant's curriculum influence at his school?

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APPENDIX A

QUESTIONNAIRES

EXPECTED--DESIRED ROLE QUESTIONNAIRE

Directions:

The following section of the Program Evaluation is divided into two types of response patterns, your expected activity, and your desired activity as it applies to your education position for the 1967-68 school year.

On the response scale (1-5) at the left of the statement you are to indicate what your expected degree of activity will be in your educational position. On the response scale at the right (6-10) of the statement indicate what your desired degree of activity would be in your educational position for the 1967-68 school year.

Please indicate your response by marking your response on the IBM scoring sheet.

The scale is defined as:

Expected Activity		Desired Activity
1	Almost never	6
2	Infrequently	7
3	Frequently	8
4	Very frequently	9
5	Does not apply	10

The terms "almost never, infrequently, frequently and very frequently" refer to the degree to which you in your educational position in the 1967-68 school year expect (left column) and desire (right column) to carry out the stated activity. The number in the columns represent these terms and not the number of times of occurrence.

Please indicate your response to each statement twice, once to indicate your expected activity, and once to indicate the degree of your desired activity in your educational position for the 1967-68 school year.

The scale is defined as:

Expected Activity		Desired Activity
1	- - - Almost never - - -	6
2	- - - Infrequently - - -	7
3	- - - Frequently - - - -	8
4	- - - Very frequently- -	9
5	- - - Does not apply - -	10

In your educational position for the 1967-68 school year you (expect, desire) to:

Expected Activity			Desired Activity
1,2,3,4,5	1.	encourage teachers to experiment with new ideas and practices in teaching science.	6,7,8,9,10
1,2,3,4,5	2.	give support to teachers who try new curriculum materials.	6,7,8,9,10
1,2,3,4,5	3.	assist in plans for constructing or remodeling science laboratories or science facilities.	6,7,8,9,10
1,2,3,4,5	4.	work with the administration to obtain an adequate budget for equipment and supplies.	6,7,8,9,10
1,2,3,4,5	5.	arrange for equipment and supplies appropriate for the curriculum being used.	6,7,8,9,10
1,2,3,4,5	6.	encourage teachers to use science demonstrations.	6,7,8,9,10
1,2,3,4,5	7.	arrange for adequate science facilities and furniture suitable for experimentation by pupils.	6,7,8,9,10
1,2,3,4,5	8.	arrange for equipment and supplies in necessary quantities for sufficient individual pupil laboratory experiences.	6,7,8,9,10

The scale is defined as:

Expected Activity		Desired Activity
1	Almost never	6
2	Infrequently	7
3	Frequently	8
4	Very frequently	9
5	Does not apply	10

In your educational position for the 1967-68 school year you (expect, desire) to:

Expected Activity			Desired Activity
1,2,3,4,5	9.	encourage individual project activity as a regular part of science courses.	6,7,8,9,10
1,2,3,4,5	10.	work as an active member of committees or groups in determining local objectives of science education.	6,7,8,9,10
1,2,3,4,5	11.	meet with teachers to develop criteria for selecting science curriculum materials.	6,7,8,9,10
1,2,3,4,5	12.	meet with teachers to evaluate current curriculum materials on the basis of developed criteria.	6,7,8,9,10
1,2,3,4,5	13.	conduct or arrange for workshops or conferences on the effective use of equipment and supplies in the teaching of science.	6,7,8,9,10
1,2,3,4,5	14.	organize committees for curriculum study.	6,7,8,9,10
1,2,3,4,5	15.	propose curriculum changes.	6,7,8,9,10
1,2,3,4,5	16.	conduct meetings to coordinate the science program through several grade levels.	6,7,8,9,10

The scale is defined as:

Expected Activity		Desired Activity
1	Almost never	6
2	Infrequently	7
3	Frequently	8
4	Very frequently	9
5	Does not apply	10

In your educational position for the 1967-68 school year you (expect, desire) to:

Expected Activity			Desired Activity
1,2,3,4,5	17.	arrange for in-service programs that are directly related to the curriculum used with pupils.	6,7,8,9,10
1,2,3,4,5	18.	conduct in-service programs through the use of T.V., radio and/or motion picture film.	6,7,8,9,10
1,2,3,4,5	19.	arrange for demonstration lessons to illustrate recommended methods of teaching science.	6,7,8,9,10
1,2,3,4,5	20.	conduct in-service meetings on the effective use of equipment and supplies.	6,7,8,9,10
1,2,3,4,5	21.	arrange for released time to enable teachers to attend in-service programs.	6,7,8,9,10
1,2,3,4,5	22.	arrange for extra pay for teachers who attend in-service meetings.	6,7,8,9,10
1,2,3,4,5	23.	arrange for extra pay or reduced load for teachers who work with science-incentive programs.	6,7,8,9,10

The scale is defined as:

Expected Activity		Desired Activity
1	Almost never	6
2	Infrequently	7
3	Frequently	8
4	Very frequently	9
5	Does not apply	10

In your educational position for the 1967-68 school year you (expect, desire) to:

Expected Activity			Desired Activity
1,2,3,4,5	24.	arrange for teachers to observe classroom teaching and individual laboratory experiences guided by another teacher.	6,7,8,9,10
1,2,3,4,5	25.	conduct or arrange for workshops or conferences in science content.	6,7,8,9,10
1,2,3,4,5	26.	conduct or arrange for workshops or conferences in the effective use of instructional materials.	6,7,8,9,10
1,2,3,4,5	27.	conduct parent meetings to explain the local science program.	6,7,8,9,10
1,2,3,4,5	28.	obtain consultants who conduct in-service activities.	6,7,8,9,10
1,2,3,4,5	29.	arrange for consultant help in the selection of science curriculum materials.	6,7,8,9,10
1,2,3,4,5	30.	select specific articles from the professional literature and recommend them to teachers.	6,7,8,9,10

The scale is defined as:

Expected Activity		Desired Activity
1	Almost never	6
2	Infrequently	7
3	Frequently	8
4	Very frequently	9
5	Does not apply	10

In your educational position for the 1967-68 school year you (expect, desire) to:

Expected Activity			Desired Activity
1,2,3,4,5	31.	collect, analyze and interpret research findings in science education and inform the teachers of pertinent conclusions drawn from this research.	6,7,8,9,10
1,2,3,4,5	32.	provide or write a newsletter or bulletin to inform teachers of new developments in science education.	6,7,8,9,10
1,2,3,4,5	33.	report to teachers after attending a professional meeting.	6,7,8,9,10
1,2,3,4,5	34.	encourage teachers to do research related to science instruction.	6,7,8,9,10
1,2,3,4,5	35.	be actively involved in educational research.	6,7,8,9,10
1,2,3,4,5	36.	help teachers design tests and use test results.	6,7,8,9,10
1,2,3,4,5	37.	arrange for teachers to evaluate films, filmstrips and other instructional aids.	6,7,8,9,10

The scale is defined as:

Expected Activity		Desired Activity
1	Almost never	6
2	Infrequently	7
3	Frequently	8
4	Very frequently	9
5	Does not apply	10

In your educational position for the 1967-68 school year you (expect, desire) to:

Expected Activity			Desired Activity
1,2,3,4,5	38.	meet with teachers to plan for changes in equipment, supplies, and resources to correspond to changes in the curriculum.	6,7,8,9,10
1,2,3,4,5	39.	aid teachers in arranging storage of laboratory equipment and supplies.	6,7,8,9,10
1,2,3,4,5	40.	provide assistance to teachers in the repair and maintenance of equipment.	6,7,8,9,10
1,2,3,4,5	41.	conduct or arrange for workshops or conferences on the effective use of equipment and supplies in the teaching of science.	6,7,8,9,10
1,2,3,4,5	42.	use individual pupil laboratory experiences.	6,7,8,9,10
1,2,3,4,5	43.	construct science demonstration devices.	6,7,8,9,10
1,2,3,4,5	44.	experiment with new ideas and practices in teaching science.	6,7,8,9,10
1,2,3,4,5	45.	use demonstrations in teaching science.	6,7,8,9,10

The scale is defined as:

Expected Activity		Desired Activity
1	Almost never	6
2	Infrequently	7
3	Frequently	8
4	Very frequently	9
5	Does not apply	10

In your educational position for the 1967-68 school year you (expect, desire) to:

Expected Activity			Desired Activity
1,2,3,4,5	46.	conduct demonstration lessons to illustrate recommended methods of teaching science.	6,7,8,9,10
1,2,3,4,5	47.	read professional science and science education journals.	6,7,8,9,10
1,2,3,4,5	48.	use some of the new experimental science curriculum projects.	6,7,8,9,10
1,2,3,4,5	49.	accept leadership roles in science education in your school, district, or state.	6,7,8,9,10
1,2,3,4,5	50.	attend state or national science education conferences.	6,7,8,9,10

****

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PROGRAM QUESTIONNAIRE

PART II

DIRECTIONS: Mark your response on your IBM answer sheet.

51. What is your major educational position for next year?

    1. classroom teacher
    2. chairman of the department
    3. principal
    4. coordinator, specialist or consultant in some curriculum area
    5. researcher
    6. other

52. What per cent of your time will be spent in the above position?

    1. 100%
    2. from 75 up to 100%
    3. from 50% up to 75%
    4. less than 50%

53. If you are not assigned 100% to the above position, what is/are your other part-time assignment(s)?

    1. classroom teacher
    2. chairman of the department
    3. principal
    4. coordinator, specialist or consultant in some curriculum area
    5. researcher
    6. other
    7. does not apply

54. What academic subjects will be your major responsibility?

    1. all subjects
    2. science
    3. mathematics
    4. reading
    5. other subjects

55. If you have a part-time assignment as noted above, what academic areas will it involve?

    1. all subjects
    2. science
    3. mathematics
    4. reading
    5. other subjects

56. Is your major educational position:

    1. new to you?
    2. the same position you had prior to EXTFP?

57. Is your part-time educational position:

    1. new to you?
    2. the same position that you had prior to EXTFP?
    3. does not apply

Program description prior to coming to MSU

58. Was the general information describing the program which was sent to you:

    1. very adequate
    2. adequate
    3. moderately adequate
    4. inadequate

59. Were the objectives of the program made clear in the descriptive information?

    1. very clear
    2. clear
    3. moderately clear
    4. not clear

60. How much agreement was there between the stated objectives of the program and its conduct?

    1. very close agreement
    2. some agreement
    3. very little agreement
    4. no agreement

Housing

61. How do you rate the university married housing apartments?

    1. very adequate
    2. adequate
    3. moderately adequate
    4. inadequate
    5. I was not living in the university apartments.

62. How do you rate the university graduate dormitories?

    1. very adequate
    2. adequate
    3. moderately adequate
    4. inadequate
    5. I was not living in a graduate dormitory.

Administrative services of the Mathematics and Science Teaching Center

63. The general administrative services of the SMTC were:

    1. excellent
    2. good
    3. fair
    4. poor

64. The secretaries were:

    1. always helpful
    2. helpful most of the time
    3. sometimes were helpful
    4. were never helpful

65. The quality and quantity of duplicating devices were:

    1. very adequate
    2. adequate
    3. moderate
    4. inadequate

Science Materials Center in Holmes Hall

66. The reference materials, printed materials, and elementary and secondary texts in the SMTC materials center were:

    1. very adequate
    2. adequate
    3. moderately adequate
    4. inadequate

67. The quantity of audio-visual equipment in the SMTC was:

    1. very adequate
    2. adequate
    3. moderately adequate
    4. inadequate

68. The science equipment and materials for projects and independent study in the SMTC materials center were:

    1. very adequate
    2. adequate
    3. moderately adequate
    4. inadequate

69. The SMTC materials center was:

    1. always helpful
    2. helpful most of the time
    3. seldom helpful
    4. never very helpful

70. In using the SMTC materials center you found the equipment and materials to be:

    1. very convenient, easily accessible
    2. convenient, generally accessible
    3. inconvenient, not very accessible
    4. very inconvenient, seldom accessible

71. What degree of use did you make of the SMTC materials center?

    1. very extensive use
    2. extensive use
    3. some use
    4. seldom used

72. The number of staff members in the SMTC materials center was:

    1. very adequate to meet your needs
    2. adequate to meet your needs
    3. inadequate to meet your needs

73. The size of the shop and the types of tools in the SMTC were:

    1. very adequate to meet your needs
    2. adequate to meet your needs
    3. slightly inadequate to meet your needs
    4. very inadequate to meet your needs

74. The science equipment and materials in the SMTC materials center laboratory were:

    1. very adequate to meet your needs
    2. adequate to meet your needs
    3. slightly inadequate to meet your needs
    4. very inadequate to meet your needs

<u>Recreation</u>

75. The size and types of recreation at MSU were:

    1. very adequate
    2. adequate
    3. slightly inadequate
    4. very inadequate

<u>Program Director</u>

76. Did the program director encourage you to seek his help when necessary?

    1. I felt welcome to seek help
    2. I felt hesitant to seek help
    3. I avoided seeking help

77. How did the director regard the student viewpoints different from his own?

    1. Welcomes differences in viewpoints
    2. Exhibits some bias, usually is tolerant
    3. Allows no contraditions, is intolerant

EXPERIENCED TEACHER FELLOWSHIP PROGRAM

PROGRAM COURSE EVALUATION

DIRECTIONS: In the following section a series of questions are asked to evaluate the EXTFP Courses. The written questions on the right apply to the courses (left column) and the Question Number appears in the column under the corresponding course. Each written question should be answered for each course using the scale as defined in the key below.

The Scale is defined as:

1 = excellent

2 = good

3 = fair

4 = poor

5 = not enrolled

Place your name, student number, and your responses to all questions on the IBM Scoring Sheet.

The Scale is defined as:

1 = excellent
2 = good
3 = fair
4 = poor
5 = not enrolled

Written Question	What was the level of your preparation in regard to the level of difficulty of the course?	How would you rate the quality of instruction in this course as compared to others at M.S.U.?	What degree of use will you make during the 1967-68 school year of the content, ideas, and concepts taught in the course?
Rating Scale	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5
Question No.	1-17	18-34	35-51
Ed. 882 EXTFP Seminar-Fall	1	18	35
Ed. 882 EXTFP Seminar-Winter	2	19	36
Ed. 882 EXTFP Seminar-Spring	3	20	37
Ed. 882 EXTFP Seminar-Summer	4	21	38
Ed. 830c Elm. Reading-Fall	5	22	39
Ed. 884 Reading Clinic-Winter	6	23	40
Ed. 882 Seminar in Reading-Summer	7	24	41
Ed. 884 Intern Teaching-Spring	8	25	42
PHS 405 Physical Science for Teachers	9	26	43
PHS 406 Physical Science for Teachers	10	27	44
B S 401 Bio. Sci. for Teachers	11	28	45
PHS 402 Math. for Teachers	12	29	46
Ed. 830a Methods of Teaching Science	13	30	47
Ed. 830a Methods of Teaching Math	14	31	48
MTH 201 Mathematics	15	32	49
B S 202 Biology	16	33	50
PHS 203 Physical Science	17	34	51

The Scale is defined as:

1 = excellent
2 = good
3 = fair
4 = poor
5 = not enrolled

Rating Scale	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5
Question No.	52-68	69-85	86-102
Written Question	What degree of motivation did the course develop for doing additional work and supplementary readings in that subject area?	What degree of Growth toward understanding the subject matter did you feel was developed by the course?	How would you rate the texts used in the course?
Ed. 882 EXTFP Seminar-Fall	52	69	86
Ed. 882 EXTFP Seminar-Winter	53	70	87
Ed. 882 EXTFP Seminar-Spring	54	71	88
Ed. 882 EXTFP Seminar-Summer	55	72	89
Ed. 830c Elm. Reading-Fall	56	73	90
Ed. 884 Reading Clinic-Winter	57	74	91
Ed. 882 Seminar in Reading-Summer	58	75	92
Ed. 884 Intern Teaching-Spring	59	76	93
PHS 405 Physical Science for Teachers	60	77	94
PHS 406 Physical Science for Teachers	61	78	95
B S 401 Bio. Sci. for Teachers	62	79	96
PHS 402 Math. for Teachers	63	80	97
Ed. 830a Methods of Teaching Science	64	81	98
Ed. 830a Methods of Teaching Math	65	82	99
MTH 201 Mathematics	66	83	100
B S 202 Biology	67	84	101
PHS 203 Physical Science	68	85	102

The Scale is defined as:

1 = excellent
2 = good
3 = fair
4 = poor
5 = not enrolled

Rating Scale	Question No.	Written Question	Ed. 882 EXTFP Seminar-Fall	Ed. 882 EXTFP Seminar-Winter	Ed. 882 EXTFP Seminar-Spring	Ed. 882 EXTFP Seminar-Summer	Ed. 830c Elm. Reading-Fall	Ed. 884 Reading Clinic-Winter	Ed. 882 Seminar in Reading-Summer	Ed. 884 Intern Teaching-Spring	PHS 405 Physical Science for Teachers	PHS 406 Physical Science for Teachers	B S 401 Bio. Sci. for Teachers	PHS 402 Math. for Teachers	Ed. 830a Methods of Teaching Science	Ed. 830a Methods of Teaching Math	MTH 201 Mathematics	B S 202 Biology	PHS 203 Physical Science
1,2,3, 4,5	103-119	How would you rate the laboratory, or other learning activities (other than lecture) of the course?	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
1,2,3, 4,5	120-138	What degree of correlation was there between the laboratories or other learning activities and the objectives of the course?	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136
1,2,3, 4,5	139-155	How well were the objectives of the course explained to you?	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155

ACTUAL ROLE QUESTIONNAIRE

Directions:

The following section of the Program Evaluation is divided into a specific type of response pattern and your actual activity as it applies to your education position for the 1967-68 school year.

On the response scale (1-5) at the left of the statement you are to indicate what your actual degree of activity will be in your educational position for the 1967-68 school year.

Please indicate your response by marking your response on the IBM scoring sheet.

The scale is defined as:

Actual Activity

1 - - - Almost never

2 - - - Infrequently

3 - - - Frequently

4 - - - Very frequently

5 - - - Does not apply

The terms "almost never, infrequently, frequently and very frequently" refer to the degree to which you, in your educational position in the 1967-68 school year, actually do carry out the stated activity. The number in the columns represent these terms and not the number of times of occurrence. Please indicate your response to each statement for your actual activity for your educational position for the 1967-68 school year.

The scale is defined as:

Actual Activity

1 - - - Almost never
2 - - - Infrequently
3 - - - Frequently
4 - - - Very frequently
5 - - - Does not apply

In your educational position for the 1967-68 school year you:

Actual Activity		
1,2,3,4,5	1.	encourage teachers to experiment with new ideas and practices in teaching science.
1,2,3,4,5	2.	give support to teachers who try new curriculum materials.
1,2,3,4,5	3.	assist in plans for constructing or remodeling science laboratories or science facilities.
1,2,3,4,5	4.	work with the administration to obtain an adequate budget for equipment and supplies.
1,2,3,4,5	5.	arrange for equipment and supplies appropriate for the curriculum being used.
1,2,3,4,5	6.	encourage teachers to use science demonstrations.
1,2,3,4,5	7.	arrange for adequate science facilities and furniture suitable for experimentation by pupils.
1,2,3,4,5	8.	arrange for equipment and supplies in necessary quantities for sufficient individual pupil laboratory experiences.
1,2,3,4,5	9.	encourage individual project activity as a regular part of science courses.

The scale is defined as:

Actual Activity

1 - - - Almost never
2 - - - Infrequently
3 - - - Frequently
4 - - - Very frequently
5 - - - Does not apply

In your educational position for the 1967-68 school year you:

Actual Activity		
1,2,3,4,5	10.	work as an active member of committees or groups in determining local objectives of science education.
1,2,3,4,5	11.	meet with teachers to develop criteria for selecting science curriculum materials.
1,2,3,4,5	12.	meet with teachers to evaluate current curriculum materials on the basis of developed criteria.
1,2,3,4,5	13.	conduct or arrange for workshops or conferences on the effective use of equipment and supplies in the teaching of science.
1,2,3,4,5	14.	organize committees for curriculum study.
1,2,3,4,5	15.	propose curriculum changes.
1,2,3,4,5	16.	conduct meetings to coordinate the science program through several grade levels.
1,2,3,4,5	17.	arrange for in-service programs that are directly related to the curriculum used with pupils.
1,2,3,4,5	18.	conduct in-service programs through the use of T.V., radio and/or motion picture film.

The scale is defined as:

Actual Activity

1 - - - Almost never
2 - - - Infrequently
3 - - - Frequently
4 - - - Very frequently
5 - - - Does not apply

In your educational position for the 1967-68 school year you:

Actual Activity		
1,2,3,4,5	19.	arrange for demonstration lessons to illustrate recommended methods of teaching science.
1,2,3,4,5	20.	conduct in-service meetings on the effective use of equipment and supplies.
1,2,3,4,5	21.	arrange for released time to enable teachers to attend in-service programs.
1,2,3,4,5	22.	arrange for extra pay for teachers who attend in-service meetings.
1,2,3,4,5	23.	arrange for extra pay or reduced load for teachers who work with science-incentive programs.
1,2,3,4,5	24.	arrange for teachers to observe classroom teaching and individual laboratory experiences guided by another teacher.
1,2,3,4,5	25.	conduct or arrange for workshops or conferences in science content.
1,2,3,4,5	26.	conduct or arrange workshops or conferences in the effective use of instructional materials.
1,2,3,4,5	27.	conduct parent meetings to explain the local science program.

The scale is defined as:

Actual Activity

1 - - - Almost never
2 - - - Infrequently
3 - - - Frequently
4 - - - Very frequently
5 - - - Does not apply

In your educational position for the 1967-68 school year you:

Actual Activity		
1,2,3,4,5	28.	obtain consultants who conduct in-service activities.
1,2,3,4,5	29.	arrange for consultant help in the selection of science curriculum materials.
1,2,3,4,5	30.	select specific articles from the professional literature and recommend them to teachers.
1,2,3,4,5	31.	collect, analyze and interpret research findings in science education and inform the teachers of pertinent conclusions drawn from this research.
1,2,3,4,5	32.	provide or write a newsletter or bulletin to inform teachers of new developments in science education.
1,2,3,4,5	33.	report to teachers after attending a professional meeting.
1,2,3,4,5	34.	encourage teachers to do research related to science instruction.
1,2,3,4,5	35.	are actively involved in educational research.
1,2,3,4,5	36.	help teachers design tests and use test results.

The scale is defined as:

Actual Activity

1 - - - Almost never
2 - - - Infrequently
3 - - - Frequently
4 - - - Very frequently
5 - - - Does not apply

In your educational position for the 1967-68 school year you:

Actual Activity		
1,2,3,4,5	37.	arrange for teachers to evaluate films, filmstrips and other instructional aids.
1,2,3,4,5	38.	meet with teachers to plan for changes in equipment, supplies, and resources to correspond to changes in the curriculum.
1,2,3,4,5	39.	aid teachers in arranging storage of laboratory equipment and supplies.
1,2,3,4,5	40.	provide assistance to teachers in the repair and maintenance of equipment.
1,2,3,4,5	41.	conduct or arrange for workshops or conferences on the effective use of equipment and supplies in the teaching of science.
1,2,3,4,5	42.	use individual pupil laboratory experiences.
1,2,3,4,5	43.	construct science demonstration devices.
1,2,3,4,5	44.	experiment with new ideas and practices in teaching science.
1,2,3,4,5	45.	use demonstrations in teaching science.
1,2,3,4,5	46.	conduct demonstration lessons to illustrate recommended methods of teaching science.

The scale is defined as:

Actual Activity

1 - - - Almost never
2 - - - Infrequently
3 - - - Frequently
4 - - - Very frequently
5 - - - Does not apply

In your educational position for the 1967-68 school year you:

Actual Activity		
1,2,3,4,5	47.	read professional science and science education journals.
1,2,3,4,5	48.	use some of the new experimental science curriculum projects.
1,2,3,4,5	49.	accept leadership roles in science education in your school, district, or state.
1,2,3,4,5	50.	attend state or national science education conferences.

This is the end of the questionnaire.

INTERVIEW QUESTIONS FOR EXTFP PARTICIPANTS

Program

1. What parts of the EXTF Program have been of most value to you?

2. What parts of the Program have been of least value to you?

3. What is your reaction to the in-depth science courses of the Program?

4. How was the Extern (Intern) part of the Program of value to you?

Curriculum

1. Have you served on any curriculum committees in science or mathematics since EXTFP?

2. Have you made any suggestions for curricular change in science or mathematics?

3. How have you changed the science and mathematics curriculum in your classroom as a result of the EXTF Program?

4. Are you teaching any of the "new" elementary science or mathematics programs?

5. What were some of the teaching techniques or ideas you learned in EXTFP that you have used? Results?

6. What are some of the contributions to the school you think you have made in science, mathematics or reading as the result of your EXTFP experience?

In-Service

1. How have you helped your fellow teachers in science and mathematics?

2. Have you given any in-service programs or demonstration lessons for your fellow teachers?

3. What part of the EXTF Program helped you most in working with fellow teachers? How could the Program be improved in this area?

Professional Plans and Growth

1. What are your current professional plans? What are your long-range professional plans?

2. What professional journals do you read? How much? Which ones do you subscribe to?

3. What professional meetings in science and mathematics have you attended in the last two or three years?

4. What other professional activities have you participated in this year?

5. How has the EXTF Program helped in your professional advancement?

Equipment and Materials

1. Have you requested any new science equipment and materials as the result of EXTFP?

2. Have you helped the school librarian in the selection on science or mathematics reading or reference books?

Public Relations

1. How have you participated in the public relations of science and mathematics in your school?

2. What has been your role in conducting science fairs, parent science night, presenting science and mathematics information sessions at school public meetings?

INTERVIEW QUESTIONS FOR THE PRINCIPALS

1. What benefits has the school received due to the EXTFP?

2. How has the participant improved science and mathematics instruction in the school?

3. How has the participant helped other teachers in science and mathematics?

4. Has the participant made requests for equipment or materials that may have been motivated by the Program - i.e. requested more science equipment, newer science or mathematics texts?

5. What special use have you as the principal made of the participant's special training?

6. Does the school have any current committees on science or mathematics? Does the participant serve on them?

7. How would you like to use the participant's special training in science and mathematics?

8. What new science curriculum projects would you like to use in this school? How could you use the services of the participant in introducing such a curriculum?

9. How could the Science and Mathematics Teaching Center better coordinate the EXTFP and the participant's return to the school system so that the school could most benefit from the participant's experiences?

INTERVIEW QUESTIONS FOR THE FELLOW TEACHERS

1. What benefits has the school received due to having a participant from the EXTFP?

2. How have you benefited from the EXTFP?

3. How has the EXTFP participant helped you in science or mathematics?

4. Have you asked the EXTFP participant for help in science, or mathematics?

5. How do you think science should be taught in the elementary school?

6. What are your interests in science? Do you like to teach it?

7. Are you familiar with some of the current science curriculum projects?

8. How do you think the participant might be able to help you if you were to teach one of the new science curriculum projects?

PARTICIPANT'S EXTF QUESTIONNAIRE
MAY 1968

Participant's Name ____________________

Direction: Please complete the questions below and return this sheet in the enclosed envelope by May 20, 1968. Use additional pages if necessary.

1. What will be your educational position and duties for the 1968-69 school year?

2. Give your 1968-69 address if it is different than your present address.

   Home:

   School:

3. Briefly discuss some of your significant educational activities since the EXTF Follow-up interview.

4. Other Comment?

PRINCIPAL'S EXTF QUESTIONNAIRE
MAY 1968

Participant's Name ____________________

Principal's Name ____________________

Direction: Please complete the questions below and return this sheet in the enclosed envelope by May 20, 1968. Use additional pages if necessary.

1. What will be the participant's educational position and duties for the 1968-69 school year?

2. Give participant's 1968-69 address if it is different than present address.

   School:

3. Briefly discuss some of the participant's significant educational activities since the EXTF Follow-up interview.

4. Other Comment?

APPENDIX B

THE EXTFP PARTICIPANTS' RESPONSES TO

THE ROLE QUESTIONNAIRES

N = 20

Ques. No.*	Role Activity**														
	0 Does Not Apply			1 Almost Never			2 Infre-quently			3 Fre-quently			4 Very Fre-quently		
	D	E	A	D	E	A	D	E	A	D	E	A	D	E	A***
1.	-	-	3	-	-	2	-	3	4	9	8	8	11	9	3
2.	-	-	2	-	1	2	1	4	1	5	4	11	14	11	4
3.	1	1	9	1	3	5	1	7	2	9	6	4	8	3	-
4.	1	1	8	3	6	4	1	4	3	6	5	2	9	4	3
5.	1	1	5	1	2	-	1	7	6	8	7	4	9	3	5
6.	1	-	3	2	3	6	1	6	3	10	5	6	6	6	2
7.	-	-	7	-	5	3	3	5	6	10	5	2	7	5	2
8.	2	2	7	-	5	2	3	5	4	7	4	3	8	4	4
9.	-	-	2	-	2	-	1	1	5	6	9	9	13	8	4
10.	-	-	7	2	6	5	1	4	3	8	8	4	9	2	1
11.	1	1	8	2	4	6	1	7	2	9	6	4	7	2	-
12.	2	2	9	2	3	4	2	10	1	7	3	15	7	2	1
13.	3	2	9	-	8	8	5	4	2	6	2	1	6	4	-
14.	2	2	7	1	6	8	9	9	2	5	1	1	3	2	2
15.	1	1	5	1	5	1	5	6	3	7	6	5	6	2	6
16.	3	3	10	2	8	3	5	4	6	6	4	1	4	1	-
17.	2	2	9	-	5	5	6	6	4	7	3	1	5	4	1
18.	3	3	12	6	12	4	5	3	4	5	1	-	1	1	-
19.	-	-	10	1	10	5	5	4	4	9	3	1	5	3	-
20.	-	-	9	2	10	6	6	4	4	7	5	1	5	1	-
21.	2	3	11	3	8	2	3	3	2	7	4	3	5	2	2
22.	2	3	12	5	10	4	4	4	2	5	2	2	4	1	-
23.	2	4	13	3	9	4	3	4	2	8	2	1	4	1	-
24.	2	3	9	3	9	4	5	5	3	7	2	4	3	1	-
25.	1	2	10	1	7	4	5	6	4	11	5	1	2	-	1
26.	1	2	10	2	6	5	5	7	3	9	4	1	3	1	1
27.	-	-	10	2	9	7	9	6	2	4	3	1	5	2	1
28.	3	3	11	2	8	2	4	6	3	10	3	3	1	-	1
29.	3	3	11	2	9	5	5	6	2	7	2	2	3	-	-
30.	-	-	3	1	2	3	4	7	6	7	7	5	8	4	3

*Question numbers correspond to those in the Role Questionnaires presented in Appendix A.

**Questionnaire response of foil five "does not apply" was mapped onto zero for analysis of an ordinal scale.

***The letters represent: D = Desired role; E = Expected role; A = Actual role.

Ques. No.*	Role Activity**														
	0 Does not Apply			1 Almost Never			2 Infre-quently			3 Fre-quently			4 Very Fre-quently		
	D	E	A	D	E	A	D	E	A	D	E	A	D	E	A***
31.	1	1	7	3	8	7	5	6	4	8	4	2	3	1	-
32.	2	3	9	7	13	8	7	2	3	4	2	-	-	-	-
33.	-	-	5	-	3	3	3	4	5	12	8	5	5	5	2
34.	-	-	8	1	7	5	6	8	3	8	3	2	5	2	2
35.	-	1	6	2	8	7	6	5	1	8	5	4	4	1	2
36.	1	1	6	2	9	8	5	8	4	11	1	2	1	1	-
37.	-	-	9	2	8	3	5	5	3	9	7	5	4	-	-
38.	1	1	6	-	5	3	4	6	6	7	6	4	8	2	1
39.	1	1	7	1	6	1	6	8	5	7	2	5	5	3	2
40.	1	1	6	3	5	4	4	6	1	7	5	6	5	3	3
41.	2	2	11	2	9	4	5	6	3	7	2	1	4	1	1
42.	-	-	4	-	4	2	1	5	2	9	8	5	10	3	7
43.	-	-	3	-	4	4	3	8	3	7	6	7	10	2	3
44.	-	-	4	-	4	1	-	2	3	8	7	4	12	7	8
45.	1	1	6	2	4	1	3	4	4	7	8	5	7	3	4
46.	1	1	9	4	8	4	4	6	6	7	4	1	4	1	-
47.	-	1	-	-	2	1	-	1	3	8	6	7	12	10	9
48.	1	1	4	2	9	3	1	6	3	8	3	3	8	1	7
49.	2	1	6	2	7	5	1	6	2	10	3	6	5	3	1
50.	1	2	6	2	8	5	2	6	7	6	2	1	9	2	1

*Question numbers correspond to those in the Role Questionnaires presented in Appendix A.

**Questionnaire response of foil five "does not apply" was mapped onto zero for analysis of an ordinal scale.

***The letters represent: D = Desired role; E = Expected role; A = Actual role.

APPENDIX C

EXTFP PARTICIPANTS WHO WERE EITHER CLASSROOM TEACHERS OF SCIENCE OR NON-CLASSROOM TEACHERS WITH DUTIES IN SCIENCE -- A COMPARISON OF THEIR MEDIAN RESPONSES TO THE ACTUAL ROLE QUESTIONNAIRE

Question Number*	Adjusted Median**	
	EXTFP Teachers N=11	EXTFP Non-Teachers N=5
1.	1.85	4.12
2.	2.12	4.34
3.	.76	2.88
4.	.43	3.85
5.	2.00	3.88
6.	1.85	3.00
7.	2.33	3.34
8.	2.25	2.25
9.	3.00	4.12
10.	1.88	3.02
11.	1.88	2.85
12.	.43	2.88
13.	.71	2.34
14.	.68	2.25
15.	2.00	3.87
16.	.43	2.00
17.	.43	2.25
18.	.11	1.88
19.	.43	2.00
20.	.43	3.12
21.	.11	2.25
22.	.11	1.25
23.	.11	2.02
24.	.43	3.34
25.	.43	2.25
26.	.28	3.34
27.	.28	2.34
28.	.11	3.02
29.	.28	2.25
30.	1.33	3.04
31.	.98	2.00
32.	.68	1.85
33.	1.25	2.85
34.	.88	2.25

*Question numbers correspond to those in the Actual Role Questionnaire presented in Appendix A.

**0.50 was added to the median so that the medians would range from 0 up to 5, and could be interpreted as follows: 0 up to 1 = does not apply; 1 up to 2 = almost never; 2 up to 3 = infrequently; 3 up to 4 = frequently; 4 up to 5 = very frequently.

Question Number*	Adjusted Median**	
	EXTFP Teachers N=11	EXTFP Non-Teachers N=5
35.	.80	3.02
36.	.75	2.00
37.	.43	2.85
38.	1.25	3.02
39.	1.00	3.02
40.	1.33	3.00
41.	.285	2.25
42.	3.87	2.00
43.	3.33	2.00
44.	3.81	2.25
45.	4.00	2.00
46.	.76	3.12
47.	3.68	3.00
48.	3.68	2.00
49.	1.20	4.12
50.	1.25	2.34

*Question numbers correspond to those in the Actual Role Questionnaire presented in Appendix A.

**0.50 was added to the median so that the medians would range from 0 up to 5, and could be interpreted as follows: 0 up to 1 = does not apply; 1 up to 2 = almost never; 2 up to 3 = infrequently; 3 up to 4 = frequently; 4 up to 5 = very frequently.