

A DESCRIPTIVE STUDY OF SELECTED
WORKSHOP FACTORS AFFECTING THE
TRAINING AND SUPPORT OF RESOURCE
PERSONNEL IN A SCIENCE CURRICULUM

Thesis for the Degree of Ph. D.
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DAVID HENRY MAY
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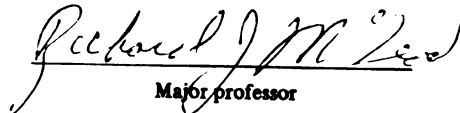
A DESCRIPTIVE STUDY OF SELECTED WORKSHOP
FACTORS AFFECTING THE TRAINING AND SUPPORT OF
RESOURCE PERSONNEL IN A SCIENCE CURRICULUM

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David Henry May

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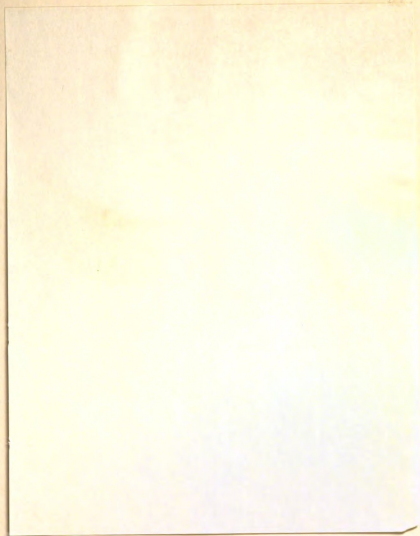
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Forty participants attended the workshop, the majority of whom were college students.

ABSTRACT

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By

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Problem

amount A continuing need exists for trained educators to work with local schools, providing information on innovations and aiding in their adoption. To meet this need, Resource Personnel Workshops (RPW) are conducted, to train college and school personnel in new programs and techniques for implementing innovations.

Prior studies of RPWs indicate that participants do function in the role of a resource person. But, no data has yet been defined which compare the activities of various educators attending the workshops. In addition, no studies have been made of how an RPW is designed and conducted, or how effective a particular model appears.

Results This study provides a descriptive investigation of an RPW, during both the formal workshop and its conducted a total of 157 activities, involving 2,134 other people.

follow-up. Participant evaluations are used to assess the effectiveness of each design component. Forty participants attended the workshop, the majority of whom were college instructors. Other participants were school science supervisors and consultants. Twenty-eight of the participants attended as members of a two-man team and twelve attended as individuals.

The study also attempted to refine criteria by which participants are selected. Certain variables were identified and tested for possible correlations with the amount of science education activities carried on during the study follow-up period.

Methodology

Data of the study were gathered prior to, during, and after the formal workshop. Study instrumentation consisted of a standardized test of science knowledge, an instrument constructed to measure perception of the educational worth of the curriculum used, a workshop evaluation instrument, and a final evaluation instrument.

Data on the activity of participants were gathered using an activity log which was returned monthly.

Results

During the follow-up period, the participants conducted a total of 157 activities, involving 3,789 other people.

~~Implication~~ Analysis of this activity indicates that, contrary to expectations gained from the literature, teams of participants were not significantly more active than were individuals. How the teams were formed, however, in terms of how much the members had worked together previously, appeared to strongly influence the activity of the teams. ~~this improvement is indicated~~ ~~shape~~. Among all participants, science supervisors proved to be the most active, and science consultants the least active. ~~appears to be~~ ~~still~~ Hypothesis testing indicated that significant correlations do not exist between the variables of academic degree, academic assignment, score on perception instrument, or score on science knowledge test, and subsequent activity. The amount of increase on the perception instrument was found to be significantly correlated with later activity levels.

Activities of the formal workshop and its follow-up appeared to meet the perceived learning needs of the participants. Planning and presentation of teacher conferences was judged the most effective workshop activity. A monthly newsletter was viewed as the most helpful follow-up effort.

Implications

Based on the study data, RPWs do appear effective in increasing the amount of implementation activity in new programs.

A high degree of perception improvement appears to be a factor related to increased participant activity. Building this improvement is indicated in future workshops.

From a cost-effectiveness point of view, selection of teams does not appear valid. Other considerations may still indicate that selection of teams is important, but from a number of activities viewpoint, teams do not appear to be cost-effective.

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Michigan State University
in partial fulfillment of the requirements
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A DESCRIPTIVE STUDY OF SELECTED WORKSHOP
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The writer wishes to By the way, the assistance
and encouragement provided by his several teachers
during the period of this study. The acknowledged support
of Drs. Glenn Berkheimer, Marion Wetherington, and George
Farree proved invaluable. And to mention, Dr. John Smith
could not have been completed without the assistance and
help of Dr. Richard McLeod, chairman of the Graduate
Committee, and director of the workshop of the School.

The forty participants of that workshop
contributed significantly to the completion of this study.
Without their willingness to provide the necessary
information, this study would not have been possible.

The writer also wishes to acknowledge the support
of his wife, Wynn, and their children. In the completion
of this study. Their confidence in him is a source of pride.

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ACKNOWLEDGMENTS

Chapter

The writer wishes to acknowledge the assistance and encouragement provided by his Doctoral Committee during the period of this study. The advice and counsel of Drs. Glenn Berkheimer, Martin Hetherington, and George Ferree proved invaluable. And in particular, this study could not have been completed without the cooperation and help of Dr. Richard McLeod, chairman of the Doctoral Committee, and director of the workshop of the study.

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Statement of Purpose

In an attempt to increase the number of teachers who are active about innovations in education, the National Science Foundation (NSF) has sponsored a series of Regional Workshops (RWs). RWs are designed to be held in local schools in two major areas: (1) to provide information to local schools about new teaching strategies; (2) to provide information to local schools about the adoption or implementation of new teaching strategies.

RWs have been funded since 1967. The evaluations so far performed have indicated that participants do function effectively as intermediaries of innovation and as implementation specialists. But, these evaluations have primarily been confined to a study of how much the participants have done, and with what effect. As yet, few investigations have been made of RW design and management directly. In order to increase the

CHAPTER I

INTRODUCTION

Statement of the Problem

In an attempt to increase the rate at which information about innovations is diffused among educators, the National Science Foundation (NSF) has developed, and continued to support, a concept known as a Resource Personnel Workshop (RPW). RPWs are designed to provide aid to local schools in two major areas. One function is to provide information to those schools about new curricula or teaching strategies. A second function is to provide readily available local aid to those schools in their adoption or implementation of innovations.

RPWs have been funded since 1967 and the evaluations so far performed have indicated that participants do function effectively as disseminators of information and as implementation specialists. But, these evaluations have primarily been confined to a study of how much the participants have done, and with what effect. As yet, few investigations have been made of RPW design and management directly. In order to increase the

effectiveness of the total RPW model, all aspects of that model require further study to determine the impact of each on the training, functioning, and supporting of a resource person.

This study provides an investigation of an RPW, prior to, during, and following the formal workshop period. Information gained through this study will be useful in modifying subsequent RPW designs through the identification of successful or unsuccessful techniques. Additionally, the study also provides information necessary for alteration or deletion of those design features which appear ineffective.

Background of the Problem

The National Science Foundation was created in 1950, and since that time has been deeply involved in attempts to upgrade science education in American schools. NSF has provided direct support for many projects designed to develop and test new curricular materials. Another strong area of emphasis for the Foundation has been that of increasing the knowledge and competency of science teachers through various institutes and inservice experiences. Both of these efforts continue, but it has become increasingly apparent that the direct training of teachers cannot, by itself, affect sufficient numbers of teachers to meet the existing needs for such training.

Current efforts at retraining are particularly focused on teachers at the elementary and junior high school levels. The necessity for such retraining is a function both of changes in the educational structure of the country and the development of new curricular materials. During the decade from 1961 to 1970, great changes occurred in science education programs for American schools, both in course content and in methods of instruction. Earlier events, such as Sputnik, had focused attention on our educational policies in general, and science education in particular. It was also during this period that the debate between the content of science and the processes of science, as legitimate areas of concern in classrooms, climaxed, resulting in the introduction of many new methods and materials of instruction.

Many of these changes were introduced in the form of new curricula, for example BSCS in 1963, S-APA in 1967, SCIS in 1967, and the Intermediate Science Curriculum Study (ISCS) in 1970. One element common to these programs and to most of the new curricula, is a strong need for teacher education, or re-education, prior to the use of the program in the classroom. Nothing less appears to insure a successful implementation.

The problem in the dissemination of an educational innovation is therefore two-fold. First, the educational community must be made aware of the existence of the innovation and its educational worth. Second, teachers must be trained in the philosophy and content of the innovation and its unique teaching strategies. The finite amount of funding for such purposes, together with the large numbers of teachers in American schools, estimated for 1972 at 2,247,000 K-12,¹ complicate the problem.

The import of these facts became clearer as each new program was released. In 1966, NSF began a search for the means to " . . . assist schools in the efforts to implement science and mathematics curriculum improvements."² The RPW model, as it is presently defined, is a compromise between the limited amount of funding available to train educators in the use of innovations and the large numbers requiring that training. Budd Rowe stated the problem thusly:

. . . the task was to create a pool of people able, willing and competent to initiate course content innovations in the colleges, to stimulate elementary schools to try new programs and to serve as consultants to schools wishing to try new science programs for elementary school children.³

Expanding the RPW model to reach all school levels and across many disciplines has not changed the purpose of the program. Basically, the RPW idea involves the training of resource people for the new curricular

materials. These people are drawn from various levels of the educational hierarchy, e.g., college teachers, curriculum specialists, science supervisors, and classroom teachers. They then function as orientation and implementation resources in and to their local schools. In addition, the college people are expected to use the materials in their classes with pre-service teachers. These activities initiate a multiplying effect which provides for widespread diffusion of knowledge about new innovations and also supplies locally available specialists to aid schools in their use. Closer working relations between schools and colleges is a side benefit which hopefully results from the work of the resource people in the schools.

Large sums of money have been, and continue to be, expended on RPWs. A rapid growth has occurred in the number funded each year. In the first year, 1967, six grants were made, at a cost of \$297,000. In 1971, forty-one such grants were made, at a cost of nearly \$1.5 million and involving nearly 1,500 educators as participants.⁴ In any undertaking of such magnitude, questions of effective goal accomplishment and the evaluation of those accomplishments becomes critical.

Study Objectives

The basic objective of this study was to provide an indepth description of an RPW as presented at

Michigan State University. In addition, this study evaluated the effectiveness of that model in meeting its stated objectives and those of an RPW in general.

Because of its descriptive nature, this study did not attempt to establish direct causal relationships between the design of the RPW and the activity of its participants. Where applicable, statistical techniques were used to further interpret the data, but the use of such techniques was necessarily limited. The generalizability of the conclusions from such analyses were similarly limited in scope.

Statistical analyses used as their dependent variable that of the science education activities of the participants subsequent to the RPW. Activity was deemed a suitable criterion since, as Rogers states, " . . . the extent of promotional efforts by change agents is directly related to the rate of adoption of an innovation,"⁵ and increasing the adoption rate of innovations is viewed as a primary function of any RPW.

Another objective of this study was to delimit those areas of RPW design and management which may require further study of a more detailed nature in the assessment of their effects and to suggest designs for such studies.

Specific questions of interest to this study will be discussed in the following section.

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Study Questions

As previously stated, the overall purpose of this study was to describe, in detail, an RPW as it was presented. Because of the importance of certain areas of the workshop, however, these areas were emphasized and information was gathered to provide answers to questions in those particular areas.

1. Participant selection: One of the earliest procedures in any workshop, and perhaps the single most important decision, is that of selecting who will receive the training. Based partially on previous experience, NSF lists suggested guidelines for participant selection. As yet, however, little empirical evidence exists to aid directors in selecting those people who are most likely to benefit from the training. Using the criterion of activity subsequent to the RPW, this study sought to determine the most active type of participant from among the different types represented. The effectiveness of teams as opposed to non-teamed participants was also assessed using the same criterion. Specific questions relating to participant selection were as follows.

Academic degree and assignment of participants: One criterion for selection of RPW participants is their supposed ability to communicate knowledge of various programs to large numbers of people. To select these people, NSF guidelines⁶ suggest the inclusion of various

levels of participants. Rowe suggests recruiting "... from each side of the barrier,"⁷ the barrier being the supposed one which exists between colleges and schools. She feels that this type of selection will promote interaction and understanding among people from different educational levels. Admitting the possible importance of this diversity, and of a need for further study of this variable, it was the intent of this study to determine the most active type of participant and to recommend the selection of that type as if activity alone were the desirable outcome. Two major sources of variability among participants were used in testing this question. First was that of the highest academic degree earned by the participant. Second was that of the academic assignment of the participant. Any significant differences between the activity of participants when grouped using these variables would indicate a possible selection criterion for future RPWs.

Selection of teams versus individuals: NSF guidelines also recommend that selection of teams be emphasized, a view supported by Cartwright when he discusses the reception received by someone who returns from a training session and attempts to put to work what he has learned. He expresses it this way. "The trainee discovers that his colleagues don't share his enthusiasm. . . . It would make all the difference in the world if

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only there were a few other people sharing his enthusiasm and insights with whom he could plan activities . . . and from whom he could gain emotional and motivational support."⁸ These are strong indications that having at least one team member available can ease some of the more difficult aspects of the role of an innovator. In a pragmatic sense, however, recruiting a team of participants from the same geographical area may limit the total amount of impact and thus the number of people that an RPW and its participants can influence. Unless teams of participants engage in a mean level of activity significantly higher than do non-teamed participants, then selection of teams may not be in accord with the amplification goal of an RPW.

Among the fourteen teams represented in the RPW, four different types of teams could be identified based on the academic assignments of the team members. The selection criteria of the RPW emphasized one particular type of team, that of a college teacher and a science supervisor. Although the numbers of teams were too small to allow any type of statistical analysis of their activity levels, this study sought to determine which of the four types of teams exhibited the greatest amount of activity. If teams did prove to be more active than individuals and their selection is emphasized in

possibility of a correlation between the activities

subsequent RPWs, information on the activity of various types of teams would be of value in team building and selection of RPW participants.

Science knowledge of participants: Studies conducted with teachers seem to indicate that subject matter knowledge is related in some way to the innovativeness of a teacher. White, in discussing this relationship, states, " . . . an extensive knowledge base provides a greater potential for change. . . ."⁹ It was of interest to this study to determine if this relationship also exists for resource people. Did participants who exhibit a greater working knowledge of science, as measured on a suitable standardized test, engage in a level of activity significantly higher than someone with a lesser knowledge of science? If such a correlation between knowledge and activity did appear, then knowledge of science could be of use as a selection criterion for subsequent RPWs.

Correlation between standardized test score and academic degree: If knowledge of science and activity did appear to be related, then some practical means of assessing the science knowledge of applicants is necessary. Requiring each applicant to take the standardized test would be a cumbersome addition to the selection process. For this reason, this study investigated the possibility of a correlation between the academic

degree of the participants and their score on a standardized science knowledge test. If such a correlation was found to exist, then academic degree would be of use in selecting future RPW participants.

2. Workshop activities: No matter how qualified the workshop participants, their success as resource people is determined to some extent by the quality of training they receive during the RPW. And, judgement of the effectiveness of a particular workshop technique is difficult to establish directly. Because of this, in seeking answers to the following questions, this study relied on the evaluations of those people most involved in the procedure, the participants. Those questions of the study which relate to the workshop phase of the RPW are discussed below.

Perception of the curriculum: Studies of factors which affect change in social systems, such as the study of Rogers and Svenning,¹⁰ indicate that the attitude of a communicator towards the content of his message influences the effectiveness of his communication. That is, a person who feels positively towards his subject matter is more apt to be successful in communicating a positive feeling about that subject. It would then appear that resource people need a positive feeling about the curriculum in question if they are to aid in its dissemination. The RPW should help to build this

positive feeling. In fact, an RPW represents a considerable investment of time and money, predicated on the educational worth of an innovation and the need for its dissemination. Ideally, as participants learn more about the program under study, and its place in education, the positive feelings will develop. But, does this positive perception develop in all participants, or at least a significant number of them? If it does not, then a design modification appears indicated. It may be necessary to allow more time and opportunity for study and discussion of the contribution which the program offers to the educative process. This study sought to determine if a change occurs in the perception of the program in question, and also if perception was related to activity in any way.

effect Correlation between program perception and activity: Another question of interest to this study was whether a more positive perception of the worth of the program appears related to a higher level of activity. Does a correlation exist between a participant's score on an instrument measuring his perception of the ISCS program and his subsequent activity level? If such a correlation was found to exist, then building a positive perception of the program would appear to be an essential part of any RPW.

3. Post-workshop activities: One of the major goals of the RPW of this study was the building of a team spirit among its participants. To facilitate learning and problem solving. Activities were designed to increase this spirit of cooperation during the workshop.

To help Effectiveness of workshop activities: Because an RPW is concerned not only with building the skills of its participants in a particular program but also in the general area of communications, the activities of the RPW must be varied in scope. It would be unrealistic to assume that all of the activities of the RPW would be viewed as completely effective. An assessment of the activities of the RPW, made using the evaluations of the participants, would provide a criterion for judging the success of various workshop activities. Such an assessment also provides an opportunity for participants to express their feelings on the adequacy of the training which they received. This appears to be the only type of information which provides the necessary data for the redesign of an RPW. A further comparison of the effectiveness of the activities in the training of a resource person can be made by asking the participants to evaluate those activities after they have been using the skills for a year in the field. What may have been judged as completely successful at the end of the RPW may appear inadequate after a year's work.

3. Post-workshop activities: One of the major goals of the RPW of this study was the building of a team spirit among its participants, to facilitate learning and problem solving. Activities were designed to increase this spirit of cooperation during the workshop.

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To help participants overcome the back home problems alluded to in discussing the rationale for team selection, the maintenance of this group cohesiveness would seem to be of great importance. Accomplishing this is one of the major goals of an active follow-up program. Identification of those follow-up activities which appear to be most successful in meeting this goal would be of value to directors of future RPWs. Again, as in the previous questions, the best source of information relative to these questions would be the opinions and feelings of the participants themselves.

Follow-up activities: Row¹¹ discusses different types of follow-up activities, particularly a group meeting of participants to share experiences and to plan further activities. Bernoff¹² communicated with his participants through a newsletter, phone calls, plus a group meeting for those participants attending a national convention. For follow-up, the RPW of this study had included in its original NSF grant funds for visits to participants, by the director. Funds were also available to support subsequent participant activity, where no other source of funding existed. In addition to these, various other follow-up activities were conducted. An assessment of the effectiveness of these activities and procedures will be of use to future RPW directors in allowing them to select those which have already been successfully used.

In summary then, the major questions to which this study will address itself are as follows:

1. Does a correlation exist between the academic degree of a participant and his subsequent activity level?
2. Does a correlation exist between the academic assignment of a participant and his subsequent activity level?
3. Do teams of participants produce significantly higher levels of activity than do non-teamed participants?
4. What type of team, based on academic degree and assignment of the team members, engaged in the highest level of subsequent activity?
5. Does a correlation exist between the score of a participant on a standardized test of science knowledge and his subsequent activity?
6. Does a correlation exist between the score of a participant on a standardized test of science knowledge and his academic degree?
7. Did a change occur in the participants perception of the worth of the curriculum of the RPW, as measured pre- and post-workshop?

Hypothesis 1: Teams of participants will exhibit a significantly higher level of activity than non-teamed participants.

8. Does a correlation exist between a participant's perception of the worth of the curriculum and his subsequent activity level?
9. Which activities of the RPW were judged by the participants as effective in providing them the skills required of a resource person?
10. Which follow-up activities were most useful in helping participants function as resource persons?

Because the questions listed above cover all phases of the total RPW, information necessary to provide answers to those questions was gathered throughout the total experience. Various procedures, including formalized tests, questionnaires, and activity logs were used to gather the data of the study. Further discussion of the data-gathering process and the instruments used will be found in Chapter III.

Hypotheses of the Study

As previously stated, because of the descriptive nature of this study, not all of the questions discussed above were analyzed using statistical techniques. Therefore, not all of the questions were listed in the form of a hypothesis. Those questions which were treated statistically are listed below.

Hypothesis 1: Teams of participants will present a significantly greater number of science education-resource activities than will non-teamed participants.

Hypothesis 2: A significant positive correlation will exist between the academic degree of a participant and his activity level.

Hypothesis 3: A significant positive correlation will exist between the academic assignment of a participant and his activity level.

Hypothesis 4: A significant positive correlation will exist between the post workshop score of a participant on the ISCS perception instrument and his activity level.

Hypothesis 5: A significant positive correlation will exist between the academic degree of a participant and his score on a standardized test of science knowledge.

Hypothesis 6: A significant positive correlation will exist between the score achieved by a participant on a standardized test of science knowledge and his activity level.

Hypothesis 7: There will be a significant increase in participant perception of the educational worth of the ISCS program, as measured pre- and post-workshop on a fourteen-item perception instrument.

Definitions

The standardized test of science knowledge is the Sequential Test of Educational Progress (STEP), Level 1A, Science.

The ISCS perception instrument is a fourteen-item questionnaire developed by the researcher.

Activity, to be used as a variable in judging the success of a resource person, is a difficult variable

to define. As previously noted, activity appears directly related to the success of a resource person, but Rogers does not define the type of activity to which he refers. For the purposes of this study, activity was defined in two ways, and the hypotheses were tested twice to use each definition. The first definition used was that of number of activities performed. Any activity, of any nature, in science education, was given equal weight according to this interpretation. The second definition was that of a contact hour. A contact hour was defined as an activity in science education involving the participant and one other person for one hour. A workshop conducted for six people, lasting for three hours, would be listed as eighteen contact hours.

Comparison of teamed and non-teamed participants was performed first. Then, when no significant differences were noted, comparisons involving various groupings of participants were performed regardless of whether the participant was a member of a team or not. Any activities performed jointly by a team were divided equally among the team members when such analyses are conducted.

Academic degrees and assignments of participants and the make-up of the teams will be discussed in Chapter IV, in the section entitled Description of the Participants.

is area who agreed to develop a comparative relationship to implement the IFP program upon their return home.

The Michigan State University RPW

The object of this study was a Resource Personnel Workshop conducted at Michigan State University under the auspices of the Science and Mathematics Teaching Center of the University, in August, 1971. Director of the workshop was Dr. Richard J. McLeod, an Associate Professor of Science Education. Focus of the RPW was the Intermediate Science Curriculum Study (ISCS) program. Funding for the workshop was provided through a grant from the National Science Foundation.

Forty participants were invited to attend the workshop, all of whom were experienced science educators. Applications were solicited from a population of college or university professors who were currently teaching science and/or science education courses for pre-service Intermediate School teachers, and from Intermediate School science consultants and science supervisors. All participants were required to furnish evidence from their administrations that they would be permitted to engage in consultation and implementation activities following the RPW.

Specific preference in selection was given to:

1. Applicant teams of college science educators and school science supervisors from the same geographic area who agreed to develop a cooperative relationship to implement the ISCS program upon their return home.

2. College teachers who indicated that they would include, where possible, an introduction to the ISCS program in their contact with pre-service teachers.
3. School leadership personnel who provided evidence that the ISCS materials would be tried in at least one classroom within their system in the 1971-72 academic year.

The primary purpose of the workshop was to prepare participants to assist local school personnel implement the new Intermediate School science curriculum programs--in particular, the Intermediate Science Curriculum Study. As a result of the workshop and follow-up activities, it was expected that participants would actively serve as resource persons and consultants to local school systems.

Specific objectives of the workshop were:

1. To provide the participants with considerable knowledge of the teacher education procedures, purposes, history, recommended modes of instruction, objectives, and materials of the ISCS program.
2. To assist the participants as a group and as individuals to plan and to prepare appropriate

materials and activities for orientation sessions and inservice and pre-service teacher education programs.

3. To provide opportunities for participants to interact with children who are using the new curriculum materials.
4. To familiarize the participants with the school setting, administrative aspects, teacher education needs, and various strategies for implementation of a curriculum innovation.
5. To provide direct experience in organizing and presenting orientation sessions on the ISCS program to groups of school teachers and administrators.
6. To help each participant to engage in orientation, consulting, and implementation activities after leaving the MSU campus.

The workshop staff included, in addition to the director, an experienced ISCS teacher and a social psychologist. The ISCS teacher served as a resource person in the program, utilizing his extensive classroom experience, and in the training of teachers in the program. The social psychologist served as a group process resource person and he conducted those sessions designed to build communication skills.

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Assumptions and Limitations of the Study

This study assumed that the RPW model is educationally sound and that it contributes significantly to the educative process. As such, it was suitable for, and worthy of, further investigation.

This study also assumed that the RPW model used at Michigan State University represented the knowledge and experience of its director and staff and that it was a model which met the criteria of an RPW. It is not assumed that the model cited contains the only, or even the best answers to the problems discussed. If the model under study does appear functional, it may then offer alternative design ideas and activities to directors of future RPWs.

The population of this study was not randomly selected and no control group was established to provide a test of reliability. These deficiencies tend to reduce the generalizability of the conclusions of this study, in a statistical sense. For the purposes of this study, however, it was assumed that for a sample of participants selected using the stated selection criteria and trained using the model cited, the results obtained could be replicated. It was also assumed that since the participants were not selected on the basis of their activity prior to the workshop, for this variable the sample was, in effect, randomly selected. The statistical

analyses relative to this variable were made using this assumption of randomness. The dependent variable of activity was somewhat limited in use because of the potential action of confounding variables. Participant activity may be limited by factors such as time available for resource work, the number of schools locally available, and their interest in receiving the activity of a resource person. However, because of its utility and direct bearing on the success of a resource person, this variable was used as if it were clear of the confounding factors. Inferences made from the data take those factors into account.

Overview of the Study

The general plan of this thesis is as follows: Chapter I presents the conclusions and implications of the study, and recommendations are made for further study of indicated areas. Chapter II is a review of the literature relative to this study. The first section deals with the need for an RPW-like experience and the second section discusses workshop design and management as they particularly apply to Resource Personnel Workshops.

Chapter III, in section one, describes the research model used in this study. The second section discusses the statistical model used in testing the study hypotheses. A third section discusses the procedures used to test the hypotheses. The fourth section describes the process by which participants were selected to attend the RPW and the population from which

participants were drawn. Study instrumentation is the topic of the fifth section, while the final section of the chapter discusses the procedures of data gathering.

Chapter IV has four sections. The first of these presents a detailed description of the workshop activities and assesses their effectiveness through participant evaluation. The follow-up activities to the RPW are described in the second section and their effectiveness is also assessed using data from participant evaluations. The third section presents the results of testing the study hypotheses. The final section of the chapter contains a detailed description of the various activities conducted by the participants during the study period.

Chapter V presents the conclusions and implications of the study, and recommendations are made for further study of indicated areas.

⁶ Experimental Project. St. Paul, Minn.: The Free Press of Glencoe, 1954.

⁷ M. B. Rowe, The Fate of Ten Educators in the Educator Teams Three Years After Certification in Leadership Training Program (Columbia: Teachers College, 1955), p. 1.

⁸ D. Cartwright, "Achieving Group Cohesion: Some Applications of Group Dynamics Theory," Human Relations, IV (1951), 386.

⁹ M. A. White, et al., "A Study of Grouping Patterns of Inservice Education," School Education, LXXXI (February, 1969), 18.

10. E. M. Rogers and L. Svenning, Managing Change (San Mateo, Calif.: San Mateo County Board of Education, 1969), p. 28.

11. Rowe, Fate of Scientists, op. cit., p. 31.

NOTES

12. R. A. Barnoff, "A Chemist Gets Immersed in Social Phenomena: Two Years of Representation in Program Design," paper presented at the American Educational Research Association, 1971.

CHAPTER I

¹ Projections of Educational Statistics to 1976-77, #FS5,210:10030-67 (Washington, D.C.: Government Printing Office, 1968).

² Experimental Projects Aimed at Developing a Corps of Implementation People, National Science Foundation, 1969, p. 2.

³ M. B. Rowe, Applications of Some Behavioral Science Concepts to Planned Change in NSF Science Programs: A Three Year Study (Columbia Teachers College, 1970).

⁴ National Science Foundation, News Release, NSF 71-103, 1971.

⁵ E. M. Rogers, Diffusion of Innovations (New York: The Free Press of Glencoe, 1964), p. 258.

⁶ Experimental Projects, op. cit., p. 7.

⁷ M. B. Rowe, The Fate of Ten Scientists--Science Educator Teams Three Years After Participating in a Leadership Training Program (Columbia Teachers College, 1971), p. 1.

⁸ D. Cartwright, "Achieving Change in People: Some Applications of Group Dynamics Theory," Human Relations, IV (1951), 386.

⁹ M. A. White, et al., "A Study of Contrasting Patterns of Inservice Education," Science Education, LIII (February, 1969), 18.

¹⁰E. M. Rogers and L. Svenning, Managing Change (San Mateo, Calif.: San Mateo County Board of Education, 1969), p. 28.

¹¹Rowe, Fate of Scientists, op. cit., p. 31.

¹²R. A. Bernoff, "A Chemist Gets Immersed in Social Phenomena: Two Years of Experimentation in Program Design," paper presented at the American Educational Research Association, 1971.

Overview of the Chapter

The first section of this chapter describes the identified trends and needs in our educational structure which contribute to the desirability of an RPW-like experience. Understanding the contributions RPWs offer towards meeting those needs will help build an understanding of the workshop design and pedagogical rationale. The second section deals with the theoretical bases of those designs. Since RPWs are modified applications of teacher training workshops, much of our theory and structure is derived directly from the experience gained in teacher workshops. An understanding of why RPWs are constituted as they are is basic to any attempt at studying them. A thorough knowledge of the rationale for the design structure is essential in any attempt at modifying or redesigning them. Information on the designs of prior RPWs, and their effect, is included to provide further information of use in assessing the effects of the RPW of this study.

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The Need for RPWs

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CHAPTER II

REVIEW OF THE LITERATURE

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The Need for RPWs

The RPW model was designed to meet certain needs. One primary need is to reduce the time lag which exists between the development of an innovative educational approach and its adoption into schools. Related to this need is one for trained personnel to aid schools in their adoption of innovations. Identifying the background of these needs will clarify the purposes of RPWs.

Change is perhaps the key word in defining the requirement for an RPW. Mankind is in the midst of an information explosion unprecedented in its history. The effects of this increase in knowledge and the technology which builds upon it, are widespread. If institutions are to survive, they must adapt to the new conditions. Education is not exempt from such change. Hilfiker assesses the effect of change in this way.

Change has become a permanent and integral part of modern society. If education is to become a part of the movement and momentum of social change, then more knowledge is needed regarding the effective ways and means of instituting changes and innovations in school systems.¹

And, educational theory and practices have changed, radically in some respects. The changes, however, filter slowly through the system. In fact, Rogers² estimates a 25-year gap between the development of an idea and its widespread adoption by schools.

Why do educational innovations take so long to appear in the classroom? One factor appears to be common

to all segments of human society: resistance to change. In discussing this reluctance to accept new methods Miles states, "For many reasons permanent systems--whether persons, groups or organizations--find it difficult to change themselves."³ This reluctance to accept change is not peculiar to education. It also appears in agriculture, industry, and other areas. People must be convinced of the value of an idea before they will consider using it. And, the convincing must be on a personal level.

This need for personal contact was noted by Yegge and his associates. In their work on the adoption of a new physics course, they involved groups of teachers and administrators in discussions of how new courses get into schools. The authors note an expression of reluctance from the groups towards the acceptance of printed claims for new materials. They also note that during the discussions, "An undercurrent of suspicion surfaced occasionally regarding the motives of commercial publishers in introducing innovations. . . ." ⁴ The authors also state that, "Many groups indicated that the most effective transmittal of information occurred on a personal, face-to-face level."⁵

Allen goes even further in stating his feelings regarding the need for personal intervention to effect changes in education. He states,

We have come to recognize that no educational endeavors, whether they be new schools or colleges or generously financed new curriculum developments, can bring about change without people prepared to affect that change.⁶

Not only must the changes be affected personally, as Allen asserts, but it is also important that those who effect the change be accepted completely by the group with whom they are working. Innovation studies like those of Rogers and Miles consistently indicate that people in any field accept changes much more readily after their adoption by recognized leaders in that field. In fact, these studies show that widespread adoption does not generally occur unless and until those leaders have demonstrated the worth of the new method.

Aware of all of these problems in the dispersion of new techniques, NSF began, in 1966, to seek possible solutions. Specifically, the Foundation sought answers to the following questions.

Considering the limited financial resources of the Foundation, what are the most efficacious patterns of support for implementing the improved curricula in schools? Is it possible to identify and prepare a cadre of resource people to function as leaders in a variety of dissemination models which preserve the fidelity of the new courses while incorporating a strategy for amplification?⁷

From a series of conferences seeking answers to those questions, particularly that of a strategy of amplification, the RPW model was developed. The framework of the solution was already in existence. Using a workshop to train educators is not a new approach.

Workshops for teachers have existed in their present form at least since 1936 and their usefulness in bringing about change is well known. The unique character of a workshop, in taking people away from their daily routine, has proven to be effective. Part of this success may lie in the fact that workshops, by their nature, can bypass or avoid the antichange forces in a system. Because of this, workshops are popular in many fields besides education. But, they are of particular use in education and Miles concludes, "It is no coincidence that a large proportion of current efforts at educational innovation involve the creation of temporary (or quasi-temporary) systems."⁸ His definition of a temporary system includes workshop types of experiences.

RPWs are adaptations of teacher training workshops, with modifications to meet the changed purposes of the experience. The nature of the modifications and the rationale behind the changes is the subject of the second section of this chapter.

Workshop Design and Management

All workshops, whatever their ultimate goals, share certain common elements. Based on these similarities, workable methods of design and management have evolved through experience gained in conducting many different types of workshops. Before an attempt is

made to assess a special type of workshop, it is necessary to understand how the workshop has been developed. One method of reaching this understanding is to study workshops as an entity. From this study, one can determine how modifications of the basic plan have been conceived. Thus, the experience gained in other types of workshops is directly applicable to an RPW even though the goals of the two vary widely, since they share elements in common. Only after the rationale and background of workshops in general are understood can one wisely progress to suggesting design and management changes. The purpose of this section is to determine the rationale of all parts of a workshop and in particular those of interest to this study. Examples of modifications of basic designs as used in prior RPWs will be presented to help trace the evolution of RPWs.

A typical workshop can be divided into three parts, with varying numbers of subdivisions of each. These three parts, or stages, are: (1) planning the workshop, (2) conducting it, and (3) what happens after it. Miles has aptly and very descriptively labeled the three divisions as those of input characteristics, process characteristics, and output characteristics.⁹ For convenience, they will be referred to here as pre-workshop, workshop, and post-workshop phases. Each part of the

total operation presents different types of problems, the solutions to which comprise and determine the effectiveness of a workshop.

Figure 1 lists these common workshop elements. The dotted lines represent information feedback loops which provide opportunities for changes in structure to meet changing conditions of the learner or situation.

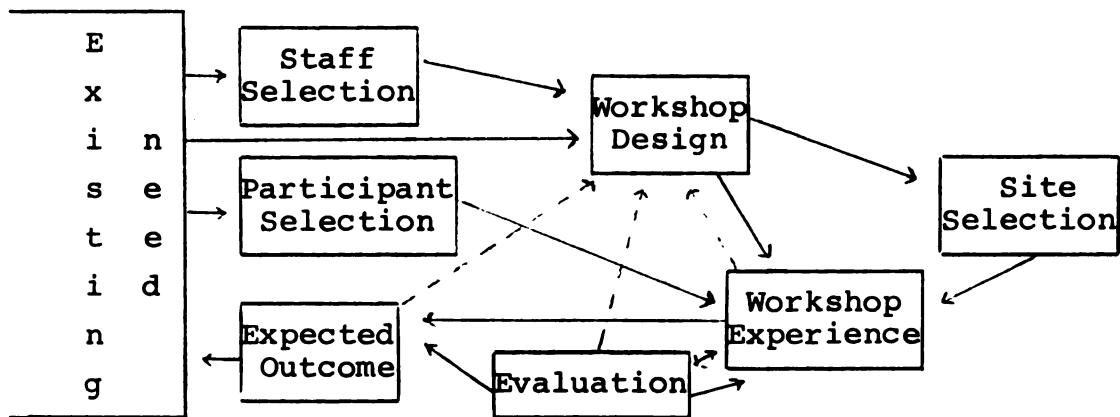


Figure 1

Pre-Workshop Activities

A workshop, as defined by O'Rourke and Burton, is "An assemblage of persons working with expert assistance concurrently and cooperatively on common needs."¹⁰ The term "common needs" implies that a definition of those needs is an early requirement of any workshop. The problem must be limited in scope sufficiently to be manageable, but at the same time be broad enough in its outcomes to justify the time and effort involved. The term also suggests that for the greatest success, the

purpose must be recognizable as important by the participants. As Kelley¹¹ points out, the most crucial learning takes place while dealing with an individual's current problems.

The common need in an RPW is the training of people to function as resource personnel in some area of education. It is assumed that by applying for the training, the applicants recognize the problem as important and are prepared to work for solutions. But, RPWs, because of their purposes, must have dual structures. First, they must provide a thorough knowledge of the program or programs under study. Secondly, they must help the participant to acquire the skills necessary to enable him to function as a resource person. Planning for an RPW must be made with this duality of purpose constantly in mind.

Workshop planning is ideally a major function of the complete staff of the workshop. Total staff involvement in this phase is necessary to utilize fully the knowledge and experience of each member and to involve them in the final outcome. And, staff composition is determined by the purpose of the workshop since individual staff members are selected on the basis of their particular talents and abilities. In speaking of staff selection, O'Rourke and Burton emphasize that, "Staff size and membership depends on the theme of the workshop,

the specific problems of the participants and the size of the group."¹² In her RPW, Rowe¹³ utilized former participants as staff members, to take advantage of their special skills and training. Staff of the RPW described by Merkle¹⁴ included a social psychologist plus teachers who were experienced in the program under study. These special talents are especially needed in an RPW.

Whatever plans are made, however, they must be flexible, to meet changing needs of participants. One way of achieving this flexibility is to design in two stages. Kelley refers to this technique as designing " . . . a long-time plan and a short-time plan."¹⁵ The long-time plan, or as Miles titles it, the Macro-design, is the master plan which expresses the long-range goals of the experience. The short-time plan, or Micro-designs, are the detailed plans of the activities specified in the Macro-design. The overall plan is relatively inflexible since it involves meeting the central purpose of the workshop. But, the individual activities can be redesigned or discarded all together, as necessary to adjust to the evolving learning needs of the participants.

The best plans are still subject to limitations, such as those imposed by the amount of available money, and time restrictions. In addition, what is being taught affects the planning. The curriculum used as the focus of an RPW, to a certain extent, determines

the type of activities designed. An individualized, lab-oriented course of study could not effectively be taught by the lecture method. Or, as Kelley puts it, "We cannot teach a skill without having the learner try it."¹⁶ This means that a workshop which uses a particular curriculum should function as closely as possible in accord with the philosophies of that curriculum. For ISCS, this means an individualized, self-paced learning situation with a minimum of teacher direction.¹⁷ But, RPW participants are trained as resource personnel in science education, with emphasis on a particular program, and a final section on alternative programs may be necessary to broaden the participants experience. In their report on workshops in teacher education, the Association of Colleges for Teacher Education stress the importance of this technique, stating that, " . . . the addition of the final component on alternatives accomplished its purpose and reassured teacher educators that the purpose of the workshop was not to offer one innovation as better than another, but to disseminate the results of educational research in a more effective manner."¹⁸ The last section of that quote speaks to the central purpose of an RPW and it strongly implies that an RPW in ISCS should also provide the participants with information on other curricula and methods which may suit a school situation as well as, or better, than would ISCS.

The plans of the RPW of this study were made with all of the above considerations on designing firmly in mind. It is one of the purposes of this study to determine how well each of those plans accomplished its purpose. It may be that RPWs, with their highly specialized objectives, may require further modifications to provide optimal training to their participants. Data gained through this study will provide some answers relating to the success of this type of design structure.

Workshop planning also includes the selection of a site for the workshop. Agreement is nearly unanimous that as much physical isolation of the participants as possible, away from distracting influences, acts to increase the effectiveness of the experience. In speaking again of workshops for teachers, Dawson states, " . . . isolation is of prime importance to the success of the conference."¹⁹ O'Rourke and Burton concur in this assessment and they state that, "Housing the entire group, staff and students, together in a dormitory or dormitories has been found to be one of the most effective features making for success in a workshop."²⁰ One effect of this isolation is to increase interaction between participants. This interaction helps to break down any communication barriers which may exist. The breaking of these barriers is also facilitated through

different types of social activities, bringing people together in conditions other than the formal working mode of the workshop.

The physical site must also include the proper facilities for the workshop. Meeting rooms for large and small group sessions are as important as are the proper laboratory facilities. Arrangements for breaks in the routine, such as a coffee break provide opportunities for relaxation and interaction between participants on a social level. All of these techniques are designed to build the team spirit of the group. This leads to a cooperative attitude towards problem solving which hopefully will carry over into the back home situation.

The elements of workshop design in the above paragraphs are also of interest to this study because of their effect on the success of the RPW. While no study questions relate directly to the effect of isolation or the physical setting of the workshop, any study of the effectiveness of the experience must consider the effect of such isolation.

The final segment of the pre-workshop phase which is of particular interest in this discussion is that of participant selection. Selection of participants is mainly a function of the purpose of the experience. It is the responsibility and the duty of the workshop

director to select participants who he feels confident will work to accomplish the objectives of the workshop. At the present time, little aid is available to an RPW director to help him make choices among applicants. Decisions are made on the basis of previous experience, his intuition, and what information is contained in the application materials. From what information is available, apparently directors have succeeded, for the most part, in choosing participants who do function as expected. What is lacking is any sort of empirical evidence on which he may base his decisions. One of the central purposes of this study is to provide that evidence. In the RPW of this study, participant selection was guided by the information discussed in the following paragraphs. The data of this study will provide more refinement in the selection process and provide directors of future RPWs with more information on which to base their selection criteria.

For an RPW, participant selection should be based on the ability of an applicant to increase the dissemination of information on new programs and to aid in their implementation. In referring to selection, NSF guidelines²¹ suggest experimentation with recruiting, selecting different types of people, from college faculties and from among school personnel. But, the same guidelines also suggest that teams appear to offer the

best strategy, " . . . since changing of social institutions requires building some sort of a support system to initiate and sustain innovations."²² Reports on the operation of previous RPWs indicate that team selection has received preference. Rowe selected teams, with preference given to a team make-up of a "scientist" and a science educator from institutions which provide teacher education. She selected teams because of their "mutual supportive function" and their "multiple resources."²³ In addition, through the make-up of the team, she hoped to promote interaction and understanding between teacher educators at differing levels. Participants were also chosen in regional clusters to increase collaboration between teams and to maximize follow-up efforts. Her evaluation of the RPW does not directly discuss the effectiveness of any one of the different types of teams. It does differentiate between the implementation activity of the science educators and the scientists (college people whose primary teaching responsibility is in the sciences as opposed to teacher education), showing that the science educators were more active. The question of teams is one that this study is directed towards answering. Whether teams are more active than individual participants is a hypothesis of this study. Of general interest also, though not to be studied directly, is whether an active follow-up by the workshop staff can be

substituted for the support assumed to be provided by a team member. If such a solution is workable and effective or if teams do not prove to be more active, then a change in selection criteria may be advisable.

In selecting participants, Bernoff²⁴ conducted a semi-sequential, two-year RPW, in that some of his first-year participants returned for further training in the second session. This changed the complexion of the workshop in the second summer. Less time was spent on the content of the curricula and more devoted to the processes of implementation. He does not discuss the activity of those who were at both sessions compared to those who attended only one. His workshop included participants who were college teachers, school personnel, and state science supervisors. His evaluation is primarily concerned with the use of the programs in the classroom and the introduction given to them in college classes. No direct comparisons are made of the activity levels of the different types of participants. Comparing different types of participants, on the basis of their activity is one of the objectives of this study.

Merkles,²⁵ study reports selection criteria as giving preference to applicants from Michigan. The rationale for this was an expected demand for resource personnel in the state as a result of the RPW activities. His participant list included college teachers, science

supervisors, and classroom teachers. Reports of their activity are contained in the study, but no attempt is made to compare activity levels of individuals or teams.

From the reports cited above, it appears as if the question of how to select participants, as teams or as individuals, and from what educational levels, has not been sufficiently studied to provide any firm answers. It may well be that, given the differing purposes of RPWs, within the general framework, no such answers can apply to all situations. But, more study is required on the question of participant selection and this question is a basic one of this study.

Workshop Activities

As noted earlier, the most effective type of workshop design appears to be one in which the learner must make decisions and assume responsibility for his own learning. The Association of Colleges for Teacher Education have also concluded from their study of teacher workshops that learning must involve doing. They assert that concepts cannot form until perceptual elements are fed into the system through sense perceptions. And, the implication is that concepts cannot be transmitted fully from person to person: they must be experienced with real referents or accurate portrayals of them. To meet these conditions, RPWs are designed as "hands on" types of experiences, giving participants ample opportunity

to work in the skill areas which they are developing. In their evaluation of workshops, and in particular RPWs, Bernoff and his associates emphasize this requirement and they state, "The type of learning environment which each person needs in order to bring himself into a condition of fair appraisal of the innovation is not one in which the institute staff are tellers and the participants are listeners and doers."²⁶ The RPW of this study provided these opportunities to its participants and it is the intent of this study to evaluate the effectiveness of such an RPW structure, through an assessment of the reactions of participants to it. No control situation, of a more traditionally oriented workshop was used, but participant evaluation will provide a test of the efficacy of the procedures.

The report by Bernoff also stresses the importance of including group process skills into the design. Group process skills are a loose confederation of knowledge and experience gained from the fields of social psychology and sociology. Their functions are to focus attention on both intra- and inter-personal relationships, to maximize the functioning of individuals as members of a group. Many barriers exist which hinder communication between people. Some of the barriers are self-erected and some are imposed by the outside world. The efforts to breach these barriers are the main emphases of group

process training. These are skills which a resource person, who is working to affect change, would find very valuable. Additionally, their use in an RPW provides an opportunity for participants to practice the skills and they also serve to enhance the learning atmosphere of the RPW. Training in these skills was included in the study RPW. This study will therefore provide more data on the effect of such training and its further use by the participants.

One activity particularly suitable to RPWs, in providing direct experience in some curriculum, is a microteaching situation. In many cases, RPW participants are college teachers who have had little or no experience, at least recently, in working directly with students at the elementary or junior high level. Rowe used microteaching to help her participants understand what types of problems are involved in teaching at the elementary level. To do this, participants taught children using the curricular materials they had been studying. Observation by other participants and discussion sessions provided feedback to the "teachers" and helped them evaluate their efforts. The report cites a marked change in attitude towards elementary teachers and their work following these sessions. Additionally, the participants undoubtedly gained a better understanding of the program itself, through their efforts to present it to the children.

Microteaching in an individualized, lab-oriented program presents different types of problems. Teaching, as such, is not a part of such a curriculum. In an RPW like that of this study, a modified lab school approach can be of value. Here, the students work under the direction of a teacher experienced in the program. The participants can then interact with the students while they are working. In effect, the participants are fulfilling the role of the teacher as they question the individual students on various aspects of the material and their reaction to it. This design of observing students at work with the materials undoubtedly provides the best evidence possible on the effectiveness of the curriculum and this was the design used in the study RPW. Participant assessment of the effectiveness of the activity will provide data needed for a decision on possible modification of the design.

The same kind of learning-by-doing can also be applied to the skills of helping schools learn about and implement the new programs. To aid his participants in practicing these skills, Bernoff's design had them teaching, and observing each other's teaching of, workshops in the curricula to groups of teachers and parents. Rowe designed a similar microteaching experience using principals and teachers as students. Merkle describes a three-day live in conference at which participants served as

resource people in the training of teams of school personnel from throughout Michigan. This type of session not only provides a proving ground for skills, it also produces a note of urgency in the workshop. Knowing they are expected to present the sessions is a motivating factor to participants throughout the workshop.

Another point which seems very clear is that no matter how carefully designs are made, and no matter how successful they appear, it is not possible to wait until the end of the workshop to find out whether or not the goals were accomplished. If evaluation is postponed until the end, it is then too late to change anything. So, evaluation, to be effective, must occur throughout the whole experience. Kelley supports this view strongly and he goes on to say,

We need to learn how to make the evaluative process continuous and subjective. We need to work at it every time the class meets, rather than just at the end. If it is continuous, we may discover that all is not well while there is still time to do better. If it is subjective, it directs the learners attention to his own learning and places the responsibility on the learner, where it belongs.²⁷

Evaluations serve to tell both the participants and the staff how things are going and allows either to make adjustments as necessary. In Merkles' study, a short questionnaire was used at the end of each activity to assess participant reactions. Bernoff used daily feedback sessions to critique and modify the workshop program. Each of these are designs which attempt to

discover where the learner is in the program and to relate that position to where the learner and the staff wish him to be. But, evaluation is of little value unless it is coupled with the willingness and flexibility required to make needed changes. Changes occurred in the RPW of this study, both in response to participant requests and those of the staff. While no specific study question relates to the effect of this willingness to adapt plans, evaluation was a constant part of the workshop design, formally at first and more informally later. The final evaluation of the workshop, while too late to affect the conduct of this RPW, is intended to aid in any redesign of future RPWs.

Post-Workshop Activities

Workshops should not end when the participants return home. If the full effects of the experience are to be realized, some type of supportive follow-up must be carried on. This follow-up reinforces the learning of the workshop and maintains the group spirit of the participants. Rowe notes a sharp increase in participant activity in periods directly after some type of follow-up activity, indicating the value of continuous support of participants. In accomplishing this, Rowe used group meetings very effectively. Her selection of participants in regional clusters acted to increase the effectiveness of the meetings. Bernoff used a newsletter,

published every two months, plus phone calls and letter to and from the participants to maintain contact. He also conducted a follow-up meeting for those participants who attended an educational convention. All of these activities, and more, were used as follow-up to the study RPW. Participant assessment of the value of each will be used to indicate whether they should be part of the design of future RPWs.

Another function of the follow-up period is providing an opportunity for an evaluation of the total workshop experience. This final evaluation is a difficult problem. Moffit, in discussing inservice workshops for teachers, states, "A successful workshop is more easily described than defined. It is the process which is most important."²⁸ And, process is difficult to quantify. Knowledge can be tested, and later activity measured, but assessing such things as the impact of interacting with other educators at levels different than your own are not so simple. In this study, success or failure will be judged on whether or not the perceived needs of the participants were met. Not only the need for skill building during the workshop, but also for support after the workshop. The basis for evaluating this success or failure will be the evaluations of the participants.

Chapter Summary

RPWs are designed to serve two major functions in a strategy of amplification of knowledge about educational innovations. To accomplish this, participants serve as disseminators of information and also as implementation resources. Providing the skills necessary to enable the participants to function in these two areas is the responsibility of the RPW and its staff. Workshop designs must build in the required skills in such a way that the participants derive direct experience in those skills. One of the required skills is taken from the field of social psychology, that of communication building. The other skill is in program content. To provide these skills, designs must be flexible and constant monitoring must occur to provide direction to the learning process. Post-workshop follow-up activities maintain skills learned during the workshop and retain the cooperative, supportive, problem-solving nature of the group. Finally, workshop designs must contain some provision for evaluating what has been done. Unless this evaluation is performed, no estimate of the effectiveness of the experience can be determined and no potential for change will exist.

NOTES

CHAPTER II

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CHAPTER III

DESIGN OF THE STUDY

Research Model

This study was intended to provide data on the design and management of an RPW through a detailed description of what was done in the workshop and an assessment of how effective those actions were. Because of the descriptive nature of the research, a modified case-study approach was selected for use in the study.

Of the two major areas of interest to this research, that of the formal workshop and the follow-up to the workshop, the case study approach was much more applicable to the workshop itself. During the three weeks of on-campus work, extensive observation of activities was possible. Once the participants returned to their homes, this personal observation was no longer feasible. An attempt was made to continue the case-study approach through the use of written feedback forms which were submitted by the participants each month. The usefulness of this device was limited by two factors. One was a reluctance of some participants to return the

form. Secondly, the use of a standardized form, desirable for reasons of quantification, reduced the personal nature of the information.

In addition to the descriptive portion of the study, certain aspects of the workshop were selected to receive further study using statistical analyses. The portion of this study concerned with testing the hypotheses used a quasi-experimental model which Campbell and Stanley refer to as a "one-group pre and post test" design.¹ For obvious economic reasons, it was impossible to provide a control group in this research. Lacking a control group, the authors identify several possible confounding variables which may jeopardize the internal validity of such a design. In particular, the confounding variables can offer valid rival hypotheses to one which states that treatment accounts for differences noted. The variables cited are those of history, maturation, testing, instrumentation, and regression.

Recognizing the importance of each of these variables, where possible they were designed into the study, to determine their effect concurrent with that of treatment. For example, history is one of the major hypotheses of interest to this research, in terms of further defining selection procedures. The effect of participant history is evaluated in those hypotheses

testing for a correlation between degree, assignment, and subsequent activity levels.

Maturation, as an alternate explanation for observed changes, was not considered an important confounding variable. All participants were mature, experienced science educators and the three-week period of the workshop was not of sufficient length to allow the effects of maturation to be of importance. Over the length of the follow-up, maturation of the individual as a resource person was an important outcome of the workshop.

Testing, instrumentation, and regression are variables whose effects are linked and they will therefore be treated as a group. The effect of testing upon the research was considered minimal for various reasons. First, testing occupied only a small portion of the total time allotted. Secondly, testing procedures and the instrumentation used would have been very similar whether or not this research had been performed. The NSF grant funding the RPW provided for an evaluation of the experience as an integral part of the workshop. It was therefore assumed that the impact of the testing procedures, and the instruments used, on the data of this study would be minor in nature. In fact, "testing," in the usual sense of the word was not a part of the RPW or of this research. The instruments were designed or

selected to provide a relative ranking within the group and were not compared to a predetermined standard. For this reason, regression was not considered a confounding variable of concern to this study.

The timing of testing, testing procedures used, and study instrumentation are discussed in detail later in this chapter.

Statistical Model

In selecting techniques to analyze data, the prime criterion must be that of obtaining the most information possible within the limitations of the research design. For this research, the use of non-parametric statistical tests appeared most applicable for the majority of the hypotheses. Non-parametric analyses are of particular use when data are in the form of rankings. The dependent variable of participant activity was, for five of the seven hypotheses, used as a rank-ordering variable.

Since no standard of activity has yet been established for RPW participants, it was impossible to compare the study subjects to any predetermined norms. Instead, this study established base-line data and this information was then used to differentiate among various types of participants. Siegel² discusses the adaptability of non-parametric techniques to this type of data and he concludes, " . . . they can be

treated by non-parametric methods, whereas they cannot be treated by parametric methods unless precarious and perhaps unrealistic assumptions are made about the underlying distribution."

Hypotheses one and seven were tested using parametric statistical analyses to obtain the maximum information from the data. Hypothesis one tested for a difference in mean level of activity between teams of participants and individual participants. The seventh hypotheses tested for a difference in means on the perception instrument, from a pre- to a post-workshop measurement. Since the dependent variable of activity was expressed in an ordinal scale for these tests, parametric analyses were possible.

The use of non-parametric testing requires that certain assumptions must be met. One assumption is that the observations are independent. A second assumption is that the variable have underlying continuity in the population. Testing for a violation of the first assumption occurred as a part of testing the first hypothesis. Since twenty-eight participants attended the workshop as members of a team, their joint activity might have violated this assumption of independence. Testing for independence, which indicated that the assumption had not been violated, first required a decision about the activity of teamed participants.

The question did not involve those activities performed as a team but rather those activities carried on as an individual. In other words, the question was, how much effect would having a team member available have on an individual's activity? Through consultation with an educational statistician, the decision was made to assume that one-half of the individual activity of a team member could be attributed to the effect of his being part of the team. To compare the means of teams and individuals, and incidentally to test the assumption of independence, the following computational formula was used. For a team of participants, A and B, the total activity of the team would be one-half of the activities conducted by A plus one-half of the activities conducted by B plus the total of activities conducted by A and B as a team. Expressed as a formula, this would be $(1/2 \text{ activity A} + 1/2 \text{ activity B} + \text{all teamed activity of A \& B})$.

An examination of the application of this formula, used to compute the activity level of a team, will serve to illustrate the use of this formula. Team C was composed of two college teachers, whose participant numbers were 19 and 2. Number 19 had 4 activities as an individual, for a total of 126 contact hours. Number 2 also had 4 activities as an individual, for a total of 316 contact hours. As a team, they conducted 3 activities

involving a total of 101 contact hours. The total activity of this team would be:

$$\text{Number of Activities: } \frac{4}{2} + \frac{4}{2} + 3 = 2 + 2 + 3 = 7$$

$$\text{Contact Hours: } \frac{126}{2} + \frac{316}{2} + 101 = 63 + 158 + 101 =$$

322

The rationale for this computation of a team's activity level is as follows. Although the literature, as previously cited, indicates that a supportive function exists between team members, no data has yet been derived which quantifies such support. For the purposes of this study, it was assumed that each of the team members would have conducted a certain number of activities whether or not they were members of a team. Of a team's activity, only those activities presented together can truly be listed as a function of the supportive nature of the team. But, some of the individual activity of the team members might also be attributable to the support of the team member. The question was, how much of this activity can be considered a result of the team supportive function?

The data of this study indicate that for many teams, this supportive function was not an important factor. Of the fourteen teams, six had no activity as a team. Of these six teams, five had one member who

also had no activity of any kind. To state that these five teams were supportive, and the work of one member of the team is the result of that support, is an assumption not supported by the data of this study.

Given the data of the study, and for purposes of hypothesis testing, the support of the team member was defined to affect one-half of the individual activities of a team member. That is, the individual would have conducted only one-half as many activities if he had not had the support and help of his team member. Therefore, the computational formula adds one-half of each team member's individual activity to that of the teamed functions to compute the total of team activity.

As a corollary to the above discussion, since hypothesis testing indicated that teams did not appear to significantly increase activity, the teamed activities were evenly divided among the members of that team in assessing the activity of individuals in the study. This computation is based on the assumption that, since teams did not appear significant, the teamed activities were, in effect, an action of two individuals and each should receive one-half of the total activity. Using this formula, a mean level of activity for all teams was derived and statistically compared to the mean level of activity of individual participants. Since

no significant difference was found to exist between the two means, the effect of teams of participants was not considered a violation of the assumption of independence.

For testing the other hypotheses, those comparing the participants activity to other variables, the decision was made to divide equally the activity of the team and add this half to the individual's activity.

The other assumption, that of underlying continuity of the variable, was deemed met since all participants had equal opportunity and freedom to carry on the indicated activities. Evidence to this effect was required upon application to the RPW, in the form of a letter from an administrator. This letter was discussed previously in Chapter I.

Testing the Hypotheses

H_{01} : There will be no significant difference in the levels of activity engaged in by teamed and non-teamed participants.

H_0 : $\bar{X}_1 - \bar{X}_2 \leq 0$ $\bar{X}_1$ = mean activity level of teams

H_1 : $\bar{X}_1 - \bar{X}_2 > 0$ $\bar{X}_2$ = mean activity level of individuals

Test: t-test for small samples, one-tailed, upper. Let $\alpha = 0.05$. D.F. = 24
($N_1 + N_2 - 2$, $14 + 12 - 2 = 24$)

Decision: Reject H_0 if computed t value exceeds 1.711, the critical value for a one-tailed, upper tail, t-test with 24 degrees of freedom, $\alpha = 0.05$.

Ho₂: There will be no significant positive correlation between the academic degree of a participant and his activity level.

Ho: $z \leq 1.66$ z = transformation of correlation coefficient.

H₁: $z > 1.66$

Test: Kendall Rank Correlation Coefficient, tau. For a sample greater than ten, tau is considered normally distributed and the statistic is converted to a z score.

Decision: Reject Ho if the z score exceeds 1.66, the critical value with $\alpha = 0.05$.

Ho₃: There will be no significant positive correlation between the academic assignment of a participant and his activity level.

Ho: $z \leq 1.66$

H₁: $z > 1.66$

Test: Same as for Hypothesis 2.

Decision: Same as for Hypothesis 2.

Ho₄: There will be no significant positive correlation between the post workshop score of a participant on an ISCS perception instrument and his activity level.

Ho: $z \leq 1.66$

H₁: $z > 1.66$

Test: Same as for Hypothesis 2.

Decision: Same as for Hypothesis 2.

Ho₅: There will be no significant positive correlation between the academic degree of a participant and his score on a standardized test of science knowledge.

$$H_o: z \leq 1.66$$

$$H_1: z > 1.66$$

Test: Same as for Hypothesis 2.

Decision: Same as for Hypothesis 2.

Ho₆: There will be no significant positive correlation between the score achieved by a participant on a standardized test of science knowledge and his activity level.

$$H_o: z \leq 1.66$$

$$H_1: z > 1.66$$

Test: Same as for Hypothesis 2.

Decision: Same as for Hypothesis 2.

Ho₇: There will be no significant increase in participant perception of the educational worth of the ISCS program as measured on an ISCS perception instrument.

$$H_o: \bar{X}_1 - \bar{X}_2 \leq 0 \quad \bar{X}_1 = \text{mean of post test}$$

$$H_1: \bar{X}_1 - \bar{X}_2 > 0 \quad \bar{X}_2 = \text{mean of pre test}$$

Test: Paired t-test, one tailed, alpha = 0.05.
D.F. = 39 (N - 1, 40 - 1 = 39)

Decision: Reject Ho if computed value of t exceeds 1.684, the critical value for a one-tailed, upper, t-test with 39 degrees of freedom, alpha = 0.05.

Participant Selection

Publication of information and solicitation of applicants for the Michigan State RPW were designed to reach a population of science educators at differing school levels. To accomplish this, workshop brochures were sent to all names on the mailing list of the National Association for Research in Science Teaching (NARST). The RPW was also publicized at the national conventions of NARST and the National Science Teachers Association (NSTA). Additional publicity was accomplished by the commercial publishers of ISCS, through NSF publications, and personal contacts of the director. All of these efforts were aimed at science educators who were in a position to work with schools to affect change, primarily college teachers and school science supervisors.

In all, a total of 104 applications were received. Initial selection procedures involved eliminating those applications which did not meet one of the selection criteria as listed on page 19. Following the first screening, 69 applications remained in consideration. Final selection was then made using the criteria in the order of their emphasis. Teams of applicants received top priority for reasons discussed previously.

Of the forty applicants originally invited to attend the RPW, nine declined to attend for various personal or professional reasons. Qualified alternates

were selected to fill all of the vacancies thus created. Complete demographic data on the workshop participants will be presented in Chapter V, in that section titled Results of Hypothesis Testing.

Study Instrumentation

Some of the data-gathering instruments used in this study were commercial publications and some were constructed specifically for this research project. The commercial instruments used were the Sequential Test of Educational Progress (STEP), Form 1-A Science, and the Fundamental Interpersonal Relationship Orientation-Behavior (FIRO-B). The instruments constructed by the researcher were, an ISCS perception instrument, a post-workshop evaluation instrument, and a total workshop evaluation instrument. Copies of the latter, self-constructed instruments are contained in the Appendices.

The rationale behind each of the instruments used, the type of data each produced, and the method of construction of the self-made tests will be discussed in the following sections.

Commercial Instruments

STEP: The STEP test was selected because a test of scientific knowledge was desired and STEP has been characterized by Mallison as one which tests primarily " . . . retention of fact and the ability to recognize

an element of scientific inquiry in a verbal context."³ An additional reason for selecting STEP was, as Mallison again points out, " . . . the lack of other suitable tests."⁴ Form 1-A is designated by the publishers as suitable for use with college freshmen and sophomores. For this reason, some concern was felt that the participants might "top out" on the exam. This concern proved groundless since the top score recorded was a seventy-three out of a possible seventy-five. No attempt was made to standardize the STEP scores because they were intended for use in comparisons only. The scores were used to test for a possible correlation between science knowledge and later activity and also between degree and knowledge of science.

FIRO-B: This is an instrument designed to measure relationships between people, particularly their compatability or ability to work together. Data from this instrument were to have been used in assessing the effectiveness of "compatible" versus "non-compatible" teams. As noted in the results of testing Hypothesis One, however, this study found the effect of teams to be non-significant, in a statistical sense. So, the problem of compatability, as rated on FIRO-B and in relationship to this study, is of moot value and will not be discussed further.

Self-Constructed Instruments

ISCS Perception Instrument: This paper and pencil instrument was designed to assess the participants' perception of the educational worth of the ISCS program. Essentially, it is an opinion questionnaire, which was constructed using the unique characteristics of the ISCS program as items. The instrument is composed of fourteen item stems written as statements relating to the features unique to ISCS. The participants were asked to respond to the statements using a scale of from one to five. The statements were positive, and a response of one indicated strong disagreement with the statement and a five indicated strong agreement with the statement. The sum of the fourteen responses is considered the perception score of that subject. No attempt has been made to standardize scores, to say that above a certain score is a positive perception and below that score is a negative perception. Scores were used to determine if a change in perception did occur and also to rank order participants on this variable.

A sampling of opinions concerning ISCS could have been accomplished with a simpler instrument but it was felt that an evaluation of the individual characteristics of the program would provide a truer evaluation. It was assumed that a positive perception of the worth of the items listed would be correlatable with a

positive perception of the program which contains them. A copy of this instrument is contained in Appendix A.

Workshop Evaluation Instrument: This instrument, which was used to obtain an evaluation of the activities of the workshop, is also a form of questionnaire. It was constructed by first listing each of the workshop objectives, and then under each, those activities designed to meet that objective. Participants expressed their opinions first as to how well the objective had been met and secondly, how useful each activity was in meeting that objective. The rating scale in each case was a ranking of one to five. For the objectives, number one meant that the objective had not been met and number five meant that the objective had been met fully. For the activities, number one indicated that the activity was of no help in meeting that objective and number five indicated that the activity was of great help in meeting that objective. Numbers two, three, and four indicated intermediate feelings between the two extremes. Use of the items to judge the objectives and activities will be made utilizing the number of responses per category and the overall mean of the responses. A copy of this instrument is contained in Appendix B.

Total Workshop Evaluation Instrument: The follow-up questionnaire used the same type of ranking as did the workshop evaluation, to judge the effectiveness of the follow-up efforts. Such activities were grouped, and participants were asked to assess their effectiveness using the one to five scale discussed above. One section of the instrument asked for a comparison of this year's activity to last year and whether any change could be attributed to the RPW and its follow-up. A final section was included, which asked the participants to re-assess the activities of the workshop after the intervening time period. This section used the final workshop evaluation instrument discussed above. A copy of this instrument is contained in Appendix C.

Procedures for Data Gathering

Data were gathered in all three phases of the total workshop experience, prior to the workshop itself, during the workshop, and in the post-workshop period. The timing of this data gathering is listed in Figure 2.

<u>Phase I</u>	<u>Phase II</u>	<u>Phase III</u>
Pre-Workshop	Workshop	Post-Workshop
April to July, 1971	August 2 to 20, 1971	September, 1971 to June, 1972

Figure 2

The type of data and methods of obtaining it varied among each of the three phases. Data gathered in Phase I were qualitative in nature and related to activities carried on before the workshop began. Data from Phases II and III are primarily quantitative and are concerned with the conduct of the formal workshop and also the follow-up. The activities examined at each phase of the workshop are listed in Figure 3.

<u>Phase I</u>	<u>Phase II</u>	<u>Phase III</u>
Pre-Workshop publicity	Ordering of objectives	Participant activity
Workshop design process	Changes in participant perception of ISCS	Evaluation of follow-up
Participant selection	Test of Participant knowledge of science	activities
Physical preparations	Evaluation of: a. workshop objectives b. workshop activities	

Figure 3

Data from Phase I are intended for supplementary use. The inclusion of this information is necessary for an understanding of the total RPW experience. No statistical analysis is planned on data from this phase. Data for hypothesis testing were gathered in Phases II and III. The methods of gathering the data are listed in Figure 4.

<u>Phase II</u>	<u>Phase III</u>
Pre and post measures	Monthly assessment of activity
a. ordering of objectives	
b. perception of ISCS	
FIRO-B	Data on use of ISCS in college courses
STEP administration	Final evaluation instrument
Workshop evaluation instrument	

Figure 4

In Phase III, the rank ordering of the workshop objectives and a completion of the perception instrument were performed on the first and last days of the RPW. Also, on the first day, biographical details, such as age and years of teaching experience at various levels, were obtained. Participants were also asked to assess their level of experience in ISCS and their knowledge of the program aims and philosophies.

The STEP instrument was administered on the morning of the sixth day of the workshop.

The total workshop evaluation instrument was completed by the participants on the morning of the last day of the workshop.

Data gathering in Level III required the participants to return a monthly activity log, on which they listed details of activities they had conducted. An additional form was completed by those college instructors

who had used ISCS in their regular classes at the college level. This form was returned at the end of each term or semester.

The overall evaluation of the follow-up asked participants to rate the effectiveness of each of the follow-up activities. This instrument was completed during the first week of May, 1972. An additional section of the instrument asked for a re-evaluation of the workshop activities, using the same instrument completed on the last day of the workshop. On this instrument, participants were also asked to make a comparison of their activity during the year of the follow-up with the previous year.

The results of this data gathering are presented in Chapter IV in the sections dealing with hypothesis testing and assessment of the activities of the workshop.

NOTES

CHAPTER III

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²S. Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill, 1956).

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⁴Ibid.

CHAPTER IV

RESEARCH FINDINGS

Overview of the Chapter

The first section of this chapter presents a detailed description of those activities designed to provide training in the various skills required of a science education resource person. This section serves two purposes. First, it was believed that a description of those activities will provide ideas and techniques which other RPW directors may find useful in designing their workshops. Additionally, the participants evaluation of those activities supplied some evidence to judge the effectiveness of each. The participant assessments were made twice, at the end of the workshop in August, 1971, and again in May, 1972. Ratings from both assessments are presented together to permit comparisons between the two and to illustrate any opinion changes which may have taken place during the nine months between the evaluations. A ranking of one to five was used to evaluate the activities, with one expressing a feeling that the activity was of little help in meeting the objective,

three a feeling of neutrality about the contribution of that activity, and five expressing a feeling that the activity was of great help in meeting the objective.

Section two of this chapter presents data obtained from the final evaluation instrument. On this instrument, participants were asked to assess the effectiveness of each of the follow-up activities carried on by the workshop staff after the formal workshop. In addition, because data were not available on the activity levels of participants prior to their coming to the RPW, the instrument also contained a section asking the participants to compare different phases of their activity during the current year to that of the previous year. This information was intended to supplement the data from the activity logs. As in section one, the intent in this section was to describe what was done and to assess the effectiveness of each action. The same rating scale of from one to five was used, in the manner described in the preceding section.

The third section of this chapter presents the results of hypothesis testing. To aid in the interpretation of these results, the section also contains demographic data on the study sample, the participants. A complete summary of the data used in testing the hypotheses is presented in Appendix D. The section also contains a detailed listing of activities.

In the final section of this chapter, a comparison is made between those participants who were most active, in terms of numbers of activities conducted, and those who were least active. The two groups are compared and contrasted on selected personal and professional characteristics.

The Workshop

During the three-week period of the formal workshop, the participants received training in four basic areas of competency. Work in these skill areas was somewhat sequentially arranged, but much overlapping occurred between them. Emphasis on building the competencies of the participants centered on the following areas.

- (1) Providing a thorough working knowledge of the content of the ISCS curriculum and its philosophical bases;
- (2) Identifying specific procedures useful and necessary in the successful training of ISCS classroom teachers;
- (3) Gaining skills in planning workshops in ISCS, and other curricula, for use with pre and in-service teachers;
- (4) Practicing those skills relating to workshops by presenting such a workshop for teachers and administrators.

Figure 5 pictorally depicts the approximate placement in time of each of these areas of emphasis.

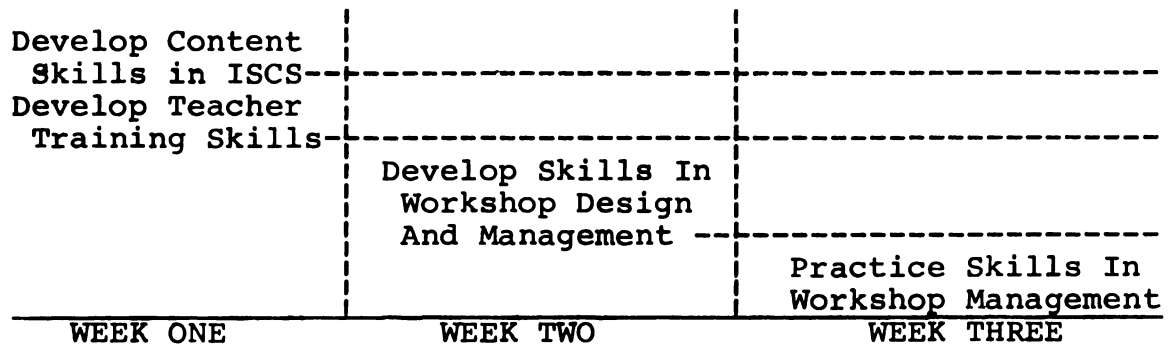


Figure 5

Ordering of Workshop Objectives

The brochures advertising the RPW, and other publicity material, contained a great deal of information on the purposes and intent of the workshop. Still, some concern was felt about what the participants were expecting from the RPW. To determine this expectation, in terms of the workshop objectives, participants were asked to rank order the objectives in light of their perceived learning needs and reasons for attending the workshop. This first ranking occurred on the first day of the RPW and a second ranking was obtained on the last day of the workshop to determine if the experiences of the RPW had caused, or contributed to, any major change in the rankings. The first ranking was to help the staff decide if what was planned appeared to meet what was expected. The

second ordering was to provide data for design of future RPWs. If a shift in importance of any of the objectives had been noted, a design modification might have been necessary to meet the changed learning needs. But, as the data in Table 1 indicate, no such shifts occurred. It is assumed that either the participants had an understanding of the role of a resource person and had decided what skills were important before they came or that a new perception of that role did not change their feelings about the relative importance of the objectives in helping them to function in that role. Also, in one case, the ranking given an objective did not reflect the feeling of how effective that activity was in helping to build the skills. Objective five was ranked third in importance on both rankings and yet, as the evaluation of the workshop activities showed, it was considered one of the most important of the workshop activities.

Workshop Activities

The description of workshop activities which follows is arranged chronologically as the activities occurred in the RPW. A complete log of the RPW activities is appended in E. This appendix also contains a table listing the amounts of time allotted to the various types of workshop activities.

Because the mean value of a one to five rating does not convey as much information as does the

TABLE 1.--A comparison of participant rank ordering of the workshop objectives, in terms of their importance to them, pre and post workshop.

Objectives ^a	Pre-workshop Ranking and Mean (N = 40) ^b	Post-workshop Ranking and Mean (N = 40)
1. To provide knowledge of ISCS objectives and materials	1 $\bar{X} = 2.29$	1 $\bar{X} = 2.46$
2. To plan and prepare materials for inservice and preservice programs.	2 $\bar{X} = 2.65$	2 $\bar{X} = 2.49$
3. Provide opportunities to interact with children using ISCS	6 $\bar{X} = 4.53$	6 $\bar{X} = 5.27$
4. Provide various strategies for the implementation of an innovation	4 (Tie) $\bar{X} = 4.22$	5 $\bar{X} = 4.27$
5. Provide direct experience in organizing and presenting orientation sessions on ISCS	3 $\bar{X} = 3.15$	3 $\bar{X} = 2.89$
6. To help each participant to engage in orientation, consulting and implementation work after leaving MSU	4 (Tie) $\bar{X} = 4.22$	4 $\bar{X} = 3.89$

^aThe objectives are presented here in abbreviated form. A complete statement of the objectives is presented in Chapter I.

^bThe objectives were ranked numerically, with the number one being given to the objective viewed as most important.

distributions of the ratings, a summary of participant rating is presented in tabled form. To facilitate reference to the data, these tables summarize data on each of three workshop activities, even though the activities in the table are not directly related. In each table, data from the workshop evaluation instrument are presented first, followed by the data from the workshop portion of the final evaluation instrument. The items on these instruments were identical. On the instruments, participants were asked to assess how helpful each of the workshop activities were in meeting the objectives of the workshop. For the purposes of this study, an activity will be judged as having been of help in meeting the objectives if thirty or more of the forty participants rate it at the three level or above.

Work in the course content of the ISCS program began early on the morning of the first workshop day and continued to occupy a significant portion of each day until the end of the second week. Laboratory work, while aimed primarily at building knowledge of the curriculum, was also intended to provide functional information relating to teacher education procedures. The laboratories were conducted as the ISCS program recommends, individualized and self-paced. While the participants were working, however, attention was also focused on evaluatory check points for use by the ISCS teacher.

In each of the laboratory sessions, the reactions of students to the materials was a topic of discussion. The workshop plan did not intend that all of the exercises in Level I (Seventh Grade) be completed. Instead, selected portions were recommended, to cover a broad range of the program. After satisfying themselves that their knowledge of the Level I materials was adequate, the participants continued on into the Level II (Eighth Grade) materials. Since Level III was not in commercial production at that time, no laboratory work could be performed in it. But, experimental texts were available and participants were able to acquire a basic familiarity with its content. Evaluations of this technique of conducting the laboratories as they would be in a regular ISCS classroom received relatively high and stable ratings across the two evaluations.

A recurring theme in all of the workshop phases was that of group process skill building. As defined previously, these are techniques derived from the fields of social psychology and sociology. Their use is intended to enhance the cohesiveness of a group and facilitate its functioning as a problem-solving unit. Their use in an RPW can also serve as models which participants could adapt for their own use.

The first element of process training used was the NASA exercise. The purpose of this experience was

to illustrate the effectiveness of group decision making through a consensus of opinions. Through the use of the staff as observers and a sharing of those observations, attention was focused on group dynamics and how the necessary decisions were made in each group. This activity was pointed directly at a later RPW function, that of team planning and presentation of a conference for teachers. This session and the other process activities were conducted by the staff member whose background and training is in the fields of communications and social psychology. As can be noted in Table 2, the ratings given this exercise were relatively high on both evaluations, with a shift towards the top on the final evaluation. It may be that after working in the field for nine months, the participants realize the value of group consensus and ways of achieving it.

TABLE 2.--A summary of participant evaluations of the first, second, and third workshop activities.

Activity	N	<u>Ratings</u>					$\bar{X}$
		1	2	3	4	5	
Content Laboratories	40	2	0	2	14	22	4.35
	40	0	0	4	12	24	4.50
NASA Exercise	40	1	3	8	22	6	3.73
	40	1	3	8	16	12	3.88
Evening Process Sessions	40	3	6	13	10	8	3.35
	40	4	7	5	16	8	3.43

Group process training was also the focus of two evening sessions held during the first week of the RPW. The first meeting was intended to help the group become better acquainted and to help overcome the barriers to communication which so often exist between strangers. After an initial warm-up, loosen-up set of physical and mental exercises, participants and staff were divided into groups of three. Roles of communicator, consultant, and observer were chosen and the communicator was instructed to raise some problem about which he felt concern. The consultant attempted to help him arrive at a possible solution. The observer was a facilitator of this process. After a specified time, the discussion was halted and roles were shifted. The sequence was repeated until all three people had occupied all three roles.

The second evening process session was conducted after teams had formed and were facing the task of designing and conducting a teacher conference. Therefore, the functioning of a group was the focus of this meeting. The activity used was an exercise known as "five small squares." Each team was given a set of five envelopes containing variously shaped pieces of cardboard. The task was to use the pieces to construct five squares of equal size. Instructions were given that no one was allowed to ask for a piece from anyone else and he could take a piece only if it was offered. The pieces

were so arranged that one person could immediately construct a square from those in his envelope. But, to complete all five squares, it was necessary that the one who had completed his square take it apart and pass the pieces around. "Five small squares" is directed towards building team cooperativeness and sharing, while building an awareness of the importance of everyone's contribution.

As the data in Table 2 indicate, the evening sessions met the criteria of being helpful on the first evaluation, but not on the second. A shift of responses both up and down from the middle also occurred from the first evaluation to the second. A post hoc comparison of responses to this activity, comparing the rankings of team members and individual participants was made, and the results indicated that twenty of the twenty-eight team members viewed this as a helpful activity and nine of the twelve individuals also viewed it as being helpful.

Team members did not apparently view this activity as either more or less helpful than did the individual participants. No pattern of responses exists between the active and non-active teams or individuals. Since the data give no clues, the question of the drop in evaluations of the process sessions must remain open. It may be that the workshop evaluation, being completed soon after the teams had been working closely, reflected

feelings of a need for group cooperativeness which became less important over time.

During the first week of the workshop, as participants worked further into the Level I materials, many questions arose concerning the equipment and its use by students. Recognizing the need for open discussion of these questions, optional meetings for this purpose were scheduled. These meetings, which were conducted by the ISCS staff resource person, covered a wide range of topics on ISCS materials and procedures. Although they continued to be listed as optional, the sessions were generally well attended. Both ratings of this activity, listed in Table 3 as Discussions on Materials, reflect the high interest in these meetings. Interest in working in the content remained high throughout the workshop, in agreement with the ranking of objectives which gave the objective of learning the content the number one rank. The high rankings on this activity also indicate the value of a staff member who has worked extensively in the curriculum of study, as the staff member of this RPW had. The rankings also indicate that the participants of this study were interested in learning more than just how to use the materials. They apparently felt a need to learn more, in depth, about the material to help prepare them to work in the program.

TABLE 3.--A summary of participant evaluations of the fourth, fifth, and sixth workshop activities.

Activity	N	Ratings					$\bar{X}$
		1	2	3	4	5	
Discussions on Materials	40	0	1	0	7	32	4.75
	40	0	0	0	8	32	4.80
Elements of a Workshop	40	0	1	4	25	10	4.10
	38 ^a	0	1	6	21	10	4.05
T.V. Viewing of Laboratory School	40	1	5	12	17	5	3.50
	40	3	1	17	13	6	3.45

^aTwo evaluation sheets had no response to this item.

Early in the workshop the participants were informed of the teacher conferences which they were expected to design and conduct. To help the participants formulate their plans, the RPW director conducted a session focusing on the elements of a workshop. The design of the RPW was used as a model to identify these elements and point out the contribution of each to the success of the experience. Both evaluations rated this discussion as being helpful in meeting the workshop objectives.

On Monday of the second week, students were brought to the workshop, and a laboratory school was conducted for three days, from 9 to 11 A.M. per day. A total of twenty-two students attended, the majority of whom were to enter the seventh grade in the fall.

To allow the students a period of adjustment to both the physical setting and ISCS, participants were not directly involved the first day. To enable participants to view the start-up and conduct of the laboratory school, a video tape recorder was used, with a monitor placed in the hall outside the laboratory. This arrangement was continued throughout the duration of the laboratory school experience, even while participants were working with the students. Data in Table 3 indicate that the participants felt that this activity was of help in meeting the workshop objectives.

During the second and third days of the laboratory school, participants entered the laboratory and had an opportunity to discuss ISCS with the students. To avoid overcrowding, a "platoon" system was used to assign times to enter the laboratory and work with the students. As the data in Table 4 indicate, the participants evaluated the laboratory school as a helpful activity on both the first and second evaluations. But, the objective relating to helping participants to interact with students who were using the materials was rated as being least important on both rankings. The two rankings are not mutually exclusive since an activity can be viewed as helping meet an objective whether or not that objective is considered as being top priority. The explanation may lie in the fact that, even though this was considered an

important objective, the others were considered to be of more importance. Considering all aspects of the role of a resource person, particularly that of working with schools to help them implement new programs, this may be a valid explanation for the low rankings of this objective.

TABLE 4.--A summary of participant evaluations of the seventh, eighth, and ninth workshop activities.

Activity	<u>Ratings</u>						$\bar{X}$
	N	1	2	3	4	5	
Interacting With Students	40	2	4	8	17	9	3.68
	40	2	6	10	12	10	3.55
Post Laboratory School Sessions	40	0	2	1	16	21	4.40
	39 ^a	0	0	2	22	15	4.33
Model Building Activity	40	0	0	4	19	17	4.33
	39 ^a	1	3	3	19	13	4.03

^aOne evaluation sheet had no response to this item.

Further indications that the laboratory school activity was of interest to the participants was evidenced by their acceptance of a post laboratory school discussion held each day after the students left. The meetings were well attended and the discussions were lively as the participants shared their experiences from the session and questioned the ISCS staff member about the experience. As the data in Table 4 indicate, both evaluations listed the discussions as a helpful activity.

During all days of the laboratory school, participants continued to work in the content of ISCS. By the beginning of the second week, most were into the Level II materials. This level of ISCS has as its theme that of building mental models. To illustrate this process, and to provide a technique useful in training teachers, the RPW director conducted a session on model building using a "black box" exercise. The box had terminals on its surface, and the terminals were connected, inside the box, with various components such as diodes, bulbs, or batteries. Using a battery-bulb test system, the learners were asked to infer the contents of the box. To do so, a mental model of the contents had to be created. This activity was rated as being helpful in meeting the objectives on both evaluations.

On Tuesday of the second week, a staff member from the ISCS project at Florida State University visited the RPW. His visit was designed to provide a further opportunity for participants to learn about ISCS, its philosophies and how it was developed and tested. During the visit, informal discussions were held while the participants were working and also a formal question and answer session. This visit was viewed as being helpful on the first evaluation, at the end of the workshop, although the ratings were low. On the final evaluation, the visit was not rated as being a helpful part of the

workshop. The data offer no discernable explanation for this drop in ratings over the nine months of the follow-up period. That such a drop did occur indicates that this design component should be studied carefully before it is included in a future RPW.

TABLE 5.--A summary of participant evaluations of the tenth, eleventh, and twelfth workshop activities.

Activity	<u>Ratings</u>						
	N	1	2	3	4	5	$\bar{X}$
Visit From ISCS Staff Member	40	4	5	22	7	2	2.95
	40	3	15	13	8	1	2.73
Preparing ISCS Teacher	40	2	0	6	24	8	3.90
	38 ^a	0	1	3	25	9	4.11
Teacher Preparation Modules	40	0	0	9	22	9	4.00
	40	0	3	5	22	10	3.98

^aTwo evaluations sheets had no response on this item.

Experimental editions of various modules, designed to train ISCS teachers, were obtained from the ISCS project. One of the modules was entitled "Preparing the ISCS Teacher." No formal session was set up to discuss the module but it was a topic frequently in discussions with the ISCS staff member. This activity was assessed by the participants as one which was helpful to them in meeting the workshop objectives. Other modules in the series dealt with other ISCS topics such as classroom

organization, the rationale of ISCS, and evaluation in the program. As with the teacher preparation module, no formal discussions were held on the modules. They were made available to the participants and any discussion of them occurred on an informal basis. As input on teacher training techniques, the modules were viewed as being helpful in meeting the objectives of the RPW.

TABLE 6.--A summary of participant evaluations of the thirteenth, fourteenth, and fifteenth workshop activities.

Activity	<u>Ratings</u>						
	N	1	2	3	4	5	$\bar{X}$
Session on Evaluation	40	2	1	9	20	8	3.78
	40	1	5	10	17	7	3.60
Free Time for Planning	40	0	1	10	8	21	4.23
	40	1	0	2	20	17	4.30
Team Sharing of Designs	40	2	4	11	15	8	3.58
	40	2	3	4	18	13	3.93

By the middle of the second week, concern about the teacher conferences, which were due to be presented on Monday and Wednesday of the third week, began to surface. Workshop activities were designed to aid in the planning of the conferences as much as possible. One such effort was a discussion of the workshop as a learning tool, with special emphasis on the importance of evaluation as a criterion for redesign. The purposes of evaluation and techniques for obtaining it were the main

topics of the meeting. Both evaluations indicate that this was considered a helpful session as it met immediate learning needs.

The latter half of the second week contained a minimum of scheduled activities, to allow a maximum amount of time for designing the conferences. The alternative of work in the program content remained open for anyone who still felt a need for it, but few people took advantage of the opportunity. Anxiety about the conferences remained high throughout this period and teams met outside of the workshop. In a three-week RPW, with the conference as part of its design, the time for planning, with no other activities scheduled, appears to be very important. But, other optional activities for those who feel comfortable with the design they have made, are also important, so that everyone has something to work on. The participants evaluated this design structure as being helpful on both of the evaluations.

After the majority of the five-man work teams had finalized their conference designs, and all had at least a tentative plan, an activity was scheduled which paired teams for a discussion and critique of each other's plan. As mentioned earlier, anxieties were high at this time, and the workshop evaluation, while rating this activity as helpful, also indicated a few dissenting rankings. On the final evaluation, a shift

of rankings towards the top of the scale occurred, although the bottom two rankings received virtually the same number of responses. This shift to the upper end may indicate that, when the pressures of the conference presentation were removed, the importance of this sharing of ideas became clearer. The rankings are high enough, particularly the second, to indicate that this activity is helpful and should be included in future RPWs.

TABLE 7.--A summary of participant evaluations of the sixteenth, seventeenth, and eighteenth workshop activities.

Activity	N	Ratings					$\bar{X}$
		1	2	3	4	5	
Orientation or Implementation Conference	40	0	1	1	13	25	4.55
	40	0	1	2	10	27	4.58
Observing at Implementation Conference	28 ^a	3	2	7	7	9	3.61
	28	1	3	13	8	3	3.32
Discussion of Implementation of a Program	40	0	2	14	19	5	3.68
	39 ^b	1	2	10	21	5	3.69

^aNot all participants engaged in this activity and so they did not respond to the item if they were not involved.

^bOne evaluation sheet had no response on this item.

Conducting the teacher conferences served as the focus of the total RPW, combining as it did all of the skills gained during the workshop. For the conferences,

the participants were divided into eight teams which selected, or traded with another team for, their choice of conference sites. Originally, RPW plans called for sixteen one-day orientation conferences, to be held at various locations throughout the state of Michigan. Sites were selected to reach as many of the population centers of the state as possible. Teachers were notified of the conferences through a direct mailing to all upper elementary and junior high schools in the state. Additional information was disseminated through publications of the University Extension Centers.

Despite these efforts, substantial problems were encountered in generating sufficient teacher interest in the conferences, causing an adjustment in plans. As an alternative to the orientation conferences, schools who had already decided to adopt ISCS were contacted and arrangements made to present for their teachers a three-day implementation conference. Three schools accepted the offer but even with the eight orientation conferences which were available, not all teams were able to present one implementation or two orientation conferences, although all teams presented at least one of the conferences. Those teams who did not have a conference to present on Monday assisted and observed at one of the implementation conferences. All feedback received on the conference activity was positive, including the two

evaluation instruments. This design component appears very helpful in aiding participants gain the skills necessary to plan and conduct workshops for teachers. It is a design worthy of consideration by the directors of future RPWs.

Following the conferences, and focusing on problems encountered in their presentation, a session was held during which the technique of analyzing forces, or power structures, within a system was discussed. Knowing the power structure of a system is of importance since this may be the point of resistance to change. Another meeting then followed, during which a discussion was held on ways by which resistance to change within a system may be overcome. Both of these sessions spoke directly to the problem of implementing an innovation in any system, with emphasis on schools. These sessions, because of the similarity of content between them, were listed as one activity on the evaluations. Both evaluations indicated that these were helpful activities in meeting workshop objectives.

One other training activity was conducted, but was inadvertently omitted from the evaluation instruments. This activity was concerned with one aspect of the role of an ISCS teacher, the working with small groups which is fundamental to an individualized program. The activity focused on ways by which an outsider could enter into

group activity with a minimum of disturbance to the work going on. Three techniques of group entry were identified and tested. These were, entering and observing without speaking, entering with a question about the work, and entering with a statement about the work in progress. Three participants who were familiar with Level I were asked to try each of these techniques on the working groups of their fellow participants. Following the trial period, a discussion of observations was held and this aspect of teaching an individualized program was discussed. This activity was evaluated on the daily evaluation sheet of day two of the workshop. On this evaluation, thirty-four of the forty participants indicated that they felt this to be a helpful activity. Based on the data, this appears to be a design component which should be given consideration in future RPWs, particularly when the curriculum of study is an individualized, self-paced program.

Other activities took place during the workshop besides those which have been discussed. But, they were not designed to provide training and so were not listed on the evaluations. The only activity, other than those described, which took any significant amount of workshop time was gathering of data, using the instruments discussed in Chapter III. Those activities described above comprised the major portion of the workshop and all were

directed at building the skills considered necessary in the functioning of a resource person in ISCS and other curricula.

Success in Meeting Workshop Objectives

Both of the workshop evaluations also contained sections on which the participants were asked to rate how well the RPW had done in meeting its stated objectives. A summary of the results of those evaluations is presented in Table 8. Data from the first evaluation are again listed first.

As noted in Table 8, three participants failed to respond to the workshop objectives items on the final evaluation. A letter was sent asking them to respond to the items, but no answer was received. The loss of three rankings out of forty is not considered a serious enough attrition rate to invalidate the evaluations. It is necessary to redefine the criterion of success which was used with the workshop activities. The same three out of four responses concept will be used to assess effectiveness in meeting the objectives, but the number required at or above the three ranking will be twenty-eight. If this criterion is reached or exceeded, the objective will be deemed to have been met.

Using this criterion to evaluate the data in Table 8, the only objective which was viewed as not

TABLE 8.--A summary of participant evaluations of success in meeting the stated workshop objectives.

	N	<u>Ratings</u>					$\bar{X}$
		1	2	3	4	5	
1. To provide knowledge of ISCS objectives and materials.	40 37 ^a	1 0	1 0	0 3	13 13	25 21	4.50 4.49
2. To plan and prepare materials for use with teachers.	40 37	0 0	0 0	3 0	16 18	21 19	4.45 4.51
3. Provide opportunities for interaction with students using ISCS	40 37	7 3	8 5	11 12	12 11	2 6	2.85 3.32
4. Provide strategies for innovation implementation	40 37	2 0	0 0	6 9	24 16	8 12	3.90 4.08
5. Provide experience in designing and presenting a teacher conference	40 37	0 0	1 0	2 3	9 11	28 23	4.60 4.54
6. Help participants to work as a resource person after leaving MSU	27 ^b 37	0 2	0 1	2 6	11 17	14 11	4.44 3.92

^a3 evaluation sheets had no response to this item.

^bOn the first evaluation, this item asked for a prediction of how well the objective would be met and not all participants responded to the item.

having been met was number three, the objective relating to participant interaction with students using ISCS. The first evaluation indicates that the participants did not feel that this objective had been met. But, the second evaluation does meet the criterion of having successfully met the objective. This is another example of participants apparent dichotomous feelings about this objective. As noted earlier, it was ranked as being the least important on both rankings and yet at the end of the workshop, the participants expressed a feeling that not enough was done to meet the objective. If this type of laboratory school is used in other RPWs, it might be of value to extend the period of the school to four days. The extra two hours would not adversely affect other activities of the workshop and the extra time might allow the participants sufficient opportunity to evaluate student response to the program.

The other objectives received evaluations which meet the established criterion of having been successfully met. Combining this ranking of objectives with the ranking of activities designed to help meet the objectives indicate that the design of the study RPW was such that it did meet its objectives of providing training in the skills required by a resource person in ISCS.

Post-Workshop Activities

Follow-up efforts by the RPW staff were directed primarily towards supporting participants in their work as resource persons and, secondly, to obtain data for use in evaluating the effectiveness of the workshop. The first supportive efforts were designed to help establish the participant as a resource in his community. This could probably not be done completely by anyone other than the participant himself. But, the actions were taken to further, and enlarge upon, the participant's own efforts. Later supportive efforts were directed to providing both direct and indirect aid to the participants. Direct support was in the form of material and financial support when requested. Indirect support consisted mainly of efforts to maintain the group cohesiveness and spirit, to share ideas, and problems, all intended to circumvent some of the identified problems of an innovator. Some of these problems were discussed earlier, in Chapter II.

Each of the post-workshop activities which were part of the RPW follow-up are described in the following sections. A summary of evaluation data relating to those activities will also be presented to aid in the assessment of those activities. The same criterion of effectiveness will be used in this section as was used in the preceding section on workshop activities. That is, a follow-up activity will be deemed to have been

effective in supporting the work of a participant as a resource person if thirty or more of the rankings are at or above the three level. The evaluation instrument listed each of the follow-up efforts in the form of a positive statement and participants were asked to respond to that statement using a five-point scale. A ranking of one expressed strong disagreement with the statement, three expressed no opinion on the statement, and five expressed strong agreement with the statement. The data for evaluating the effectiveness of the follow-up efforts were derived primarily from the Final Evaluation Instrument (appended). Other data on follow-up efforts were gathered during the study and that data are presented in the descriptive discussions. The numbers listed for each follow-up effort in the tables corresponds to the number of that item on the final evaluation.

Letters: Many of the participants had already established their credentials as resource persons prior to their arrival at the RPW. Others, because of their teaching assignments, or other constraints, had not been as actively involved in working with local schools. For those who were already established, the intent was to broaden their base of support. For others, these efforts were intended to introduce them in their new roles and help to establish them. As one means of accomplishing

these objectives, letters were sent from the RPW director to certain people who were in a position to assist the participant.

TABLE 9.--A summary of participant evaluations of the effectiveness of letters as a follow-up activity.

Type of Letter	<u>Ratings</u>						
	N	1	2	3	4	5	$\bar{X}$
The Letter to an Administrator							
23. Was mentioned to me by him	40	11	4	4	13	8	3.08
24. Helped build me a base of support	40	6	2	13	15	4	3.23
25. Should be a part of '72 RPW	40	2	1	1	17	19	4.25
The Letter to State Dept. of Education							
26. Resulted in them contacting me	40	21	11	2	3	3	1.90
27. Was effective in helping me	40	20	9	8	2	1	1.88
28. Should be a part of '72 RPW	40	0	1	12	15	12	3.95

The first of these letters (Appendix F) was sent to each administrator who had written the required letter accompanying the workshop application. The letter to him explained the purpose of the RPW, what type of training it involved, and what type of action it was hoped the training would evoke. The assumption made was that when the administrator was reminded of the purposes of the RPW, which he had earlier supported, he would be more inclined to help where possible.

As indicated in Table 9, the letter to their administrator was not mentioned to most of the participants but it was assessed as being effective in helping to build their base of support in their school. On the question asking if this letter should be used again as a part of an RPW follow-up, the indicated answer was yes. One direct response to this letter was received. In it, one of the administrators acknowledged receipt of the letter and indicated that he agreed with the goals of the RPW. The participant to whom this letter referred turned out to be the second most active among the participants. How much direct effect this letter had on his activity was not determined, however. But, it appears that this letter can be helpful to participants and the reuse of this type of letter should be considered as a part of any RPW follow-up.

A letter similar in content to the one sent to administrators was also sent to the science supervisors in the State Departments of Education of each participants home state (see Appendix F). This letter was prompted by the assumption that having someone on the state level aware of a participants qualifications could act to increase the potential influence of that participant as a resource person. Participant responses on the items relating to this letter indicate few were contacted by the state as a result of the letter, and few

considered the letter to be effective in helping them to function as a resource person. But, even with no evidence to support their belief, the participants must have been convinced that the letter could potentially help because the indication was that the letter should be a part of the follow-up to another RPW.

One letter was also received in response to this letter. In it, the writer indicated that he would use the participants if the occasion arose. But, the participant team referred to presented only one activity, that one as a team, and as a direct result of a visit by the director. No direct evidence exists as to the effectiveness of this letter but, based on the evaluations of the participants, the letter appears worthy of consideration as a follow-up effort to an RPW.

TABLE 10.--A summary of participant evaluations of the effectiveness of visits by the director as a follow-up activity.

		<u>Ratings</u>					
	N	1	2	3	4	5	$\bar{X}$
A Visit by the Director							
39. Increased my activity	9 ^a	0	2	2	3	2	3.56
40. Would have increased activity	31 ^b	3	3	16	7	2	3.06
41. A phone call would be as effective	9 ^a 31 ^b	0 4	2 8	2 6	3 10	2 3	3.56 3.00
42. Should be part of '72 RPW	40	2	0	9	16	13	3.95

^aParticipants who were visited

^bParticipants who were not visited

Visits by the director: The NSF grant supporting the study RPW had funds written into it to support travel by the director to visit participants. Early in the follow-up period, the question arose as to how these visits could most effectively be used. One use of the money would have been to visit those who had shown early activity and seek to increase their activity and effectiveness. The second option was that of visiting those who were not as active and seek to build their activity. The decision was made to visit the less active, the consideration being that here lay the greatest potential for affecting change. In choosing this option, the assumption was made that lack of activity could be a result of a participant's situation, and a visit from the director could act to change that situation.

Visits were made to four teams of participants and one individual. This is a very small sample to attempt to infer from, but some indication of the effect of these visits can be derived from studying the activity of those visited both before and after the visit. This information is presented in Table 11.

The data in Table 11 do not appear to indicate that a visit by the director functioned to increase the activity of the participant. Two of the teams, F and G did have their only teamed activity as a direct result of the visit. The difficulty in interpreting the data

TABLE 11.--A comparison of activity of participants prior to, during, and following a visit by the director.

Team Identifi- cation	Partici- pant Number	Number of Activities		
		Prior	During	Following
F	29	0	1	0
	9	0	1 (Teamed)	0
G	20	2	0	0
	32	0	0	0
H	5	0	0	3
	30	2	0	3 (Teamed)
B	16	0	0	1
	34	2	0	1 (Teamed)
	18	2	0	2

is also compounded by the relative shortness of the follow-up period of this study. A visit by the director could have effects which do not immediately show up on an activity measuring instrument. But, based on this sample, it must be inferred that this model of visits by the director did not serve to effectively increase participant activity.

Through their rankings on the evaluation, those who were visited did express a feeling that the visit served to increase their activity. But, by exactly the same ranking they indicated that a phone call, or calls, would have been as effective. Those who were not visited gave responses to item 40 which indicate they are not sure whether a visit would act to increase their activity.

This indecision is also evident in their responses to the item asking if a phone call would be as effective as a visit. The total group, through their responses to item 42, indicate that they feel the visits by the director should be a part of other RPWs. More study of this question is needed before a final decision can be made as to the effectiveness of visits. The option of visiting those who are already active, to see if their activity can be increased, should be tested.

Other types of follow-up activities were intended to be more supportive in nature than were the efforts described above. All of the following efforts were directed at maintaining the cooperative spirit which was formed during the RPW. Evidence cited earlier in this study strongly indicates the value of such support.

One purpose of this study was to assess the effectiveness of the different supportive functions. Those which were used are described and evaluated in the following sections. These activities are not chronologically arranged. Some occurred throughout the period of the follow-up and others lasted for only a short time.

Newsletter: In an effort to maintain lines of communication between the participants themselves and the staff and the participants, a newsletter was compiled monthly and sent to each member of the group. News items were taken from the activity logs and from an

"items of interest" sheet which was included with each activity log. A copy of these two feedback instruments is appended in G. Personal messages were transmitted from participant to participant via the newsletter, a service which was quite often used to send cryptic and humorous messages.

Items of interest relating to education in general and ISCS in particular were duplicated and included with the newsletter where applicable. The newsletter averaged three typewritten pages and was mailed the first of each month. This time was chosen because the activity logs for the next month were enclosed along with the newsletter.

The data in Table 12 give a strong indication that the newsletter was considered an effective follow-up activity. This evaluation supports the idea that a newsletter to participants is an important part of the follow-up of an RPW. How often the newsletter should be sent may not have much affect on its usefulness as a supportive function but the participants of this study indicated that a monthly newsletter was not too often for them. That it is sent seems to be the important thing.

Names of other participants: Another supportive activity tried during the follow-up was an attempt to link up this year's participants with participants from

other RPWs. Michigan State had hosted four RPWs prior to this one, although they were not in ISCS. Because the workshops were all similar in design, though not in curricula, it was hoped that participants from the different workshops could and would work constructively together. To instigate this cooperation, participant lists from previous RPWs were sent, along with a suggestion that working relationships might be formed with someone from that list.

TABLE 12.--A summary of participant evaluations of the effectiveness of a newsletter as a follow-up activity.

		<u>Ratings</u>						
		N	1	2	3	4	5	$\bar{X}$
The Newsletter								
32.	Kept me in contact with others	40	0	1	3	17	19	4.35
33.	Was enjoyable	40	0	0	0	0	31	4.78
34.	Was informative	40	0	0	0	17	23	4.58
35.	Was interesting	40	0	0	0	14	26	4.65
36.	Came too often	40	14	17	6	3	0	1.95
37.	Should be part of '72 RPW	40	0	0	0	9	31	4.78

Twelve of the participants indicated that they had contacted someone from the list of names and the activity log for May indicated that one activity had been conducted with a participant from another workshop. The

data indicate that participants felt this activity might be of value to them even if they had not contacted anyone from the list. This type of link up between workshops appears to be an effort worth making in future RPWs.

TABLE 13.--A summary of participant evaluations of the effectiveness of attempting to link up participants from different RPWs.

		<u>Ratings</u>						
		N	1	2	3	4	5	$\bar{X}$
30.	The list of names may be of future benefit to me	40	0	1	8	23	8	3.95
31.	'72 RPW participants should be given this list of names	40	0	0	3	18	19	4.40

Monetary Support: Based on prior experience, it was hypothesized that an inability of schools to financially support a workshop could be a barrier to participant activity. To help overcome this difficulty, funds were available in the RPW grant to allow partial support of participants where other, more adequate, support was not available. To qualify for the payment of fifty dollars, a participant submitted a request in advance and then, after the activity, returned a payment request form which contained details of the activity. A total of fifty-two such requests were received during the year

of the follow-up, fourteen of which were to cover activities planned for after the close of the follow-up period. The requests for payment came from fourteen different participants, some of whom were very active and some for whom this was their only activity.

TABLE 14.--A summary of participant evaluations of the effectiveness of support payments as a follow-up activity.

	N	<u>Ratings</u>					$\bar{X}$
		1	2	3	4	5	
55. The payment would allow me to conduct a workshop without any other support	40	8	5	4	16	7	3.23
56. The support payment is an effective way to encourage activity	40	1	2	7	16	14	4.00
57. The support payment should be part of '72 RPW	40	0	2	2	16	20	4.35

The availability of this support was discussed during the workshop and again twice in the newsletter but still four participants responded that they were not aware of the opportunity. Most were, however and some payments were requested for reasons other than personal ones. One team requested support money for a summer workshop they were planning which was to take the place of a non-funded CCSS proposal. The money was requested to cover the expenses of the workshop and not for

salaries. The participants had agreed to donate their time. The data from the final evaluation indicate that even if they did not apply for such support, the participants feel that is a valuable type of support activity and it should be an option open to the participants of other RPWs.

Convention Meeting: Some type of meeting where as many participants as possible could meet to socialize and share ideas was considered to be an important follow-up activity. Acting on this assumption, a group meeting was arranged during the 1972 convention of NSTA. Eleven participants were able to attend the meeting, which lasted for one and one-half hours. The first half-hour was an informal mixer. After everyone had a chance to renew acquaintanceships, a formal discussion period was begun. During the formal portion, problems were discussed and possible solutions suggested. A discussion was held on the formal operation of the RPW and its follow-up, and which phases of each appeared effective and which not.

The data in Table 15 indicate that those who were able to attend the group meeting found both the formal and informal parts of the meeting to be interesting. Those who were not able to attend indicated that they would have liked to attend. This type of meeting

TABLE 15.--A summary of participant evaluations of the effectiveness of a large group meeting as a follow-up activity.

		<u>Ratings</u>					
	N	1	2	3	4	5	$\bar{X}$
The NSTA Meeting							
59. The informal part was interesting to me	10 ^b	0	0	1	6	3	4.2
60. The formal part was interesting to me	10 ^b	1	0	1	4	4	4.0
61. I would like to have been able to attend	29	0	0	0	12	17	4.59
62. This type of meeting is an effective follow-up	38 ^a	0	0	3	18	17	4.37
63. I would like to attend such a meeting at '73 NSTA	40	0	0	2	14	24	4.55

^aTwo evaluation sheets had no response to this item.

^bOne evaluation sheet had no response to this item.

appears to be an effective follow-up activity and strong indication was made on the evaluation that a second meeting would also be well received.

Materials Support: Although the curriculum materials were too bulky to be shipped to participants for their use, they were utilized by two participants from Michigan. Other materials which could be loaned were a set of 2 X 2 slides and a cassette recording on the philosophy and content of ISCS. The tape and slide set were borrowed a total of nine times during the follow-up. A set of evaluation materials for use in ISCS was obtained from the publisher and these were borrowed three times. One question on the final evaluation asked the participants if they had received adequate material support from MSU. Even though only fourteen people had requested and received such support, enough people felt that they had received adequate support so that that portion was judged a successful part of the follow-up, according to the study criteria. Thirty-eight people ranked this question, number 12, as three or above, indicating that the material support was adequate.

Commercial Publishers of ISCS: Another support activity attempted to place participants in contact with the sales representatives of the ISCS publisher,

and vice versa. Names and addresses of the local sales representatives were sent to the participants and a participant's list was sent to the publisher for distribution to their representatives. On the final evaluation, twenty-five of the participants indicated that they had been in contact with a sales representative of the ISCS publisher. Considering the possible benefit to be derived from such a contact, in terms of possible support in conducting ISCS activities, some way of establishing communication between the participants and the publisher would seem an important addition to an RPW. More emphasis may be needed in the workshop on this point. It might also be helpful to invite a representative of the publisher to discuss what the company is able and willing to do to help support participant activities. Participants should also be encouraged to contact the sales representative and enlist his support.

The last section of the final evaluation instrument asked participants to provide a "grade" on the effectiveness of the formal workshop and its follow-up. The item asked that all of the good and the bad points of both be taken into consideration in ranking the two. The results of this evaluation are summarized in Table 16. The conclusion made from these data is that, in the participant's view, both the workshop and the follow-up to it were effective in meeting the perceived needs of

the participants. This belief does not preclude the possibility that design changes can still further increase the effectiveness of the total RPW. But, it does indicate that what was done was relatively successful in the training and support of resource personnel. Since the design structure of this RPW does appear to have been successful in meeting its objectives and those of RPWs in general, it may prove useful as a model from which other directors can draw design and management ideas.

TABLE 16.--A summary of participant evaluations of the overall effectiveness of the workshop and its follow-up.

	N	<u>Ratings</u>					$\bar{X}$
		1	2	3	4	5	
The Workshop	40	0	0	1	11	28	4.68
The Follow-up	40	0	2	4	22	12	4.10

Tests of the Hypotheses

Data for testing the study hypotheses were drawn primarily from the activity log returned by participants each month. This data-gathering device was discussed in Chapter III and is appended in G. Additional data were gathered during the formal workshop period, using the study instruments and data-gathering procedures also discussed in Chapter III and appended.

On the activity log, each activity was recorded, plus additional information such as the purpose of the activity, its length in hours, the number of people in attendance, and whether it was conducted as an individual or a teamed activity. From this information, a summary of activity was compiled for each team and individual. These data summaries are contained in Appendix D.

Activity was listed in two categories, one being the actual number of activities conducted and the other being the total number of contact hours. Contact hours were computed by multiplying the length of the activity times the number of people in attendance. Each of the study hypotheses which used the dependent variable of activity as a ranking variable were tested using both definitions of activity. The two different tests were an attempt to derive the maximum amount of information from the data.

The factors of number of activities and number of contact hours were found to be closely related. A discussion of the analysis used to test the correlation between the two definitions of activity will serve to illustrate the usage of Kendall's Rank Correlation Coefficient which was used to test five of the study hypotheses.

Kendall's tau is a measure of correlation between two variables and is used in the following manner. The subjects are ranked on both variables and the correlation coefficient is computed from a comparison of the ranking positions of the second variable. The correlation coefficient is, in effect, a difference score between the two rankings. Analysis of the two activity definitions produced a tau value of 0.603. For a sample greater than ten, tau is considered normally distributed and is converted to a Z score. The Z statistic is compared to the tabled Z to determine the probability of the occurrence of a value as extreme as the computed value. For the two definitions, the Z score associated with the computed tau value is 5.48. Reading of the tabled Z indicates that the probability that these two scores are not from the same population is less than 0.0003. Kendall's tau requires use of an additional computation in the event of two or more tie scores on any variable. Such ties did occur in the activity totals and corrections for ties were made. For a further discussion of the Kendall Rank Correlation Coefficient: tau, the reader may wish to refer to Nonparametric Statistics for the Behavioral Sciences, by Sidney Siegal.

The procedure discussed above for testing correlations using Kendall's tau was used to test hypotheses two through six. Hypothesis one was tested using a

small sample t-test, the analysis which seemed to offer the best test within the study limitations. For this study, it was assumed that the sample size was large enough to allow the use of the normal approximations. Hypothesis seven was tested using a paired-sample t-test for the same reasons discussed above. The t-test is relatively powerful for forty subjects at the 0.05 level of significance, the level at which these hypotheses were tested.

The results of testing the hypotheses are presented in a following section of this chapter. A discussion of the implication of those results is contained in Chapter V. To help interpret the results it is necessary to know for which population the results given are valid. The following section describes the sample of this study, the RPW participants.

Description of Participants

Participants for the Michigan State University RPW were selected from a population consisting of college and university professors who were currently teaching science and/or science education to pre-service intermediate school teachers and, intermediate school personnel who were working either as science supervisors or science consultants.

In all, because of participants declining to attend for various personal reasons, a total of forty-nine

educators were invited to attend the workshop. Of the forty who actually participated, thirty-four were males and six were females, a ratio slightly below that of male to female applicants. All of the participants were college graduates but a variance existed in the highest academic degree they had received. The participant's list included ten people who held a Ph.D., twelve who held an Ed.D., thirteen who had received a Master's degree, and five with Bachelor's degrees. All of the participants in the latter category had earned graduate credits beyond their degree as had those with the Master's degree.

Teaching position or job assignment varied among the forty also, with twenty-seven of the participants assigned as teachers at the college or university level, eight serving school districts as a science supervisor, and five acting as science consultants in the schools where they taught. Data on the gender, academic degree, and school assignment of the forty participants is presented in Table 18.

Participants came to the workshop from nineteen states and thirty-four different educational institutions, located in four of the major geographical regions of the nation. Each of the participants was an experienced teacher, with 75 per cent (thirty of the forty) having had experience at some level other than

TABLE 17.--Gender, academic degree, and employment assignment of the participants.

Gender	Academic Degree	Classroom Teacher	Science Supervisor	College Teacher
Male	Ph.D.	-0-	-0-	10
	Ed.D.	-0-	-0-	11
	Masters	-0-	5	4
	Bachelors	4	-0-	-0-
Female	Ph.D.	-0-	-0-	-0-
	Ed.D.	-0-	-0-	1
	Masters	-0-	3	1
	Bachelors	1	-0-	-0-

TABLE 18.--Number of participants with teaching experience at each school level and the mean years of experience at that level, by academic degree.

Academic Degree	Elementary	Junior High	Secondary	College
Ph.D.	-0-	4 ($\bar{X}$ = 4.0)	7 ($\bar{X}$ = 10.0)	10 ($\bar{X}$ = 8.4)
Ed.D.	5 ($\bar{X}$ = 1.8)	5 ($\bar{X}$ = 6.4)	11 ($\bar{X}$ = 5.4)	12 ($\bar{X}$ = 5.0)
Masters	3 ($\bar{X}$ = 8.6)	9 ($\bar{X}$ = 8.0)	4 ($\bar{X}$ = 7.2)	8 ($\bar{X}$ = 11.1)
Bachelors	1 ($\bar{X}$ = 20.0)	4 ($\bar{X}$ = 3.5)	2 ($\bar{X}$ = 4.0)	-0-

that at which they were then assigned. Teaching experience ranged from two to thirty-seven years. The forty had a total of 599 years of teaching experience for an average of 14.975 years. Fifty-five per cent of the participants had taught for some period of time in a junior high school, and 60 per cent listed teaching experience at the secondary level. Of the twenty-seven college teachers, all but three were directly involved in the teaching of science education courses at their institutions. The other three college teachers were teachers of science courses in which pre-service teachers are enrolled. Table 18 presents data on the teaching experience of the participants at different school levels.

Selection criteria of the RPW emphasized the team approach, and of the forty participants, twenty-eight attended as members of a team and twelve attended as individuals. The fourteen teams were divided into four different types based on the academic assignment of the team members. Six teams were composed of two college teachers. Three teams had as members a college teacher and a science supervisor. Four teams were made up of a college teacher teamed with a science consultant, and the other team had as members a science supervisor and a science consultant. All six of the teams of two college teachers had both members from the same school but not necessarily from the same department.

Of these fourteen teams, six were formed in response to the selection criterion which indicated a preference for teams of applicants. None of the team members of these six teams had worked together extensively prior to attending the RPW. Two teams had as members educators who had worked together on a few occasions. The other six teams were composed of members who had worked together extensively prior to their attendance at the RPW.

Upon entering the workshop, the participants were asked to assess their experience in working with ISCS, and also their knowledge of the aims and philosophies of the program. The results of that survey are presented in Table 19.

TABLE 19.--Participant assessment of their entering experience with ISCS and their knowledge of its aims and philosophies.

	None	A Little	Some	Quite A Bit	Extensive
Experience	19	13	4	3	1
Knowledge	8	15	11	4	2

The data from this survey indicate that over three-fourths (80%) of the participants came to the workshop with little or no experience in the ISCS program. Over one-half (57.5%) came with little or no

knowledge of the program aims and philosophies. Two of the science consultants had used the ISCS program in their classrooms.

The population variables of interest in the hypothesis testing portion of this study were those of attendance as part of a team or as an individual, academic degree, academic assignment, perception of the worth of ISCS, and knowledge of science. These data, and the level of activity of each participant are appended in D. The results of testing hypotheses relating to these variables and a discussion of the results of such testing comprise the next section of this chapter.

Results of Hypothesis Testing

Hypothesis 1: There will be no significant difference in the levels of activity engaged in by teamed and non-teamed participants.

The hypothesis tested was $H_0: \bar{X}_1 - \bar{X}_2 \leq 0$. The hypothesis of interest was $H_1: \bar{X} - \bar{X}_2 > 0$, where $\bar{X}_1$ equals mean of team activity (3.89) and $\bar{X}_2$ equals mean of individual activity (5.50). There were fourteen teams and twelve individuals in the study sample. This hypothesis was tested using a one-tailed, upper, t-test with twenty-four degrees of freedom. The critical value for this test is 2.064. Analysis of the data produced

a computed t-value of -0.978 for number of activities and -0.549 for contact hours. The null hypothesis was not rejected.

The test of team activity compared to the activity of individuals, performed using the definitions of the study, indicates that there was no significant difference between the activity of teams and individuals in this sample. Any conclusions drawn from the results should take considerations of team formation procedures into account, however.

As noted, some teams were formed in response to the selection criteria, and their members had not worked together previously. If the activity of these teams is removed from the total, the mean for teamed activity changes from 3.89 to 4.88. If only those teams whose members had worked together extensively are considered, the mean rises to 5.67 which is above that of the individual participants.

Another factor which must be considered in interpreting these results is a study of the activity of individual participants. Team members, alone or together, conducted a total of ninety-one activities. Individuals conducted a total of sixty-six. But, of these sixty-six, one participant, a science supervisor, conducted twenty-two activities, or 33.3 per cent of the total individual activity. The mean level of activity for the other eleven individuals is 4.00.

These factors do not in any way change the results of testing the hypothesis but they must be considered in any inferences made from that testing. One apparently viable inference, supported by the data, is that making up teams in response to a selection criterion does not appear helpful in increasing participant activity. The data also indicate that teams whose members have worked together extensively prior to the RPW continue that work after the RPW. More study is needed to determine if that activity is increased as a result of the RPW.

Hypotheses two through six were tested using Kendall's tau statistic. To facilitate discussion of the results of that testing, Table 20 presents the values computed from the data for these five hypotheses.

TABLE 20.--Computed tau values and their Z score conversions used in testing hypotheses two, three, four, five, and six.

Hypothesis	Computed Tau Values		Z Score Conversions of Tau Values	
	No. of Activities	Contact Hours		
2	0.152	0.017	1.38	0.15
3	0.127	-0.068	1.15	-0.07
4	-0.028	0.087	-0.26	0.79
5	3.140	---	2.85 ^a	---
6	0.139	0.145	0.15	1.32

^aSignificant at the 0.05 level.

Hypothesis 2: There will be no significant positive correlation between the academic degree of a participant and his activity level.

The hypothesis of interest was $H_1: Z > 1.66$. As the data in Table 20 indicate, the computed Z score was less than this value and the decision was to not reject the null hypothesis.

This hypothesis testing was intended to provide information useful in refining participant selection criteria by differentiating between the activity levels of participants. But, for the sample of this study, tested with the techniques used, no correlation was found to exist between the academic degree of a participant and his activity. For the sample tested, academic degree does not appear to be a good predictor of activity and other means must be found to provide information on selection. Other variables must be identified and tested to determine if they will function more effectively as a predictor of activity.

Hypothesis 3: There will be no significant positive correlation between the academic assignment of a participant and his activity level.

The hypothesis of interest was $Z > 1.66$. The computed Z score, as shown in Table 20, did not exceed this value and the decision was to not reject the null hypothesis.

Testing this hypothesis was also intended to provide information which would be of use in the refinement of selection criteria. However, the data did not

support the predicted correlation between the assignment of an individual and his activity level. And so, the academic assignment of an applicant does not appear usable as a predictor of his subsequent activity. Other variables must be identified and tested in relation to activity levels if selection criteria are to be made more effective, and if activity, as defined by this study, is considered an important result of the RPW.

Hypothesis 4: There will be no significant positive correlation between the post workshop score of a participant on an ISCS perception instrument and his activity level.

The hypothesis of interest was $H_1: Z > 1.66$. Analysis of the data produced a Z score below the critical value, as indicated in Table 20, and the decision was to not reject the null hypothesis.

This hypothesis dealt with one aspect of the search for ways to increase participant activity. If a correlation had existed between the perception, as measured on this instrument, and activity level, building a positive perception would have been an important goal of an RPW. Because it was considered that building positive perception was important, a post hoc analysis of the data was performed to see if any relationship existed between the change in perception which a participant indicated on the instrument and his activity

level. A significant correlation was found to exist between the amount of increase in perception and activity level. More information on this result is contained in the discussion of testing hypothesis 7. The indication is, however, that increasing a participant's perception of the program under study can act to increase his activity.

Hypothesis 5: There will be no significant positive correlation between the academic degree of a participant and his score on a standardized test of science knowledge.

The test of interest was $H_1: Z > 1.66$. The computed Z value obtained from analysis of the data exceeds that of the critical value and the decision was to reject the null hypothesis and assume that such a correlation does exist for this sample.

This hypothesis testing was designed as an adjunct to hypothesis six, which tested for a correlation between score on the standardized test and activity. Since that hypothesis testing did not indicate that such a correlation exists for this sample, the value of the information derived from this testing is somewhat limited. The information may be of some use in workshop design, however. If knowledge of science content is a goal of that workshop, design components will need to keep this indicated variance in amount of science

knowledge in mind, to provide sufficient information to meet the different learning needs of the participants.

Hypothesis 6: There will be no significant positive correlation between the score achieved by a participant on a standardized test of science knowledge and his activity level.

The test of interest was again $Z > 1.66$. Analysis of the data, as indicated in Table 20, derived a Z score which did not exceed the critical value and the decision was to not reject the null hypothesis.

Testing of this hypothesis was intended to provide further information to aid in refining the selection criteria. If a correlation between knowledge of science and activity had been found, then selection of those applicants who have a greater knowledge of science would have been indicated. Such a correlation was not indicated by the study data, however, and this revision of selection criteria will not be of value if activity, as defined by this study, is a desired outcome of the RPW.

Hypothesis 7: There will be no significant increase in participant perception of the educational worth of the ISCS program as measured on an ISCS perception instrument.

The hypothesis tested was $H_0: \bar{X}_1 - \bar{X}_2 \leq 0$. The test of interest is $H_1: \bar{X}_1 - \bar{X}_2 > 0$, where $\bar{X}_1$ equals mean of post test, (56.9) and $\bar{X}_2$ equals mean of pre-test

(48.3). Analysis of data, made using a paired t-test, derived a computed t-value of 2.96. With thirty-nine degrees of freedom, the critical value for this test at the 0.05 level is 1.684. The decision was to reject the null hypothesis and assume that a significant positive increase in perception, as measured by this instrument, did occur. The workshop design did apparently function to build an increased perception of the educational worth of the ISCS program.

This hypothesis testing was intended to be a corollary to hypothesis four which tested for a correlation between perception of the program and activity. If such a correlation had been indicated, then the question of whether this design did function effectively in building perception would have been of great interest. To determine if the amount of increase in perception is correlated with activity, a post hoc Kendall's tau was computed using the study data. A tau value of 0.194 was computed, which transforms to a Z score of 1.76. This Z score is significant at the 0.05 level, indicating that the greater the increase in perception of the worth of ISCS, as measured by this instrument, the greater the activity level. More study of this question is needed to determine if this correlation holds for other populations. If it does, then building a greater perception of the worth of the program would seem indicated as a goal of an RPW.

Table 21 summarizes the results of testing the study hypotheses and lists the values calculated from each test, and the decisions made. A summary of all participant activity recorded during the period of this study is the subject of the next section of this chapter.

TABLE 21.--Results of hypothesis testing.

Hypothesis	Test Used	Tabled Value	Calculated Value	Decision
1	t-test (d.f. = 24)	2.064	-0.978 -0.549	Do not reject Null hypothesis
2	Kendall's tau	1.66	1.38 0.15	Do not reject Null hypothesis
3	Kendall's tau	1.66	1.15 -0.068	Do not reject Null hypothesis
4	Kendall's tau	1.66	-0.255 0.79	Do not reject Null hypothesis
5	Kendall's tau	1.66	2.85	Reject null hypothesis
6	Kendall's tau	1.66	1.26 1.32	Do not reject null hypothesis
7	paired t-test (d.f. = 39)	1.684	2.96	Reject null hypothesis

Participant Activity

Participant activity subsequent to the RPW consisted primarily of the presentation of orientation or implementation workshops, either in ISCS or other new science programs. Other types of activities were carried on, however, and this section describes these.

Workshop presentation: The forty participants conducted a total of 157 workshop type of activities during the academic year of 1971-72. As the data in Table 22 indicate, these activities were conducted throughout the whole year. In Table 22, teamed activities are recorded separately from those activities conducted by a team member. In order to be recorded as a team activity, both team members had to be involved in conducting the activity.

TABLE 22.--A summary of participant activity as reported on the monthly activity log.

Performed By	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Total
Individuals	8	9	7	5	9	10	8	5	5	66
Team members (as individuals)	14	12	5	8	6	4	9	4	9	71
Teams (as a team)	1	1	3	0	3	4	3	1	4	20
Total	23	22	15	13	18	18	20	10	18	157

As the data in Table 22 indicate, activities conducted jointly by team members comprise only a small portion of the total activity. The twenty teamed activities account for only 12.7 per cent of the total. Of the fourteen teams represented in the RPW, only eight

presented a teamed activity. Five of those eight teams were composed of two college teachers. These five teams conducted fourteen of the twenty teamed activities. The only three other teams to present a teamed activity were composed of a college teacher teamed with a science supervisor. In addition, six of the eight active teams were made up of members who had worked together extensively prior to the workshop. Only one out of the six teams which were formed in response to the selection criteria presented a teamed activity. Associated with the conclusion of the study that teams do not appear to significantly increase the activity of their members must be one which states that made up teams appear especially ineffective.

And, while the conclusion is that teams were not significantly more active in the study sample, alternative explanations might account for the results noted. For example, it may be that a team composed of a college teacher and a science supervisor would have the supervisor very busy setting up activities for the college teacher but not participating in conducting them. In this instance, the supervisor's activity would not be recorded. This explanation is not supported by the data of this study, however, but this type of "hidden" activity is a problem to uncover and record in a study

of this type. Some means, such as a different type of data feedback report, must be developed which will be able to include this type of data.

Another possible explanation for the relative inactivity of some teams may be that of the length of the study. The study might not have been long enough, in time, to allow the effects of teams to fully express itself. Teams, and especially those who have not worked together previously, may need more time to become a team than the nine months of the study could allow. Another alternative is that the extensive and supportive follow-up of this study may have provided the same type of help and support as would a team member. More research on all of these questions is clearly indicated before a final decision on the effectiveness of team selection can be made.

Among all participants, the most active were those who held an Ed.D. The mean averages were: Ed.D., 5.83; M.A., 4.61; Ph.D., 3.60, and B.A., 2.20. In comparing activity by academic assignments, the science supervisors had the highest average. Some concern was felt that the supervisors would work primarily in their own districts but this did happen. Of the forty-seven activities conducted by science supervisors, twenty-one were conducted outside of their home districts.

The means, by academic assignment, were: science supervisors, 6.57; college teachers, 4.44; and science consultants, 2.20.

Through the 157 workshops conducted by participants, a total of 3,789 people received training in some area of science education. The majority of these workshops focused on ISCS, but other curricula were also used. Among these were the Science Curriculum Improvement Study (SCIS), the Elementary Science Study (ESS), and the AAAS program, Science-A Process Approach (S-APA). In fact, a significant portion of the activities noted, thirty-one, or 19.7 per cent, were presented on the SCIS program. This high percentage of emphasis on one particular other science curriculum resulted from the activity of four participants who attended two RPWs during the summer of 1971, one in SCIS. The majority of their efforts were directed towards working in SCIS because of their personal situations. SCIS is an elementary program, for grades one through six, and because of this, it may offer more opportunity for work as a resource person. While an RPW does not exist to promote one particular curriculum, the work of these four participants must raise a question about participants attending two RPWs. That question is, would the activities of these four participants have been any different if they had not attended the second RPW?

From the data, the answer appears to be no, but more study would be required before any decision could be made about attending two RPWs.

The total of activities also includes, besides orientation and implementation workshops, at least one presentation to a PTA meeting, and two workshops at regional educational conferences. In addition, four of the RPW participants were involved in ISCS related activities at the 1971 NSTA convention.

Thirty-four of the forty participants presented at least one activity, and the most active participant presented a total of twenty-two. The mean of participant activity was 3.95. Of the six who did not present any activity, two were science consultants, one a science supervisor and the other three were college teachers. By degrees, two held a Ph.D., one an Ed.D., one an M.A., and two a B.A. A comparison is made between the ten participants who were not active, and the ten most active participants later in this chapter. This comparison is an attempt to isolate and identify any characteristics common to either group which may be of use to refine selection criteria for future RPWs.

Use of ISCS with Pre-Service Teachers: Another area of participant activity which helps to meet the multiplying of information objective of RPWs is that of use of the new programs in college classes with

pre-service teachers. Participants of the study RPW used the ISCS program in a total of eighteen colleges or universities during the period of this study. In these institutions, ISCS was used in twenty-six different classes, which enrolled a total of 584 students. The majority of these classes, twenty out of the twenty-six, were science methods courses, but two were curriculum courses in science, two were science courses for teachers, and two were in the area of physics and chemistry education.

ISCS was used in these courses both as an introduction to the program and also for an in-depth study. Use ranged from one to thirty-six hours in these classes. Additionally, at least four institutions have purchased ISCS materials for use by pre-service teachers, at the request of participants.

This effect of the RPW is considered important for two reasons. First, this use of the program will undoubtedly be lasting, and these college teachers will continue to use the program in the training of teachers. Secondly, the training of pre-service teachers in the new curricular materials has the potential to affect science education even in schools where the materials are not available. The new programs all utilize current theories of learning, and teachers who use the programs will have a first-hand opportunity to evaluate the effectiveness of

the newer teaching methods. Also, if the teacher does have an opportunity to use one of the new programs, he may not require as extensive training, or retraining, as do teachers who have not been exposed to the programs, and their philosophies, previously. Further efforts to increase the use of ISCS and other curricula in college classes would appear to be indicated.

CCSS Proposals: Another participant activity which is considered to be helpful in meeting the RPW objective of dissemination of information is that of participants requesting CCSS funding. Cooperative College-School Science programs are designed to help colleges and local schools join forces to implement a new program. Funds are provided through NSF to train teachers and to follow up on that training during the next school year.

Participants from the study RPW wrote a total of seven CCSS proposals, of which five received funding. These grants will support the training of a total of 178 teachers. The five CCSS proposals were written to help implement ISCS, SCIS, ESS, and S-APA. An additional three CCSS proposals have been submitted, requesting funding for training teachers in the summer of 1973.

The CCSS proposal appears to be a logical follow-up to the training received in an RPW. Through these

grants, a participant can help a school implement a new program where they might not otherwise be able to do so. And, the training the participant received in the RPW is used by him to plan and direct such a program.

Assessment of Activity on Final Evaluation Instrument

In addition to the above data on participant activities, gathered through the activity log, certain sections of the final evaluation instrument also asked participants to evaluate their own activity level. A discussion of the results of those evaluations is presented in the following sections. As with the other data from the final evaluation this information was intended to supplement the information received from participants during the workshop and the follow-up period.

The first set of items relating to activity asked the participant to compare his activity during the year subsequent to the RPW to his activity of the previous year. These data are not assumed to be valid enough to base any decisions on, but they do give an indication of a participant's feelings about his activity and how the RPW affected it. The data in Table 23 indicate that, for all of the questions, the responses were positive. This is inferred to be an expression of the participants' feelings that the RPW did have an affect on their activity and tended to increase it.

TABLE 23.--A summary of data from final evaluation instrument items relating to activity.

Item	<u>Ratings</u>						
	N	1	2	3	4	5	$\bar{X}$
1. I have been more active this year	40	2	3	2	22	11	3.93
2. I have presented more workshops	40	4	5	1	11	19	3.90
3. I have been more effective in consulting this year	40	1	1	5	23	10	4.00
4. I have been more effective in conducting workshops this year	40	3	1	2	18	16	4.08
5. The RPW contributed to my change in activity this year	40	0	2	3	13	22	4.38
6. The RPW contributed to my increased effectiveness	40	0	1	1	15	23	4.50
7. The RPW provided sufficient content knowledge in ISCS	40	0	0	1	16	23	4.55
8. The RPW provided sufficient process skills	40	0	3	2	19	16	4.20
9. The follow-up program was effective	40	0	2	8	21	9	3.93
10. I am more accepted as a resource person this year	40	2	3	12	10	13	3.73
11. I have a better working relationship with schools this year	40	1	4	7	18	10	3.80

An examination of the responses of those six participants who did not conduct an activity during the study period showed that only one of the six, a science consultant, indicated that he had been less active this year than last. Two other responses on the question of activity indicated "no opinion on this question." Many other activities with schools are possible outside of the definition of activity used in this study, of course. It is assumed that in these cases, the work with schools was not such that it was recorded on the activity log.

The data in Table 24 are taken from a section of the final evaluation instrument which sought to derive more information on the effect of teams of participants. One piece of unexpected information was found. As noted on the table, one team of participants, who had not worked together at all prior to the RPW, answered the questions as individuals rather than as team members. The team in question had no teamed activities during the period of the study, and one member had no activity at all. For this team, at least, it appears as if the RPW failed in its attempts to build the functioning of teams. On the question of whether team selection is a valid criterion, one of the members of this team answered with a three, or "no opinion," and the other with a four, indicating agreement with the statement.

TABLE 24.--A summary of data from final evaluation instrument items relating to teams.

Item	N	<u>Ratings</u>					$\bar{X}$
		1	2	3	4	5	
<u>Questions for Team Members</u>							
13. Having a team member increased my activity	26 ^a	0	5	4	9	8	3.77
14. Having a team member increased my effectiveness	26	1	5	3	9	8	3.69
15. I worked closely with my team mate in planning activities	26	2	5	2	12	5	3.50
16. I worked closely with my team mate in presenting activities	26	1	6	3	11	5	3.50
17. My work was facilitated by having a team member	26	2	5	3	8	8	3.58
18. Selection of teams is a valid criterion for RPWs	26	1	1	2	11	11	4.15
<u>Questions for Individuals</u>							
19. Having a team member would have been a help in planning activities	12	0	6	3	1	2	2.92
20. Having a team member would have been a help in conducting activities	12	0	5	2	4	1	3.08
21. Having a team member would have facilitated my work	12	2	3	2	4	1	2.92
22. Selection of teams is a valid criterion for RPWs	12	2	3	3	3	1	2.83

^aOne team, which had been made up of two people who had not worked together previous to the RPW, answered this question as individuals.

The other responses to these items by team members indicate that, as inferred, those who were active in working together considered their team member as being helpful to them. The responses to the first five questions on the effectiveness of teams is almost evenly split, with the members of the eight active teams indicating they were effective and the other team members indicating a less positive feeling. But, response to the last item, that asking if selection of teams is a valid selection criterion for an RPW, indicates that even teams who were not active and who did not feel their team was effective felt teams are valuable enough to be selected.

The responses from individuals indicate they did not feel that a team member would have been of too much help to them in their work. The individuals were asked the same question relating to a team selection criterion and their answers were almost evenly divided. Five indicated they did not feel it was a valid criterion and four indicated they felt it was a valid criterion.

These data from the final evaluation are not of much help in attempting to assess the effectiveness of teams. They indicate what has already been indicated by other data, that active teams were viewed as supportive by their members, but not whether the resultant activity was a function of that support. Since the most

active teams appear to be those whose members have worked together previously, perhaps the RPW did not function to increase that activity other than to give the team knowledge of a new program. As noted earlier, more research is needed on the question of team activity before a decision on their selection in RPWs can be made.

The data in Table 25 treat one of the continuing problems of this study, that of obtaining return of information. As discussed earlier, the primary data-gathering instrument of the follow-up period was the activity log. Participants were asked to return the log at the end of each month and to list on it details of activities they had conducted. The rationale behind the evaluation section of the RPW was discussed during the workshop and the use of the activity log detailed.

These discussions must not have made their points, however, because problems with information feedback began in September and continued throughout the entire follow-up period. Various devices were used in an attempt to increase the return of information and all were effective in bringing in current information. But, their carry-over effect was small and new efforts had to be made in succeeding months.

The percentage of those participants who needed a reminder about return of information was not above 35 per cent in any month after September, but repeaters

TABLE 25.--A summary of data from final evaluation
instrument items relating to the activity log.

Item	Ratings						$\bar{X}$
	N	1	2	3	4	5	
43. Had I known of the activity log requirement I would not have applied to the RPW	40	29	9	2	0	0	1.33
44. The log was difficult to fill out	40	24	11	2	0	3	1.68
45. Filling out the log was too time consuming	40	19	16	1	3	1	1.78
46. Sending in the log was embarrassing to me	40	18	12	2	4	4	2.10
47. Filling out the log was an imposition on my time	40	17	16	4	3	0	1.83
48. The log is an effective means of assessing activity	40	0	4	5	23	8	3.88
49. Assessing activity is an important part of RPW evaluation	40	0	3	2	13	22	4.35
50. Withholding part of stipend would insure feedback of information	40	14	7	9	4	6	2.53
51. The log would be more effective if required less often	40	7	13	11	6	3	2.63
52. The log should be a part of the '72 RPW	40	1	1	4	21	13	4.10

were common. Efforts to increase the amount of data feedback included the use of postcard reminders, notes in the newsletter, letters to individuals, and telephone calls. As mentioned, each of these methods, or reminders, did bring in the back information, but the effect was not lasting. Although they were not designed for this purpose, the visits by the director also served to stimulate the return of information. And, in two instances, this stimulation was lasting as the two participants continued to return the information in the months after the visit. For one other participant, the visit did not produce this effect, however and obtaining information from him remained a continual problem.

The responses summarized in Table 25 do not indicate that the log was viewed as burdensome and the importance of assessing activity received a positive response. Item 46 was generated by a feeling that those who were less active might feel embarrassed at having to send in an activity log which often indicated no activity. For the six participants who did not conduct an activity, agreement that it was embarrassing came from three of the six. Five others also indicated it was embarrassing to them.

Item 50 dealt with a possible RPW design modification to increase the return of information. In this design, return of information is considered an integral

part of the workshop and until that phase is completed, the last of the stipend should not be payed. When given the opportunity to evaluate this technique, the participants of this study responded negatively. However, this evaluation may express more of a feeling of "I don't like it," than it does about the effectiveness of the technique.

The last item asked if the log should be a part of future RPWs, and here the response indicated was yes, it should be. Through their evaluations the participants indicate that they are aware of the importance of evaluation but providing the information was a different story.

If evaluation of activity is to be a part of future RPWs, then some means of overcoming the problems associated with information feedback will have to be found. More discussion, during the workshop, on the instrument to be used and the reasons for gathering the data may be of assistance in alleviating the problem. Withholding a portion of the stipend is a technique which could also be tested, not to threaten the participants but to remind them that the RPW does not end with the formal workshop.

Comparison of Active and Non-Active Participants

One of the major objectives of this study was to provide information on participant activity which could

be used in refining selection criteria. The most active type of participants were to be identified so that preference could be given to that type, if activity was a desired result of the RPW. As noted, however, no significant correlations were found to exist between the participant variables identified and activity levels. Because of this, no specific recommendations on participant selection are possible as a result of this study. But, the study does provide data on participant activity levels which can serve as base line data and may be valuable for comparison purposes in other evaluations.

In an attempt to further interpret the data on activity, a comparison was made of certain characteristics of the ten most active participants and the ten least active. A summary of the results of that comparison is presented in Table 26.

The data in the table do not indicate large differences on any of the variables identified. Active participants tended to be younger than non-active and they had a lower mean on years of teaching experience. The mean on the STEP instrument was also higher for the active group, but mean scores on the perception instrument are identical. More females were in the non-active group than in the active, but there were only six female participants and the sample may be biased.

TABLE 26.--A comparison of selected personal and professional characteristics of the most and the least active participants.

Partici- pant Number	Academic Assign- ment	Age	Sex	Teach- ing Exper- ience	STEP Score	Percep- tion Score	Teamed
<u>Most Active</u>							
23	SS	48	F	16	59	61	No
15	CT	33	M	11	64	60	Yes
21	CT	31	M	7	55	59	No
27	SS	40	M	10	46	50	Yes
14	CT	37	M	12	55	53	Yes
22	CT	36	M	23	67	60	Yes
25	CT	50	M	28	66	51	Yes
19	CT	40	M	13	61	58	Yes
8	CT	36	M	15	62	68	Yes
7	CT	39	M	14	67	54	No
Totals		390		149	602	574	
<u>Least Active</u>							
31	SS	30	M	9	56	53	Yes
29	CT	38	M	7	49	57	Yes
16	CT	46	M	17	66	63	Yes
9	CT	44	M	21	55	55	Yes
1	CT	63	M	37	45	55	No
10	CT	37	M	11	66	63	Yes
13	CT	50	F	7	70	51	Yes
32	SS	57	F	25	36	63	Yes
39	SC	31	M	3	55	57	Yes
40	SC	49	F	20	44	57	Yes
Totals		445		157	542	574	
Means	Active	39.0		14.9	60.2	57.4	
	Non-Active	44.5		15.7	54.2	57.4	
	All Particip.	40.1		14.98	57.8	56.9	

CT denotes college teacher; SS denotes science supervisor; SC denotew science consultant.

The one area of comparison which does appear meaningful is that of teams. The data indicate that nine of the ten least active participants were members of a team. Both members of one team, who had worked together prior to the RPW, are listed among the non-active group. Of the seven other teams who had one member among the least active, five were made up of participants who had not worked together prior to the RPW. Again, this appears to indicate that the technique of composing teams, because of their assumed supportive function, does not appear valid.

The twenty participants were also compared on characteristics other than those listed in the table. Neither the active nor the non-active appeared to be grouped in any one of the geographical regions of the country, but were scattered approximately equally throughout them. The size of the population center in which the participants work was not found to be a common element in either group. Because of this lack of discrimination between the active and non-active participants, this comparison may be of limited value in determining selection criteria. Three areas were identified, however, those of age, years of teaching experience, and knowledge of science as measured on the STEP instrument. Further study of these variables with respect to activity, may be of value in refining selection criteria.

Chapter Summary

This chapter has presented a description of the total RPW, which included both the formal workshop and its follow-up. In addition, through participant evaluations and other means, the effectiveness of the workshop and follow-up activities was assessed. The participant evaluations indicated that a majority of these activities were deemed helpful and effective. For those activities assessed as not being effective, design modifications were suggested.

Another section of this chapter is concerned with testing hypotheses relating to participant variables and activity levels. The results of that testing indicated no correlation between the identified variables and activity levels. Further study will be required if modification of selection criteria is to occur.

The final section of this chapter compared and contrasted certain characteristics of the most and least active participants, according to the study definitions. The only differences noted in this comparison were in age, years of teaching experience, STEP scores, and how teams were formed. Further study will be required to test the effect of these variables on participant activity levels.

CHAPTER V

SUMMARY AND CONCLUSIONS

Overview of the Chapter

The first section of this chapter is concerned with those conclusions which can be drawn as a result of analysis and interpretation of study data. The second section discusses the implications of the study and recommendations for further research are made.

Conclusions

The purpose of this study was to provide a description of RPW activities prior to, during, and following the formal workshop, as they were conducted. Further, this study assessed the effectiveness of various components of that workshop in meeting the self-perceived learning needs of its participants. An assessment of the effectiveness of the workshop in meeting its stated goals and objectives was also made, using participant evaluations.

Resource Personnel Workshops are designed to meet a perceived need for trained educators to work with, and in, local schools to aid in the improvement of

instruction. A trained resource person can function both to provide information on educational innovations, and to facilitate the adoption of such innovations. Although an RPW may use a specific curriculum as its focus, the intent is not to promote that program alone. Instead, the central purpose of an RPW is to help schools provide better educational opportunities and experiences for their students no matter which program is selected for use. Work in a certain curriculum may serve to open channels of communication between a resource person and local schools but it is hoped that the interaction between the two will not be confined to that one program. Combining the skills and talents of educators from various levels to improve instruction in schools is the underlying purpose of any RPW. This was also the objective of the study RPW, and its design and management were directed towards aiding the forty participants develop the special skills required of a resource person in a science curriculum.

The sample of this study was drawn from a population of science educators at the college, school supervisory, and school leadership levels. Selection emphasis was placed on teams of participants from the same geographic area who could later provide mutual support in the "back home" activities. Primary selection criterion used in the RPW was the opportunity the

applicant would have to work with schools in his area in improving their science instruction. Opportunity to work with pre-service teachers was an additional criterion applied to applicants from the college level. The forty participants who attended the RPW varied in degree held, academic assignment, age, and years of teaching experience. All forty were experienced science educators who were employed either as intermediate school teachers, science supervisors, or at the college level.

Data for the study evaluations were gathered prior to, during, and after the formal workshop. To gather data during the workshop, various instruments were designed or selected to gather specific information. One such instrument was an ISCS perception questionnaire which assessed participants' perception of the educational worth of the ISCS program. Various evaluatory instruments were constructed and used to obtain participant assessment of the activities of the workshop and its follow-up.

Data for testing the study hypotheses were obtained in the workshop itself and through the use of a monthly activity log. On this log, participants recorded information on the different types of activities they had conducted. These data were used to rank participants, in terms of activity, both by the number of

such activities, and by contact hours. A contact hour was determined by the number of hours a participant worked with his second generation participants. The term contact hour was defined as one hour of work with one person in some area of science education.

Follow-up to the RPW consisted of various efforts to support and increase the activity and effectiveness of the participants' work as a resource person. Such activities as visits by the director, letters to contacts of the participant, and financial help were used. The effectiveness of each was assessed, in terms of their usefulness in meeting the perceived needs of participants.

The hypotheses that were tested in this study are listed in complete form in Chapter I and they will not be listed here, to avoid repetition. The results of that testing will be discussed in the following section. Kendall's Rank Correlation Coefficient was used to test for correlations between selected variables and the dependent variable of activity. Paired and small sample t-tests were used where applicable to test for equality of means. The study hypotheses were designed primarily to provide information useful in further refining the selection criteria of RPWs. The activity referred to in hypothesis testing is that science education activity carried out with local schools by the participants during the follow-up period of nine months.

Results of hypothesis testing:

1. No significant difference exists between the levels of activity engaged in by teams and individual participants.
2. There is no significant correlation between the academic degree of a participant and his activity level.
3. There is no significant correlation between the academic assignment of a participant and his activity level.
4. There is no significant correlation between the post-workshop score of a participant on the ISCS perception instrument and his activity level.
5. There is a significant positive correlation between the change in perception of the ISCS program, as measured pre- and post-workshop, and a participant's activity level.
6. There is a significant positive correlation between the academic degree of a participant and his score on a standardized test of science knowledge.
7. There is no significant correlation between a participant's score on a standardized test of science knowledge and his activity level.
8. There was a significant positive increase in participant perception of the ISCS program as measured from pre- to post-workshop.

The first hypothesis tested, that of the activity of teams compared to individuals, indicates, for this study and its sample, teams did not conduct a significantly greater amount of activity than did those who were not members of a team. Selection guidelines, based on previous study, had indicated that the supportive

function of a team was sufficient to recommend selection of teams. But, this study and its data indicate that how a team is constructed, and in particular whether its members had worked together prior to the RPW, is an important factor in the activity of that team. Additionally, the data indicate that teams consisting of two college teachers engaged in the greatest number of activities. The members of the fourteen two-man teams conducted a total of ninety-one activities, either as individuals or as a team. The overall mean for team members is thus 3.25 activities. The twelve individuals presented a total of sixty-six activities, for an overall mean of 5.50. While the supportive function of a team may be important in other areas, as alluded to in previous studies, in terms of activity, selection of teams does not appear to be a valid criterion.

The other hypotheses were tested in an attempt to refine the selection criteria of RPWs through an identification of variables which might predict subsequent activity. These hypotheses tested for correlations between the variables of academic degree, academic assignment, perception score, and standardized test score with subsequent activity levels. No significant correlations were found to exist, so the predictive value of these variables in participant selection appears very limited.

One hypothesis tested for an increase in participant perception of the educational worth of the ISCS program, as measured pre- and post-workshop. A significant increase was found to have occurred between the two measures. This finding is of increased significance when coupled with the significant positive correlation found to exist between the amount of increase in perception and later activity levels. The RPW design used in this study did increase participant perception of the worth of the ISCS program and the amount of increase in perception was correlated with later activity levels.

The data of the study indicate that participants were active as science education resource persons. Eighty-five per cent of the participants presented at least one activity during the period of the study. A total of 157 activities were conducted by the participants, involving the training, or orientation, of 3,789 people. Work with these activities produced a total of 13,866 contact hours. Numbers of activities presented by participants ranged from a low of no activity to an upper value of 22. The mean level of activity for all participants was 3.945.

Fourteen two-man teams were included among the forty participants. These teams presented a total of twenty activities at which both members of a team worked. Four different types of teams were identified, based

on the academic assignments of the team members. The most active type of team appears to be one in which both members are college teachers. For all teams, however, the most active teams were those whose members had worked together prior to attending the RPW. The technique of forming teams, for their assumed supportive function, does not appear to be an effective strategy unless the team members have worked together previously.

Other types of activities, engaged in by participants but not recorded in the above totals, included the use of, or introduction to, ISCS in a total of twenty-seven regular college classes. These classes had a combined enrollment of 584 pre-service teachers. The use of ISCS in these classes ranged from one to thirty-six class hours.

RPW participants also wrote, or are writing, a total of ten CCSS proposals, five of which were funded for the 1972-73 academic year. Three of the proposals are for the 1973-74 academic year and no decision has yet been announced on them.

During the formal workshop of the RPW, the most effective activity appeared to be the planning and presentation of teacher orientation or implementation conferences. All evaluations taken indicate a feeling that this was a very helpful activity. Participants also rated as very helpful the opportunities to discuss

with the ISCS staff member, who was an experienced ISCS teacher, program materials and their use in the classroom. Other activities viewed as helpful were the laboratory school and the various group process sessions.

The follow-up effort which was viewed as most helpful in supporting the work of participants was a newsletter, which was compiled and mailed monthly. Other follow-up efforts viewed as helpful included letters to persons in positions to aid the participant, and a group meeting held during an educational convention.

These data are presented to indicate the success of the study RPW in meeting the goal of multiplying knowledge of educational innovations. The activity of its participants indicates that the study RPW was successful in meeting that objective. The assessment of the workshop activities, and those of the follow-up, indicate that the model used was effective in meeting the goal of training and supporting resource personnel in science education.

Implications and Recommendations

Because of the descriptive nature of this study, and its case study approach, certain opinions have been formed, some supported in part by the data of the study, and other from more of an intuitive feeling. One such feeling is that, for the model used in this study, selection of full-time school teachers is not

indicated. The five participants of this study who were full-time teachers ranked at the bottom in terms of activity. It may well be that their job commitments leave them little time for work outside of their own school. While the role of a teacher leader can be of great importance in the improvement of instruction, the training provided in this type of RPW does not appear suited to meet the needs of such participants. Other types of workshops may be better suited to provide this training, still within the RPW model. Suggestions for other types of workshops will be discussed in more detail later in this section.

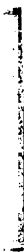
Secondly, for various reasons, it appears that the RPW model, as used in the study workshop, is better suited for training science educators than it is for training educators in the "pure" sciences. In this study, college personnel whose primary responsibilities were in science education appeared to be more active in working with local schools than did those in the science disciplines. It may be that the content knowledge of participants who are not in science education can be of great assistance in the improvement of instruction. But, the RPW model used, admittedly based on a small sample, does not appear to cause such involvement. As in the previous discussion, a design change may serve to

increase the activity of this type of participant. A discussion of such a possible design structure will be presented below.

Finally, based on observation of participants during the workshop of this study, it appears as if those who were active during the workshop continue to be active following it. During the follow-up, the two most active participants came from that group which appeared totally involved in the activities of the workshop, both during working hours and after them. This involvement may be a result of the commitment of the participant to education and his role in it, or it may be a function of his personality. More study would be required to determine the action of this variable and find ways to build involvement.

Even with the above considerations, based on the study data, an RPW is apparently a viable means of diffusing information on innovations and aiding in their adoption. As the newer programs in science are adopted into more schools, the need for trained resource personnel will grow. For these reasons, it is recommended that more Resource Personnel Workshops be conducted.

And, because of the continuing need for data to use in improving the RPW model, it is also recommended that an evaluatory program be an integral part of those RPW designs.



But, the model used may not be the most effective one possible, or provide the most efficient means of accomplishing the objectives. Further research is needed on alternate methods of providing the training. Data are needed which assess the learning needs of the various levels of participants so that design structures can meet the differing needs. Instead of bringing participants to one campus, it may be more efficient to take the workshop to various locations and work with a localized group in an intensive program of shorter duration. Particularly with college teachers, who presumably have already acquired the skills necessary in workshop presentation, this type of "mini-workshop" could concentrate on the program under study. Regional meetings of this type could also provide a supportive corps of personnel available to work with and in local schools.

If the present models continue to be used to train a broad range of educators in terms of prior experience and education, it may be necessary to design different workshops for different levels of participants. For example, many college teachers may already possess the basic skills of workshop design and management. A workshop for this population would then concentrate on more than one program, to broaden the effectiveness of the participants. For school personnel, who may not

have acquired such management skills, an RPW might concentrate more on these themes, to meet the specialized needs. For those participants not previously involved in science education, an RPW could provide training which emphasizes their potential contribution to improving science instruction. For this technique of different types of workshops to be completely effective, more research must be done to determine the present level of basic skills and knowledge of potential RPW participants.

As indicated, evaluation of an RPW experience is strongly recommended. If, however, this study is replicated, it is recommended that design modifications be made in gathering data on participant activity. The methods used in this study to promote return of the activity log did not appear to be completely effective. The activity log itself appears to be a useful instrument, but ways of facilitating return of information need to be explored. Providing more information during the workshop, on the type of data required, and the reasons for gathering it, may help to alleviate the problem.

In any further study of participant activity following an RPW, some types of data on previous activities of participants appear necessary. In order to truly assess the effectiveness of an RPW in increasing participant activity, some base line data are needed for comparison purposes.

One such type of data would relate to the commitment of the participant to his job in education and to the improvement of education. Some educators may view their assignment as a nine-to-five job, while others feel themselves to be missionaries in the field. If this commitment appears to be correlated to activity, as expected, an RPW could either select for this type of participant or try to build the commitment during the workshop.

Further research on the process of selection of participants is indicated by the data of this study. The question of whether an RPW should select those who are already active in local schools, or those who are less active, requires further study. It may be that the RPW training does not increase the activity of a participant who is already involved in working with schools as much as it could increase that of someone who is not so involved. If the goal is to increase the total amount of implementation activity, selection criteria might well emphasize choosing those who are not as active.

More research on the role of teams in RPWs is also indicated. The data of this study indicate that teams in general are not as effective as are individual participants. But, the make-up of the team affects its activity and those teams who were composed of people who had worked together previously were more active than

those not so composed. If teams continue to be selected in RPWs, efforts appear indicated to build the effectiveness of those teams as functioning units. Team selection might also be based on the commitment of the team members, as discussed above.

Follow-up support of participants, as a function of the continuing process of aiding participants, is an area where further research is also indicated. The methods described in this study appeared effective but no quantitative data were gathered to indicate how effective. A cooperative research effort among directors of different RPWs might help to supply such data. Different types of follow-up activities could be used in the different workshops and a comparative assessment of their effectiveness made. Visits by the director could be expanded to reach all participants in one workshop, and not in another, for instance. If the participants were selected using the same criteria, the effect of this effort could more closely be determined. All of the follow-up activities of this study appeared suited to this type of research. This cooperative effort among directors could be expanded to provide data on many RPW activities and provide information to make the RPW model even more effective.

One area of participant activity which appears to be of great value in meeting the RPW objectives is the

use of the new programs in classes with pre-service teachers. This technique can be of help in training pre-service teachers in new methods and materials of science instruction. If more use of the new programs could be made in college classes, the extensive need for re-training of in-service teachers might be alleviated. In-service training would still be needed in the particular innovation to be adopted, but the background of learning theory would have already have been built. It is recommended that the RPW design be more explicit in ways of introducing the new curricula in pre-service science and science education classes.

Further research on RPWs might also be concerned with other areas than a participant's activity in working with schools. As discussed, use of the new programs in college classes with pre-service teachers is recommended. Further study might concentrate on the effectiveness of this technique in providing training to the pre-service teachers. If effective, this training could ultimately remove the necessity for an RPW-like experience.

And, research might also be performed to discover if an RPW has any effect on the teaching strategies of its participants. It may be that a participant learns about the newer methods of instruction but continues to teach his classes in the traditional manner. An

RPW could be effective in helping a teacher to change his methods of instruction but no evidence exists to indicate whether it affects this change or not.

Further research on RPWs might also seek to discover whether the participants of the workshop are more receptive to change as a result of the experience. This question is related to the one discussed above and both are concerned with the need for an educator to be open minded about the educative process. Hopefully, the exposure to change provided through an RPW, and its method of operation, can serve to build this receptiveness to change. More study is required to determine the effect of RPW training in these areas.

An investigation which relates more to the broad area of science education, rather than the specific area of an RPW, would involve research into the ways in which science educators view science. Potentially, the way an educator views such questions as the relationship between the scientific and non-scientific spheres of life, or the value of science in human endeavor, could affect his work in the field. It may be that these philosophical views of science are, in some way, correlated with the amount of activity generated by a participant. If so, they are worthy of further investigation.

Data from all of these areas of research could be used to adapt the RPW model to make it an even more effective means of aiding in the improvement of science instruction.

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APPENDICES

APPENDIX A

ISCS PERCEPTION QUESTIONNAIRE

APPENDIX A

ISCS PERCEPTION QUESTIONNAIRE

Section 1: Please answer these questions directly.

1. The highest academic degree I hold is (circle one answer)

BA BA+15 BA+30 BA+45 MA MA+15 MA+30 MA+45 EdD PhD

2. The major course of study for the degree listed in #1 was in

3. I received the degree listed in #1 in 19__.

4. I have held my present position for the past ____ years.

5. My teaching experience includes

____ years at the elementary level (K-6)

____ years at the 7 and 8 grade level

____ years at the secondary level (9-12)

____ years at the college level

6. My experience with the ISCS program is (circle one answer)

none a little some quite a bit extensive

7. My knowledge of the aims and philosophies of the ISCS program is

(circle one answer)

none a little some quite a bit extensive

Section II: Please respond to the following statements by selecting a number from the scale which matches your feelings about that statement and placing that number in the space provided next to the question.

1--I strongly disagree with the statement

2--I disagree with the statement

3--I am neutral about the statement or I lack sufficient information

4--I agree with the statement

5--I strongly agree with the statement

- ___ 1. Strongly lab oriented curricula provide better vehicles for junior high science education than do non-lab oriented programs.
- ___ 2. Self-paced, individual learning programs provide better vehicles for junior high science education than do non-self paced curricula.
- ___ 3. The ISCS flow of content from seventh to ninth grade meets the educational needs and desires of the junior high student.
- ___ 4. ISCS materials are suitable for use by junior high students.
- ___ 5. The reading level of the ISCS material is consistent with the reading skills of the students the program is designed for.
- ___ 6. The remedial excursions in ISCS provide enough teaching or reteaching of basic skills to allow the slower learner to achieve success in the program.
- ___ 7. The self evaluation exercises in the ISCS program provide enough data to the student to enable him to guide his learning.
- ___ 8. The ISCS program provides sufficient evaluatory material to allow the teacher to accurately gauge student progress.
- ___ 9. The ISCS program provides a logical follow-up to the newer elementary science programs such as SCIS and S-APA.
- ___ 10. ISCS provides sufficient opportunity for group interaction among students.

- ___ 11. Group interaction among students is an important strategy in science education at the junior high level.
- ___ 12. ISCS offers enough opportunity for teacher divergence from the programmed materials.
- ___ 13. The ISCS model of increasing student freedom to explore divergent questions as he passes through the program is a suitable vehicle for increasing student ability to function as an independent learner.
- ___ 14. The ISCS program adequately prepares students to enter the newer high school science programs such as PSSC, BSCS, etc.

APPENDIX B

WORKSHOP EVALUATION INSTRUMENT

APPENDIX B

WORKSHOP EVALUATION INSTRUMENT

We would like your evaluation of how well we met the workshop objectives and how each of the activities contributed to meeting the objectives. For the objectives, please circle the number which expresses your feelings on the scale below each objective.

For the activities, please choose a number from the scale below which matches your feelings about how helpful that activity was in meeting the objective and place that number in the space next to the activity number.

1--the activity did not help to meet the objective

2--the activity was not of much help in meeting the objective

3--the activity was of some help in meeting the objective

4--the activity was of help in meeting the objective

5--the activity was of great help in meeting the objective

Objective 1: To provide the participants with considerable knowledge of the teacher education procedures, purposes, history, recommended modes of instruction, objectives, and materials of the ISCS.

1	2	3	4	5
did not		did so-so		met the
meet it		in meeting it		objective

Activities:

___ a. Content labs, individually paced, as opposed to working as a group.

___ b. Discussions with Charlie on materials.

- ___ c. Teacher preparation modules.
- ___ d. Visit from Dave Redfield.
- ___ e. Model building activity using black circuit puzzles.

Objective 2: To assist the participants as a group, and as individuals, to plan and to prepare, appropriate materials and activities for orientation sessions and in-service, and pre-service teacher education programs.

1	2	3	4	5
did not meet it		did so-so in meeting it		met the objective

- ___ a. Dick's discussion on workshop elements.
- ___ b. Mason's day sessions on evaluation, team make-up sites, etc.
- ___ c. NASA exercise.
- ___ d. Mason's evening sessions on group processes.
- ___ e. Team design sharing sessions.

Objective 3: To provide opportunities for the participants to "teach" children science using the new curriculum materials and to provide him with feedback on his teaching.

1	2	3	4	5
did not meet it		did so-so in meeting it		met the objective

Activities:

- ___ a. Observation of start-up activities on TV.
- ___ b. Interacting with the kids while they were working.
- ___ c. Post-teaching sessions discussions with Charlie.

Objective 4: To familiarize the participant with the school setting, administrative aspects, teacher education needs, and various strategies for implementation of a curriculum innovation.

1	2	3	4	5
did not		did so-so		met the
meet it		in meeting it		objective

Activities:

- ___ a. "Preparing the ISCS Teacher" booklet.
- ___ b. Planning and conducting the various workshops in the field.
- ___ c. The session on implementation problems and force field analysis.

Objective 5: To provide direct experience in organizing and presenting orientation sessions on the ISCS program to groups of school teachers and administrators.

1	2	3	4	5
did not		did so-so		met the
meet it		in meeting it		objective

Activities:

- ___ a. Orientation and/or implementation sessions.
- ___ b. Observing sessions on Monday, for teams not otherwise occupied on those days.
- ___ c. Free time devoted to planning.
- ___ d. Team sharing of designs.
- ___ e. Staff serving as consultation agents.

Objective 6: To help each participant to engage in orientation, consulting, and implementation activities after leaving Michigan State University. (This is a post-workshop activity, and we would like your comments and/or suggestions as to how we can best meet this objective. Here are some suggestions we have. Please rate them as to their value to you.)

1	2	3	4	5
will not		will do so-so		will meet
meet		in meeting it		it

Activities:

- ___ a. A newsletter sharing ideas that have either worked or not worked and suggestions on problem solving techniques.
- ___ b. Visits from director and/or staff.
- ___ c. A meeting (Happy hour?) for those who attend NSTA, to share experiences.
- ___ d. Letters to schools in your area.
- ___ e. Our contacting the Silver Burdett representative in your area.
- ___ f. Telephone consultations with the staff.

APPENDIX C

M.S.U. RESOURCE PERSONNEL WORKSHOP

FINAL EVALUATION INSTRUMENT

APPENDIX C

M.S.U. RESOURCE PERSONNEL WORKSHOP

FINAL EVALUATION INSTRUMENT

Name _____

DIRECTIONS: All items are in the form of statements except for a few yes and no questions. Express your agreement or disagreement with each statement using the following scale.

1. I disagree strongly with the statement
2. I disagree with the statement
3. I have no opinion on the statement
4. I agree with the statement
5. I agree strongly with the statement

A space has been provided next to the number of the statement. Place the number from the above scale which most closely matches your feelings about that statement in the space provided. Complete all items unless otherwise directed. We also invite, and will welcome, any additional comments or suggestions you would care to make. Use the backs or a separate sheet.

I. ACTIVITY:

- ___ 1. I have been more active in consulting with schools this year than I was last year.
- ___ 2. I have presented more workshops this year than I did last year.
- ___ 3. I have been more effective in my consulting with schools this year than I was last year.
- ___ 4. I have been more effective in conducting workshops this year than I was last year.

- ☐ 5. The MSU RPW contributed directly to the change in my activity level this past year.
- ☐ 6. The MSU RPW contributed directly to my perceived increase in effectiveness as a resource person this past year.
- ☐ 7. The MSU RPW provided sufficient content knowledge in ISCS to enable me to function as a consultant in the program.
- ☐ 8. The MSU RPW provided sufficient process skills to enable me to function as a resource person.
- ☐ 9. The followup program of the RPW was effective in supporting my work as a resource person.
- ☐ 10. I am more accepted as a resource person by local schools this year than I was last year.
- ☐ 11. I have better working relationship with local schools this year than I did last year.
- ☐ 12. I received adequate material support from MSU during the past year in my work as a resource person.

II. TEAMS: (If you attended the RPW as an individual, please skip this Section II.)

- ☐ 13. Having a team member available increased my activity as a resource person.
- ☐ 14. Having a team member available increased the effectiveness of my work as a resource person.
- ☐ 15. I worked closely with my team mate in planning science education activities.
- ☐ 16. I worked closely with my team mate in conducting science education activities.
- ☐ 17. During the past year, my work as a resource person was facilitated because I had a team member with whom to work.
- ☐ 18. Selection of teams is a valid criterion for an RPW director to use.

III. INDIVIDUALS: (If you attended the RPW as part of a team, please skip Section III.)

- ☐ 19. Having a team member available would have been a help to me in planning science education activities.
- ☐ 20. Having a team member available would have been a help to me in conducting science education activities.
- ☐ 21. My work as a resource person would have been facilitated if I had had a team member with whom to work.
- ☐ 22. Selection of teams is a valid criterion for an RPW director to use.

IV. RPW FOLLOWUP:

A. Letters

- ☐ 23. My administrator mentioned to me the letter he received from Michigan State University.
- ☐ 24. The letter to my administrator was effective in building a base of support for my work as a resource person in ISCS.
- ☐ 25. The letter to administrators should be a part of the follow-up to the '72 RPW.
- ☐ 26. I was contacted by the State Department of Education as a result of the MSU letter to them.
- ☐ 27. The letter to the State Department of Education was effective in helping me function as a resource person.
- ☐ 28. The letter to the State Department of Education should be a part of the follow-up to the '72 RPW.

B. Names of Participants from other workshops.

() Yes () No

- ☐ 29. Did you contact anyone on the list of participants from other workshops.
- ☐ 30. I feel this list of names may be of future benefit to me in my work as a resource person.
- ☐ 31. Participants in the '72 RPW should be given the names and addresses of former workshop participants.

C. The Newsletter

- ___ 32. The newsletter was effective in keeping me in contact with the other participants.
- ___ 33. I enjoyed reading the newsletter.
- ___ 34. The newsletter was informative.
- ___ 35. The newsletter was interesting.
- ___ 36. The newsletter came too often.
- ___ 37. A newsletter should be a part of the followup to '72 RPW.

D. Visits by the director:

() Yes () No

- ___ 38. I was visited by the director (if yes, skip #40), (if no, skip #39).
- ___ 39. The visit by the director increased my activity as a resource person.
- ___ 40. A visit by the director would have increased my activity as a resource person.
- ___ 41. A phone call or calls could be as effective to me as a visit by the director.
- ___ 42. Visits by the director should be a part of the followup to the '72 RPW.

E. The Activity Log.

- ___ 43. Had I known of the requirement to provide monthly feedback on my activity I would not have applied to the RPW.
- ___ 44. The activity log is too difficult to fill out.
- ___ 45. Filling out the activity log is too time consuming.
- ___ 46. Sending in the activity log was embarrassing to me.
- ___ 47. Filling out the activity log was an imposition on my time.
- ___ 48. The activity log is an effective means of assessing participant activity.

- ___ 49. Assessing participant activity is an important part of an RPW evaluation.
- ___ 50. Withholding part of the RPW stipend would be an effective means of insuring participant feedback of information.
- ___ 51. The activity log would be a more effective means of assessing activity if required less often than monthly.
- ___ 52. Participant completion of an activity log should be a part of the evaluation of the '72 RPW.

F. \$50 Support Payments from MSU.

() Yes () No

53. I applied for a \$50 support payment.

() Yes () No

54. I knew of the opportunity to receive a \$50 support payment from MSU.

- ___ 55. A \$50 payment would be enough to allow me to conduct a workshop even if no other support were available.
- ___ 56. The \$50 support opportunity is an effective way to encourage RPW participants in their work as resource people.
- ___ 57. The \$50 support payment should be a followup option open to the '72 RPW participants.

G. NSTA Meeting.

() Yes () No

58. I attended the meeting at NSTA. (If your answer was no, skip #'s 59 and 60. If your answer was yes, skip #61.)

- ___ 59. The informal part of the meeting was interesting and of value to me.
- ___ 60. The formal part of the meeting was interesting and of value to me.
- ___ 61. I would have liked to meet with the group at NSTA.

___ 62. Some type of a group meeting would be an effective followup activity to an RPW.

___ 63. If I had the opportunity to attend the '73 convention I would like to attend a group meeting.

V. Silver Burdett Representatives.

() Yes () No

64. I have been in contact with the Silver Burdett Representative.

VI. Overall Evaluation.

Taking into consideration all of the good points and the shortcomings of each, please assign a one to five grade to the workshop and followup. One means very poor, five means very good.

___ 65. The workshop.

___ 66. The followup.

VII. A re-evaluation of the workshop: now that you have been working as a resource person in ISCS for a few months, we would like you to look again at what we did during the workshop. Some of the activities may be difficult to remember but please evaluate their effectiveness for us, one more time.

This time, expect for the objectives, the scale is:

- 1--the activity did not help to meet the objective
- 2--the activity was not of much help in meeting the objective
- 3--the activity was of some help in meeting the objective
- 4--the activity was a help in meeting the objective
- 5--the activity was of great help in meeting the objective

Please rate our success in meeting the objective using the scale provided after each. Circle the appropriate number.

(The rest of this instrument is identical to the workshop evaluation instrument which is appended in B. The items will not be repeated here.)

APPENDIX D

ACTIVITY SUMMARY OF INDIVIDUAL PARTICIPANTS

APPENDIX D

TABLE D-1.--Activity Summary of Individual Participants.

Assignment	Participant Number	Number Activities	Number of Contact Hours
CT	1	0	0.00
CT	3	3	272.00
CT	4	5	337.00
CT	6	3	378.50
CT	7	7	1,594.50
CT	18	4	220.00
CT	21	12	976.50
SS	23	22	1,310.25
CT	25	1	8.00
SS	35	2	318.00
SC	37	6	847.25
SC	38	1	8.00
Totals		66.0	6,270.00
$\bar{x}$		5.5	447.85

Note: CT denotes college teacher
SS denotes science supervisor
SC denotes science consultant

TABLE D-2.--Activity Summary of Teams of Participants.

Team	Type of Team	Participant Numbers	As an Individual		As a Team		Team Activity Total	
			#	Contact Hours	#	Contact Hours	#	Contact Hours
A*	CT-CT	10	0	0.0	0	0.00	4.5	148.25
		22	9	296.5				
B*	CT-CT	34	2	662.0				
		16	0	0.0	1	62.5	2.0	393.50
C*	CT-CT	19	4	126.0				
		2	4	316.0	3	101.0	7.0	322.00
D*	CT-CT	25	0	0.0				
		14	2	36.0	7	727.0	7.0	745.00
E*	CT-CT	11	3	69.5				
		12	0	0.0	2	35.5	3.5	70.25
F**	CT-CT	29	0	0.0				
		9	0	0.0	1	6.00	1.0	6.00
G***	CT-SS	20	2	200.0				
		32	0	0.0	0	0.00	1.0	100.00
H**	CT-SS	5	0					
		30	2	208.0	3	42.50	4.0	146.50
I*	CT-SS	27	9	111.0				
		8	5	617.0	2	32.00	9.0	396.00
J***	CT-SC	17	1	720.0				
		39	0	0.0	0	0.00	0.5	360.00
K***	CT-SC	24	2	215.0				
		40	0	0.0	0	0.00	1.0	107.50
L***	CT-SC	15	17	853.0				
		31	0	0.0	1	66.50	9.5	526.25
M***	CT-SC	13	0	0.0				
		28	4	918.0	0	0.00	2.0	459.00
N***	SS-SC	33	1	400.0				
		36	4	775.0	0	0.00	2.5	587.50
Total			71.0	6,523.0	20	1,073.00	54.50	4,367.75
x			2.5	232.9	1.4	76.60	3.89	311.98

*A team who had worked extensively together.

**A team who had worked some together.

***A team who had not worked together.

TABLE D-3.--Summary of Data Relating to Participants.

Degree	Participant Number	Age	Years of Teaching Experience	Step Score	ISCS Perception		Number of Activities
					Pre	Post	
PhD	1	63	37	45	42	55	0
	2	38	6	58	42	44	7
	3	46	17	69	44	55	3
	4	35	14	73	45	58	5
	5	43	22	71	45	53	3
	6	37	13	64	46	67	3
	7	39	14	67	49	54	7
	8	36	15	62	49	68	7
	9	44	21	55	51	55	1
EdD	10	37	11	66	59	63	0
	11	36	12	52	42	59	5
	12	38	12	54	42	54	2
	13	50	7	70	44	51	0
	14	37	12	55	44	53	9
	15	33	11	64	47	60	18
	16	46	17	66	49	63	1
	17	48	23	47	50	56	1
	18	39	16	57	50	54	4
	19	40	13	61	50	58	7
	20	42	8	54	51	53	2
MA	21	31	7	55	52	59	12
	22	36	23	67	53	60	9
	23	48	16	59	42	61	22
	24	56	37	36	37	42	2
	25	50	28	66	42	51	7
	26	37	9	59	42	60	1
	27	40	10	46	42	50	11
	28	47	22	70	43	61	4
	29	38	7	49	43	57	1
	30	33	12	45	46	51	5
	31	30	9	56	48	53	1
	32	57	25	36	58	63	0
	33	39	13	44	59	60	1
	34	45	33	63	61	61	3
BA	35	30	5	45	62	61	2
	36	24	2	65	63	56	4
	37	29	7	63	62	54	6
	38	26	6	64	51	58	1
	39	31	3	55	43	57	0
	40	49	20	44	42	57	0

APPENDIX E

**SCHEDULE OF RESOURCE PERSONNEL
WORKSHOP ACTIVITIES**

TABLE E-1.--Time Allotted to Various Workshop Activities (in Minutes).

Day	Misc. Activities:					ISCS Content Labs	Group Process Techniques	Workshop Planning & Present.	Interaction With ISCS Students	Total
	Misc. Activities: Orientation & Feedback Sessions	Evaluation & Feedback								
1	30	30			210	90	-0-	-0-	-0-	360
2	-0-	25			290	45	-0-	-0-	-0-	360
Evening	-0-	-0-			-0-	150	-0-	-0-	-0-	150
3	15	10			335	-0-	-0-	-0-	-0-	360
4	10	15			335	-0-	-0-	-0-	-0-	360
Evening	-0-	-0-			-0-	150	-0-	-0-	-0-	150
5	-0-	15			275	-0-	70	-0-	-0-	360
6	15	135			60	-0-	-0-	-0-	150	360
7	-0-	15			195	-0-	-0-	-0-	150	360
8	10	-0-			95	-0-	105	-0-	150	360
9	-0-	-0-			15	-0-	345	-0-	-0-	360
10	30	-0-			45	-0-	285	-0-	-0-	360
11	-0-	-0-			-0-	-0-	360	-0-	-0-	360
12	-0-	-0-			-0-	-0-	360	-0-	-0-	360
13	-0-	-0-			-0-	-0-	360	-0-	-0-	360
14	30	180			60	90	-0-	-0-	-0-	360
15	-0-	150			30	-0-	-0-	-0-	-0-	180
Totals	140	575			1,945	525	1,885	450		5,520
%	2.54	10.42			35.24	9.51	34.15	8.15		100.01

Activities Log of ISCS Resource Personnel Workshop
Held at Michigan State University, August 2 to
August 20, 1971 Under the Sponsorship of
the National Science Foundation

Sunday, August 1, 1971

7:00 to 9:00 PM

Informal welcoming reception

Monday, August 2, 1971

9:00

Welcoming remarks by the Director of the Science and Mathematics Teaching Center, Michigan State University, Dr. J. R. Brandou.

9:10

Opening remarks by the Director of the Resource Personnel Workshop, Dr. R. J. McLeod. Introduction of the workshop staff.

9:30

Participant rank ordering of workshop objectives, in importance to them. Participant completion of ISCS perception instrument.

9:50

Content Lab in Level I of ISCS.

11:40

Discussion of content lab and related questions. Participants voted to change working hours from 9 to 4, to 8 to 3.

12:00

Lunch

1:00

Group process session by Dr. Mason Miller. Decision by consensus, the NASA exercise.

Procedure:

1. Items ranked individually.
2. Participants divided into four groups. Items ranked by consensus, with an observer present in each group.
3. Comparison of individual and group ranking with the NASA ranking.
4. Discussion of the process of decision making in the individual groups, with input from the observer.
5. Presentation of the data from the exercise by Dr. Miller, and a discussion of the meaning of the exercise.

2:30

Content Lab in Level I of ISCS.

3:50

Participant completion of evaluation sheet of activities of the day.

Tuesday, August 3, 1971

- 8:00
Discussion of data acquired from evaluation sheet of previous day.
- 8:10
Overview of the ISCS program. A slide and lecture presentation by Mr. Charles Richardson.
- 9:05
Content Lab in Level I of ISCS.
Work on "Group Entry Techniques."
Procedure: Three participants were asked to function as "teachers," and practice entry techniques on groups of other participants.
Techniques of entry to be used:
1. Enter the group with silence.
2. Enter the group with a question.
3. Enter the group with a statement.
4. Enter the group using any alternate techniques that appear feasible.
- 11:00
Discussion of group entry as a part of the role of an ISCS teacher.
Discussion of group entry exercise and feedback from the "teachers."
- 11:45
Lunch
- 12:45
Content Lab in Level I of ISCS.
- 2:45
Participant completion of evaluation sheet of activities of the day.
Florida State Teacher Preparation Module on "Classroom Evaluation" passed out to participants.

Evening Session, Tuesday, August 3, 1971

- 7:00 to 9:30 PM
Group process session by Dr. Miller. Exercises designed to help participants to get to know one another, to enhance participant awareness of their functioning as a member of a group, and sharing of common "back home" problems.

Wednesday, August 4, 1971

- 8:00
Discussion of data acquired from evaluation sheet of previous day.
- 8:10
Content Lab in Level I of ISCS.
- 11:45
Lunch
- 12:30
Open staff meeting with participants. Discussion of aims of the workshop and related areas of interest.

1:00

Content Lab in Level I of ISCS.

2:00

Discussion of evaluation in the classroom, and the evaluation module, with Mr. Richardson.

Thursday, August 5, 1971

8:00

Discussion of "housekeeping" topics of the workshop.

8:10

Discussion with Mr. Richardson concerning the first exercises in the Level I portion of ISCS, and student reaction to it, particularly the battery.

9:00

Content Lab in Level I of ISCS.

11:30

Lunch

12:30

Content Lab in Level I of ISCS. Work teams for conferences selected.

2:00

Optional discussion with Mr. Richardson on ISCS materials and student reactions.

2:45

Participant completion of evaluation sheet of activities of the two previous days.

Evening Session, Thursday, August 5, 1971

7:00 to 9:30 PM

Group process session by Dr. Miller. "Five small squares" exercise used as a vehicle to build group cooperativeness and collaboration. Observers were assigned and the observations were fed back to the groups as part of a general discussion of the exercise.

Friday, August 6, 1971

8:00

Discussion of data acquired from evaluation sheet of previous day.

8:15

Discussion of the elements of a workshop, by Dr. McLeod.

9:10

Content Lab in Level I of ISCS.

11:30 to 12:30

Lunch

12:30

Discussion of Orientation and implementation conferences by Dr. Miller. Sites and contact people listed and teams asked to list their preferences for sites.

12:45

Content Lab in Level I of ISCS.

Team sign-up for site preferences.

Optional guided tours of the Science and Mathematics Teaching Center and the facilities available.

2:15

Optional session with Mr. Richardson on ISCS materials.

Monday, August 9, 1971

8:00

Content Lab in Level I or II of ISCS.

8:00

Participants who attended the workshop as a team were administered the instrument known as FIRO-B.

9:00

Students in for microteaching activity. To permit the students to become accustomed to the teaching situation, participants were not actively involved in this session. Optional viewing of activities via TV was available. Work in ISCS content also occurred during this period.

11:00

Discussion with Mr. Richardson on the microteaching experience.

11:30

Lunch

12:00

Open staff meeting with participants. Discussion of the workshop so far and future plans.

12:30

Model building exercise by Dr. McLeod. Circuit puzzles used to introduce concept of model building, as used in Level II of ISCS.

1:30

Discussion of the visit of Mr. Dave Redfield, of the ISCS project staff.

1:45

Administration of the Sequential Test of Educational Progress, (STEP), IA, Science.

2:45

Participant completion of evaluation sheet of activities of the two previous days.

Tuesday, August 10, 1971

8:00

Discussion of data acquired from evaluation sheet of previous day.

8:15

Discussion of teacher preparation module "Classroom Organization" with Mr. Richardson. Also a slide presentation of types of storage facilities in use in schools now using ISCS.

9:00

Students in for microteaching activity. Participants entered the lab in small groups for a short period of time each, to interact with the students. TV monitor again available for viewing of the activity. Work in content of Level II and III occurring at the same time.

11:00

Discussion with Mr. Richardson on the microteaching experience.

11:30

Lunch

12:30

Question and answer session with Mr. Redfield, of the ISCS project staff.

2:00

Content Lab in Level II or III of ISCS.

Wednesday, August 11, 1971

8:00

Group picture taken.

8:10

Content Lab in Level II or III of ISCS.

9:00

Students in for microteaching activity. Procedure followed was exactly the same as for Tuesday, August 10.

11:00

Discussion with Mr. Richardson on the microteaching experience.

11:30

Lunch

12:30

Discussion by Dr. Miller of the conferences phase of the workshop, covering such items as time allotted for planning, assignment of sites, transportation, housing, and division of available ISCS materials.

1:30

Content Lab in Level II or III of ISCS

Planning of Orientation or Implementation conferences, by teams.

Publicity photographs taken to be sent to home town newspapers.

Thursday, August 12, 1971

8:00

Discussion of workshop evaluation techniques by Dr. Miller.

9:00

Conference design sharing sessions in two team groups.

11:30

Lunch

12:30

Planning, redesign sessions, and gathering of materials for conferences.

2:30

Optional discussion with Mr. Richardson on ISCS materials.

Thursday Evening, August 12, 1971

5:00 to 8:30 PM

Participant, staff and families picnic and cookout, held at East Lansing Park.

Friday, August 13, 1971

8:00

General discussion of the workshop, and material problems for the conferences.

8:

Planning and design sessions for conferences.

Preparation of materials for conferences.

Content Lab in Level II or III of ISCS.

11:30

Lunch

12:30

Same as the morning session.

1:30

Optional session with Dr. McLeod on proposal writing.

2:30

Optional session with Mr. Richardson on ISCS materials.

Monday, August 16, 1971

Participants engaged in one of three activities:

1. Presenting an orientation conference on ISCS to teachers (two teams).
2. Presenting an implementation conference on ISCS to teachers (three teams).
3. Attending an implementation conference as an observer (three teams).

Tuesday, August 17, 1971

Participants engaged in one of three activities:

1. Implementation conferences continuing.
2. Teams who presented an orientation conference discussed the experience, redesigned, and prepared materials for the next conference.
3. Teams who were observers planned and prepared materials for the orientation conference to be presented the next day.

Wednesday, August 18, 1971

Participants engaged in one of two activities:

1. Continuation of implementation conferences.
2. Presentation of an orientation conference in ISCS to teachers (five teams).

Thursday, August 19, 1971

8:00

Participants in work groups, writing an evaluation of the conferences presented.

9:30

Work groups broken up into six small groups to discuss the experiences of the conferences.

11:00

Lab cleanup and replacement of equipment.

11:30

Lunch

12:30

Discussion by Dr. Miller of positive and negative factors which affect the adoption of an innovation in any area.

12:45

Participants, including pairs of back home teams, working on a listing of factors which might affect change in their home environment.

1:00

Discussion by Dr. Miller of how the positive factors may be strengthened and the negative factors weakened to affect change in any situation.

1:15

Discussion of methods of instituting an educational innovation, by Dr. McLeod.

2:00

Overview of Level III of ISCS by Mr. Richardson.

Presentation by Mr. Richardson of an alternative exercise to focus on model building, which he has used in the classroom.

Thursday Evening, August 19, 1971

7:00 to 9:00 PM

Participant, staff and families Farewell Banquet.

Friday, August 20, 1971

8:00

Participant completion of evaluation sheet covering the total workshop, with emphasis on how well each objective was met, and how helpful each activity was in meeting that objective.

9:00

Participant completion of ISCS perception instrument.

Participant rank ordering of workshop objectives, in importance to them.

10:00

Discussion of the workshop experience with Dr. McLeod and suggestions to better the experience. Closing remarks by the director.

10:30

Optional session with Mr. Richardson on materials of Level III of ISCS.

Workshop Completed

APPENDIX F

RPW FOLLOW-UP LETTERS

APPENDIX F

Dear

We had the privilege of working with your colleague during our Resource Personnel Workshop this summer. As you undoubtedly know, the purpose of the workshop was two-fold. First, it was designed to provide the participants with considerable knowledge about the intermediate Science Curriculum Study (ISCS) program, its philosophies and aims, teaching strategies, etc., and second; to help participants to gain the skills necessary to help schools become acquainted with the new materials and/or to help them in the trial and implementation process.

During the three weeks spent on campus, the participants worked extensively in ISCS in a lab situation and had an opportunity to interact with students using the program during the micro-teaching experience, under the supervision of an experienced classroom teacher of ISCS. Then, during the final half of the workshop, the participants, in teams, planned and presented, either an orientation or an implementation session in ISCS, to teacher groups throughout Michigan.

We very much enjoyed having with us this summer, and we would like to take this opportunity to thank you for your support of her application and also in her efforts to improve science education. We hope that in the near future, she will have many opportunities to help schools improve science education.

In this regard, a letter has also been sent to the Science Supervisor in your State Department of Education, identifying as a resource person in ISCS, and a copy of that letter is enclosed for your information.

Sincerely yours,

Richard J. McLeod, Director
Resource Personnel Workshop

RMJ:bjj
Enclosure

November 4, 1971

Dear Sir:

During the summer of 1971, Michigan State University, through its Science and Mathematics Teaching Center, was host to two NSF sponsored Resource Personnel Workshops, one in the Intermediate Science Curriculum Study (ISCS), and one in the Science Curriculum Improvement Study (SCIS). SCIS is a laboratory oriented program for grades 1-6, and ISCS is an individualized, self-paced program covering grades 7-9.

The resource personnel workshops were designed to accomplish two goals, (1) to provide resource people who are thoroughly trained in SCIS, or ISCS, or both, and able to function as orientation and/or implementarion consultants in the curricula, and (2) to provide the participants with the skills necessary to successfully function in this role, not only in SCIS or ISCS, but also in other areas of science education where they may be of service to schools.

The Michigan State University workshop participant lists included some people from your state, whose names and addresses are listed below. It is our hope that you will find occasion to utilize the unique talents of these people. You will find them not only well trained, but also willing to be of service to education.

Sincerely yours,

Richard J. McLeod, Director
ISCS

Glenn D. Berkheimer, Director
SCIS

bj

APPENDIX G

POST-WORKSHOP ACTIVITIES LOG

APPENDIX G

Name _____
 Month _____ 197 _____

Type of Activity (Orientation, Imple- mentation, Other)	Location of Activity	Teamed With	Number of People Attending	Length of Conference in Hours	Programs Used (ISCS SCIS, Etc.)	Audience Level (Teachers, Adminis- trators, Parents)

Information Sharing Record

Please record on this sheet anything you would like to share with other participants or the workshop staff. For example, please list any activities you have tried that have been very successful that you feel others might like to try, or, activities that you tried that did not work out too well that others might like to avoid. You might also list any suggestions you have, comments, or requests for help of any kind. We will include as much of this information as possible in the newsletter.

Use of ISCS in Regular College Classes

If you were involved in the teaching of any regular college courses, as opposed to a workshop situation, in which information about ISCS or its materials were used during the past term or semester, please fill in the information requested on this form and send it in with the monthly report. Do this even if you mentioned the course earlier on one of the report forms. Thanks for your help.

Your Name _____

College or University Name _____

Course Title _____

Dept. _____ Course Number _____

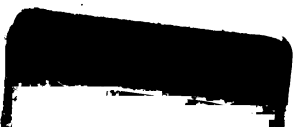
Number of Students Enrolled _____

Approximate Number of Hours (or Fractions Thereof) ISCS was Used _____

Level of Students Enrolled: () Fr. () Soph. () Jr. () Sr. () Grads.

Any Reactions Expressed by the Students

A Brief Outline of the Content of the Course



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