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SELECTED SUPERVISORY ACTIVITIES AS PERCEIVED BY PRE-SERVICE AND IN-SERVICE SECONDARY SCIENCE SUPERVISORS IN NEW YORK STATE

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

by

Thomas Allen Boehm, B.A., M.S.

The Ohio State University
1969

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The advice and encouragement of Dr. John S. Richardson will constitute an integral part of the writer's professional development during his career as a science educator.
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Studies in Botany.  Professor Clarence E. Taft

Studies in Teacher Education.  Professor L. O. Andrews
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CHAPTER I

INTRODUCTION TO THE STUDY

This study investigates and compares some of the ways pre-service and in-service secondary science supervisors perceive their supervisory roles. The procedure involves the multi-variate analysis of responses of these categories of individuals to the importance of selected supervisory activities and the reasons these activities are considered to be important. The need for such a study arises in part from historical conflicts in the perception of the supervisor's role.

Perceptions of the role of the science supervisor differ among the various members of the educational group within which he functions. Cardenas directed a study toward ascertaining the role of the instructional supervisor as perceived by supervisors, administrators, and teachers. He found little accord among these educators as to what should constitute that role. Barnard contends that "many science supervisors have inherited the title of supervisor without being certain as to what was involved in their new positions of influence or how they were to carry out their new responsibilities." Over two hundred years of change in

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both the philosophy and the practice of supervision lie behind the varying views now held by science supervisors and their colleagues in other content areas.

Supervisory control of schools from 1750 until about 1850 was vested in local civil or religious officers and special committees of laymen who had the power not only to inspect schools, but also to evaluate and dismiss teachers. Supervision served as a means of inspection by laymen who professed an ability to tell teachers how and what to teach.

The first major change in supervision did not occur until the American school system was more than one hundred years old. In the latter half of the nineteenth century, the responsibility for supervising teachers gradually shifted to the professional educator. By 1870, superintendents and principals of schools had the supervision of instruction as one of their primary roles. Their main supervisory function seemed to be in-service teacher training with emphasis on showing the teacher how to conduct his classroom work.

A second change took place with the introduction, near the beginning of the twentieth century, of new subjects into the curriculum. Special teachers and special supervisors, assigned to a central office, were hired to conduct classes and to assist regular teachers in special content areas such as music, drawing, and home economics.

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Ayer notes that shortly thereafter, as a result of an increase in
the "mass of existing knowledge and experimental data with reference to
the subject matter and methods involved in teaching the various academic
subjects," special supervisors were appointed to provide leadership in
these subjects; thus, science supervisors came into existence.6 This
third change, however, apparently caused little alteration in the prac-
tice of supervision at that time. Supervision was still primarily re-
garded as that aspect of administration specifically concerned with the
raising of the performance of teachers to a certain standard.7 Lowry in
1908 viewed the principal as a person who should release the "unexpected
talent" of teachers and the supervisor as a person who should work with
the principal rather than directly with teachers. He considered the
responsibility for instructional policy in both regular and special sub-
jects to be that of the principal, regardless of how expert the visiting
supervisor might be "in his particular line."8 Lucio comments, "The
assumption that teachers were best helped and changed by direction from
above was implicit in most of the practice of the day."9

The introduction of supervisors of academic subjects is classified
here as a change, but there were actually very few science supervisors

6Ayer and Barr, op. cit., p. 22.
7William H. Lucio and John D. McNeil, Supervision: A Synthesis of

8National Society for the Study of Education, The Relation of Super-
intendents and Principals to the Training and Professional Improvement of
Their Teachers, The Seventh Yearbook, Part II, (Chicago: University of

9Lucio, loc. cit., p. 6.
in the schools. A study by Ayer and Barr showed that in 1923, 15 years
after Lowry's views had been published, there were 19.5 supervisors of
science employed in 44 American cities having a population of over 100,000.
The subjects they supervised were many, including nature study, elementary
science, school gardens, home gardens, and agriculture. Only one super-
visor worked primarily in secondary school science. Twenty-three years
later, Robert Carleton's study revealed that of the 31 school systems re-
plying to a questionnaire in cities of 150,000 or more population only 22
had supervisors who were assigned any responsibility for science super-
vision. Also, of the school systems studied, only 5 had individuals who
were employed as full-time science supervisors. It is apparent that
the change represented by the addition of specialized supervisors was
limited rather than widespread.

Supervision in all areas had settled by 1913 into a limited role of
rating teachers, a role which had been inherited from the administrators
and laymen of the past. The task of rating, however, was sufficiently
complex and controversial to cause a search for more objective methods
of determining teacher effectiveness. An innovation called "scientific
supervision" seemed to answer the problem. According to Bobbit,
"scientific supervision was partly a protest movement against the con-
fusion of goals and existing practices of the time." The new approach

10Ayer and Barr, op. cit., p. 23.
11Robert H. Carlton, "An Investigation of the Director or Supervisor
12Franklin Bobbit, The Supervision of City Schools, Twelfth Yearbook
of the National Society for the Study of Education, Part I (Chicago: The
characterized supervision as a fact-finding process that enabled school leaders to administer tests in order to identify the best methods of teaching. O. G. Brim stated that the test results suggested the authority of the fact rather than the subjective opinion of a supervisory officer. This belief in the reliability of test results as a basis for supervisory practice made scientific supervision more autocratic, for it was then the job of the supervisor to insure that teachers employed the methods so identified.

Scientific supervision attracted many followers, for it appeared to resolve the issue of evaluation by indicating that teacher effectiveness was clearly visible in student performance on tests. Those who supported this position gradually realized in the next twenty years that testing, even when standardized, did not provide reliable evaluation of the instructor. The supervisor therefore had no direct indication of either corrective or preventive measures to be instituted for the improvement of instruction. The dilemma was intensified by the fact that "The supervisor had his opinions but others of equal ability had neutralizing opinions. When the supervisor turned to the literature of his profession for guidance, he found more conflicting opinions."14

Both the literature and the practice of supervision in the first thirty years of its specialization indicate almost no philosophical change from the authoritative stance held since the days of the Latin grammar


14 Lucio, op. cit., p. 9.
school. Science supervisors, like their counterparts in other academic subjects, still appeared to believe that "teachers were best helped and changed by direction from above."  

Some philosophical change emerged in the 1930's and 40's. Writers began to look upon supervision as a guiding rather than an authoritative position. The teacher was considered a professional and efficient person who was capable of self-analysis, self-criticism, and self-improvement. Wiles points out, however, that in practice the standards for teaching procedures were still determined at higher administrative levels.

Partially stimulated by Gestalt psychology while still retaining a semblance of the procedures prevalent in past years, supervision gradually came to be viewed as a cooperative service. There was a movement away from an autocratic beginning toward a philosophy more consistent with American democracy. Wiles stated that "the supervisor's role has become supporting, assisting, and sharing, rather than directing." The authority of the supervisor's position has not decreased, but is used in another way. It is used to promote growth through assuming responsibility and creativity rather than through dependency and conformity.

Current literature dealing with supervision would lead one to believe that, having undergone both major and minor changes, supervisors have at

15 Lucio, loc. cit., p. 6.


17 Ibid., p. 9.
last renounced the authoritative in favor of the democratic. There is no assurance, however, that writings on changes in supervisory practice and philosophy reflect corresponding changes in actual supervision. Several factors suggest that there is a discrepancy between what is written and what is done:

1. Today's supervisors have been educated under several theories of supervision, including authoritative. 18

2. As a result of being exposed to several conflicting supervisory approaches, teachers become confused and harbor distorted perceptions of what the supervisor is trying to accomplish. 19

3. There is a current lack of general agreement among educators and supervisors in the field as to what constitutes effective supervision and how it might best be implemented. 20

4. There has developed while this dissertation was in progress a shift in focus of supervision as a result of professional negotiations. "Passage of professional negotiation acts in many of the states ensures that teachers will

18 Ibid., p. 6.
19 Ibid., p. 6.
20 Ibid., p. 5-6.
be involved in decisions affecting them and decisions concerning the goals of the education field."^{21} Each poses the possibility that teacher autonomy gained from negotiations through teachers' organizations coupled with the commercial production of the packaged curriculum could conceivably make the supervisor's role extinct.^{22}

The current literature on science supervision, like that on general supervision, rather consistently depicts effective supervision as having an assisting and supporting role which should be carried out in a democratic manner. Regarding specific responsibilities of science supervisors, it is pointed out that there are major activities which should be common to the roles of the pre-service and in-service secondary science supervisor. This "common ground" is looked upon as a means of developing continuity between the pre-service phase of supervision experienced by the science teacher during his student teaching, and the in-service phase when a teacher becomes a staff member in a school. The National Science Teacher's Association recommends in a publication that:

The pre-service training of teachers should provide an opportunity to learn and practice, under suitable supervision, the skills and techniques which form the vehicle of the teaching process. At this stage, the technique of critical self-evaluation should be built into the teacher's philosophy so that

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the development of these skills will continue through the in-service period and will be retained.\textsuperscript{23}

The \textit{Forty-sixth Yearbook of the National Society for the Study of Education} stresses that pre-service education should blend into in-service education in such a way that it would be difficult to know where one begins and the other leaves off. It is further stated that a first step towards this goal is to organize pre-service education so that it develops an awareness of the importance of continuous professional education.\textsuperscript{24}

Richardson, in discussing the importance of continuity between pre-service and in-service supervisory practices, has emphasized the importance of both a carry over from pre-service to in-service supervision and the development of the expectation in undergraduates that they should look for and expect supervision throughout their professional lives.\textsuperscript{25}

There is no indication in the literature that the above ideas constitute the philosophy of the people who are actually engaged in science supervision. Thus, although the literature identifies an apparent relationship among the various phases of science supervision, the actual relationship cannot be described with any degree of certainty.

One approach toward resolving this uncertainty is to determine and


\textsuperscript{25}Lecture by John S. Richardson, Professor of Science Education, College of Education, The Ohio State University, May 23, 1966.
compare the role perceptions of various groups of individuals actively engaged in secondary science supervision. The results of such a comparison should provide a better understanding of how pre-service and in-service secondary science supervisors perceive their supervisory roles. Such understanding could help science supervisors to develop activities that strengthen continuity and significance in the professional growth of the science teachers with whom they work.

**Statement of the Problem**

The intent of this study was to investigate and compare some of the ways pre-service and in-service secondary science supervisors perceive their supervisory roles. The groups of persons selected for the study were college science supervisors, supervising teachers (cooperating teachers) in secondary science, and secondary school science department chairmen. Four subordinate problems were identified by analyzing the main problem. These were:

1. to determine the degree of importance each supervisory group assigns to selected supervisory activities.

2. to reveal the similarities and differences among the three supervisory groups in the degree of importance assigned to the selected supervisory activities.

3. to reveal the similarities within each group in rating the suggested reasons for these activities according to importance.
4. to reveal the similarities and differences among the three groups in rating the suggested reasons for these activities according to importance.

Definitions of Terms

Secondary Science Supervising Teacher: An experienced teacher employed by a local school system who teaches high school students and supervises college students during their student teaching experience in secondary science.

Secondary Science Supervisor: A department chairman; an individual on the faculty in a secondary school charged with the responsibility of supervising secondary science teachers and improving instructional methods in science.

College Science Supervisor: A staff member of a college or university who regularly visits and observes student teachers who are teaching science at local high schools.

General Supervisor: An individual who is responsible for all the instructional activities of a school system: often an assistant superintendent, a director of education, or a high school principal.

Pre-Service Science Supervision: Supervision of the prospective science teacher during his student teaching by the secondary science supervising teacher and the college science supervisor.

In-Service Science Supervision: The promotion of the professional development of secondary science teachers by secondary science supervisors.
**Secondary Science:** The science program that is inclusive of grades seven through twelve.

**Group Process:** The democratic procedures by which a group of individuals identifies, explores, attacks, and attempts to solve a problem of common concern.

**Delimitation of the Study**

1. This study does not attempt to include all potential secondary science supervisory activities. It is limited to those activities that were found to be the most important by examining:
   a. the literature on pre-service and in-service supervision.
   b. the results of personal interviews with secondary science supervisors and college professors who represented the fields of science education, teacher education, and science.
   c. the responses of a pilot study of secondary science supervisors who were actively involved in supervision.

2. No attempt is made in this study to ascertain the degree to which each supervisory activity is actually carried out by each group of supervisors. This study is limited to the ways pre-service and in-service supervisors actually involved in secondary science supervision perceive their supervisory roles with respect to the selected list of activities and reasons for the activities.

3. The scope of this study is limited to the responses of supervisors from New York State.

4. This study is limited to secondary science supervisors who have the most direct and probably most frequent contact with either pre-service
or in-service secondary science teachers. These supervisors include:

a. college science supervisors whose supervisory responsibilities are restricted to teachers in secondary science.

b. secondary school science department chairmen who teach a minimum of one class in a particular school and have the responsibility of supervising secondary science teachers employed at that school.

c. supervising teachers who teach science in a secondary school and supervise student teachers in secondary science at that same school.

Assumptions

1. Respondents answered the questionnaire honestly in terms of their individual supervisory philosophies.

2. The instructions and the items in the questionnaire conveyed the same meaning to all respondents.

3. The activities in the questionnaire are representative of supervisory responsibilities purported in the literature to be common to all three supervisory groups.

4. The sampling technique employed in this study helped to insure that the sample obtained from each supervisory group was representative of the thinking of that particular group.

5. Information collected could be processed in such a way as to yield answers to the sub-problems and thus to the main problems being investigated.
Plan for Subsequent Chapters

Chapter II is a review of the literature which served as a basis for structuring the questionnaire used in this study. Chapter III describes the plan for the study including the development of the questionnaire, the method used to select the samples of the three populations of supervisors, and the techniques that were used to collect and process the data statistically. Chapter IV is composed of two parts. The first part contains a statistical analysis of the data. Separate graphic representations of responses are provided for each of the ten supervisory activities. Each graph illustrates similarities and differences among the three groups in assessing the importance of the reasons suggested for that supervisory activity. A final graph is used to illustrate similarities and differences among the groups in rating the importance of the ten activities. Each graph is followed by a brief semantic interpretation. The second part of Chapter IV contains a series of grids which indicate the most pronounced similarities and differences among the three groups with respect to the supervisory activities and accompanying reasons. Chapter V contains conclusions, implications, and suggestions for further research.
CHAPTER II

SUPERVISORY PRACTICE AS PRESENTED IN THE LITERATURE

The literature relevant to this study includes writings both in general supervision and in science supervision. Pertinent commentary from both types of sources has been used to develop an overview of prevalent contemporary views of supervisory responsibilities. Several objectives served as bases for the selection of references:

1. to find information dealing specifically with actual or suggested activities in science supervision.

2. to find information dealing with actual or suggested activities that might be applicable to science supervision.

3. to find information dealing with actual or suggested activities that might be appropriate for both pre-service and in-service supervision.

4. to find information providing a broad view of the types of supervisory activities suggested and of their importance.

This chapter is devoted to a presentation and discussion of eight activities found to fulfill these objectives.
Classroom Observation

Originally a rating and inspection process, observation is now, according to the literature, intended to provide a means of helping the teacher to improve his professional competencies. Observation may take either of two forms: the supervisor is present in the classroom but does not participate in the activities, or the supervisor assumes an active role in the activities of the class. Classroom observation is a practice used in both pre-service and in-service training, but supervisory objectives in these two areas are not completely identical. Observation has long been considered by most authorities to be a very important responsibility of the supervisor.

The purpose of the supervisor in visiting a class should be to give direction to his observations. Wiles suggests the following reasons for in-service supervisory visitations:

1. studying the psychological principles being used in the classroom and their effectiveness in relation to the content being taught.

2. identifying problems related to learning difficulties of individual students.

3. evaluating new projects that are being carried out in the classroom.

4. planning for some joint activity that the supervisor and teacher might carry on with the teacher's class.

5. participating actively in the class at the request of the teacher.
6. identifying problems the teacher is having in the classroom.  

Battle also views observation as the most significant supervisory activity and as a means of identifying classroom problems. He supports supervisory participation in preplanned activities of the class as a means of helping teachers and providing a basis for sharing ideas.  

Many writers, after suggesting aspects of the class toward which a supervisor might well direct his attention, supply possible applications of the information thus gathered. Their suggestions relate to three areas of supervisory responsibility: teachers, students, and program of instruction. A representative list includes the following reasons for and uses of observation:

**In-service teachers**

1. to define areas in need of improvement to the complacent or overconfident teacher.

2. to increase the confidence of a competent teacher who is hesitant.  

3. to spot potential troubles and perhaps correct them before any real damage is done.  


4. to establish a basis from which to initiate supervisory assistance.
5. to demonstrate to a staff effective ways of teaching for various outcomes such as critical thinking.

Students
1. to identify and help to solve pupil problems concerned mainly with their capacities, achievements, interests and attitudes.

Program of instruction
1. to identify innovative ideas being developed by a teacher so that these ideas can be applauded and disseminated to other teachers.
2. to identify creative teachers who might serve on a committee to establish guidelines for the program.
3. to identify curriculum problems involving specific questions dealing with the subject matter offerings and activities comprising the total school program.

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8 Harbeck, loc. cit., p. 34.
10 Harman, loc. cit., p. 38.
4. to have "more complete information and insight into the differentiations and manifestations of accelerated programs in science."\(^ {11}\)

5. to assess "how all kinds of teachers are presently handling the science program."\(^ {12}\)

6. to provide the first step toward "developing an articulated science program."\(^ {13}\)

In the training of pre-service teachers, observations are made both by and of the student teacher. Three reasons are given for observations of experienced teachers by student teachers:

1. to help the student teacher to become acquainted with good teaching.\(^ {14}\)

2. to familiarize him with the pupils he will teach.\(^ {15}\)

3. to give him some insight into the subjects he will teach.\(^ {16}\)

When the pre-service teacher has become acquainted with the situation and has assumed some teaching responsibilities, he is observed by the supervising teacher. Objectives in these observations may, when appropriate, parallel those listed for in-service teachers. Andrews

\(^ {11}\)Ibid., p. 38.

\(^ {12}\)Hale, op. cit., p. 10

\(^ {13}\)Ibid., p. 10.


\(^ {15}\)Ibid., p. 59.

\(^ {16}\)Ibid., p. 59.
emphasizes the particular value of observation by the supervisor in the pre-service program as providing a basis for promoting the development of the student teacher to the point where he can effectively practice self evaluation.  

Observation, as treated in the literature, is a highly regarded supervisory activity. Observation may well be one of the most time-consuming activities, as Johnson suggests. He found, in a survey of science supervisors during a summer conference, that they rated classroom observations as second to curriculum development and implementation in terms of the amount of time this activity had required during the previous school year.

**Individual Conferences**

The need for the individual conference as a supervisory activity is delineated by McKean as follows:

> Even though group procedures have increasingly been used with good results in supervision, the supervisor tends to feel that some of his most effective and satisfying work is accomplished with individual teachers. Procedures in which the supervisor offers assistance and attention to individual teachers are time consuming and demand great portions of the supervisor's work load; yet such a relationship possesses several very important potential advantages.

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McKean also presents the specific and perhaps unique advantages of the individual conference:

Teachers' individual differences are best discovered and dealt with most constructively in the individual teacher-supervisor relationship. The supervisor and teacher are often able to establish close and relatively stable bases for cooperative work. The supervisor is able to secure specific and concrete information about the teacher, the students assigned to the teacher, and the particular classroom situation. The teacher is likely to secure assistance and counsel regarding his own unique problems and needs. He often will develop enough confidence in the supervisor to reveal concerns and deficiencies which would never be brought out in a group context. Certainly the individual teacher-supervisor procedure has a vital part to play in the total supervisory effort.20

Supervisory conferences may be divided into four main types: follow-up, unplanned, teacher-initiated, and supervisor-initiated. The characteristics of each type are considered in the subsequent paragraphs.

The follow-up conference after a classroom observation serves as a means of pointing out strengths of teachers as a basis for focusing their attention on future plans for improvement. McKean states that "teachers learn far more significantly through their successes than through their failures."21

The un-planned conference is valuable to the supervisor in establishing rapport and gaining insight into the teacher's attitude towards teaching, satisfaction in his job, and individual ambitions and aspirations. Because it is usually informal and quite brief, this type of conference can open up problems and concerns which might never be brought

20 Ibid., p. 81.

21 Ibid., p. 91.
to the surface in a more formalized situation.22

The teacher-initiated conference serves principally as a means of enabling the teacher to seek advice about workshops, conventions, proposed changes in his teaching, the progress he is making, or problems that he is having in the classroom. According to Edwards, if the teacher "knows that he may see the supervisor when he has a problem, or when he wants to discuss something of interest, it is evident that the supervisor has created an atmosphere of acceptance."23 Bongarzone adds that even the most experienced science teacher seeks individual supervisory consultation to prevent himself from "unwittingly falling into poor teaching habits."24

The supervisor-initiated conference can serve several very important functions for the supervisory program. First, it provides an opportunity for the supervisor to meet new teachers on a more personal basis so that they have a better understanding of the teaching situation they are or will be involved with. Second, it gives the supervisor a chance to sample teacher opinion regarding proposed supervisory action before it is put into practice. Third, it provides an opportunity for the supervisor to discuss serious instructional difficulties which have escaped the teacher's attention.25

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22 Ibid., p. 87.
23 Edwards, op. cit., p. 18.
25 McKeen, op. cit., p. 88.
Each of the above types of supervisory conference may be useful in both in-service and pre-service supervision. For example, Washton notes that the major function of the follow-up conference in pre-service supervision is guiding, reassuring, and helping the student teacher to evaluate his own instruction. The development of the process of self evaluation "is the most important part of student teaching experience in science." 26

Several types of individual conferences relatively unique to pre-service supervision are presented in publications of The Association for Student Teaching. Occasionally individual conferences between the college supervisor and the supervising teacher are recommended. This type of conference provides an opportunity for the college supervisor to outline the responsibilities of the supervising teacher, and for the supervising teacher to give the college supervisor a realistic picture of the school setting. 27 The two-way conference between the student teacher and the college supervisor should include the supervising teacher whenever possible. This type of modification can "facilitate the setting of goals, planning, evaluation, the arranging of additional experiences, and the solving of problems" 29 pertinent to the student teaching experience.


29 Andrews, op. cit., p. 65.
"Individual conferences with teachers provide one of the most productive settings for supervisory work. In many such conferences the supervisor and teacher meet as equals, both interested in solving an instructional problem."  

**Content Oriented Meetings**

Content-oriented meetings planned by the science supervisor provide an opportunity for the dissemination of pertinent information to science teachers, prospective or enrolled science students, and other members of the school's professional staff. The structure of the meetings should be clearly related to the groups attending.

An in-service program for science teachers, usually a series of meetings, is an example of the relationship between structure and group. Content in such programs is discussed in terms of its applicability "in comprehending objectives of modern science education, in using individual laboratory experiences as the primary source of learning, and in using science equipment and supplies effectively in the teaching of science."  

A second type of meeting, intended to benefit teachers who are working with new approaches to science, is a discussion of content by supervisors. Curriculum proposals in new programs often contain far more content than can be utilized in the school year. Therefore, decisions must be made to tailor the curriculum to size. The meeting between supervisor

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and teachers should be a joint consideration of the proposed content; the meeting should facilitate decisions. The supervisor can contribute valuable insights that might aid content selection by using feedback from previous teaching experiences and from his overall knowledge of the objectives of the entire science program.

Content-oriented meetings are essential in aiding teachers who have been assigned a wide variety of science courses or who are not formally prepared to teach science but have been assigned the teaching of a science course. Both types of assignment usually occur more in smaller schools where the secondary science faculty may consist of only one or two persons. Conant points out that one of the most unprofessional and often utilized provisions in New York State's certification requirements is that a teacher may, without state permission, be assigned to teach one period a day in an area for which he is not certified.

Harbeck recommends special lectures, seminars, and other programs


35. Conant considers implications of this provision as follows: "It would be possible, under these arrangements, to have all the courses in a particular subject taught by persons untrained in that subject. That is, if a school has no science teacher, it might assign a general science course to an English teacher, a physics course to a history teacher, a chemistry course to the home economics teacher, and a biology course to the coach." p. 52.
to disseminate content-related information to both teachers and students:

Special lectures or seminars can also be planned for both students and teachers. Traveling exhibits sponsored by industrial firms, nonprofit educational institutes, and governmental agencies are also available to those who wish to enrich the science program for the entire student body or some segment of it. Preplanning and follow-up activities are necessary to make this kind of program a justified part of the total school instructional plan. The present trend is away from packaged traveling programs and toward flexible program segments which can be mixed and matched to fit the wishes of each individual school.

Orientation Meetings

The orientation meeting can forestall problems and convey information for both the pre-service and the in-service teacher.

An important task of the supervisor is to orient new teachers to the school in which they will work. Many school systems particularly the larger ones, conduct special orientation meetings for teachers who have not had previous teaching experience, or for teachers who have taught previously but are employed for the first time in a particular school system. Some of the major activities of the science supervisor in such meetings include:

1. assigning beginning teachers to experienced

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36 Harbeck, op. cit., p. 41.


39 Harman, op. cit., p. 45.
staff members who have agreed to serve as 
guides. 40

2. making arrangements for beginning teachers 
to visit classes of experienced faculty 
members. 41

3. arranging for an individual get-acquainted 
conference with each new teacher before he 
commences his teaching responsibilities. 42

4. discussing the philosophy and objectives of 
the school, the nature of the community, 
the details of the science curriculum, and 
the nature of the student body. 43

5. informing teachers what equipment and sup-
plies are available and where they can be 
found. 44

6. performing selective demonstrations with 
equipment with which teachers are unfamiliar. 45

7. informing teachers what is available in the

40 Ibid., p. 46.
41 Ibid., p. 46.
42 Ibid., p. 46.
43 Ibid., p. 46.
44 Bongarzone, op. cit., p. 21.
school library as reference material.

Edwards considers an orientation conference involving the student teacher and the college supervisor as an important prerequisite to the student teacher’s induction into the cooperating school. The supervisor should during such a conference define the roles of the people the student teacher will be working with, discuss purposes and goals of the student teaching program, make available information pertinent to the supervising teacher and the school situation, and plan for the student teacher to make a preliminary visit to the cooperating school. The supervising teacher should, while the orientation conference between the student teacher and supervisor is being carried out, orient his pupils to the idea that they will have another teacher who will be in charge of the class and will work as a new team member.

The supervising teacher provides the "ST (student teacher) with a place for his personal and professional materials, and provides areas at the school in which the ST may study, prepare materials, and work. Provides orientation to building, classes, school, faculty, the total staff team, school system, and community." During the latter part of the orientation program, the supervising teacher should involve the student teacher in activities more directly associated with the classroom climate. Some of these activities include encouraging the student teacher to:

46 Ibid., p. 21.
47 Edwards, op. cit., p. 11.
1. Talk with students and answer some of their questions.
2. Observe classes being taught by the supervising teacher.
3. Study permanent record cards and the supervising teacher's notes.
5. Understand his role in relation to the entire school program.

Research in Science Teaching

The supervisor's responsibility for research lies in two categories: participation in research and interpretation of research.

In the participation phase of the supervisor's research responsibilities, "he should be able to design and conduct investigations that will yield reliable evidence regarding the effectiveness of instructional programs." The supervisor should also "provide stimulation,
encouragement and guidance for teachers who desire to experiment with new courses and methods of instruction".55

Woodburn, in discussing another aspect of the supervisor's responsibility for research, points out that exciting and creative investigations are being carried on in many school systems. The science supervisor is described as the individual "who should be cognizant of all of these exploration and research activities. In many senses of the word, his effective role as the communication link will serve to catalyze the research and development aspect of the total school system."56

Several research studies have been done during the past decade which give at least a partial picture of the importance of research as a supervisory responsibility. Lee's study, part of which involved determining the actual status of secondary supervision on the local level, showed that the local science supervisor rated the process of research as the least important part of his supervisory role.57 Two years later, in a study by Ploutz on the professional responsibilities of the science supervisor, "supervisors reported that they should but were unable to spend more time organizing and conducting educational or scientific experimentation and research."58

55Stotler, op. cit., p. 67.


57Lee, op. cit., p. 149.

58Ploutz, op. cit., p. 147.
Harwell's study, dealing with responsibilities of the science supervisor as indicated by science teachers showed that classroom teachers thought the following research related supervisory activities were important:

1. encouraging the teacher to experiment and discuss findings to create a desire in students to do research.
2. urging science teachers to evaluate their teaching in light of research findings.
3. encouraging teachers to do research relating to science instruction.
4. working on individual research projects.

When the same science teachers were asked to ascertain the extent to which the above research oriented supervisory activities were assumed by the science supervisor, the general consensus was that "science supervisors infrequently work on individual research projects; and they do not frequently encourage teachers to do research relating to science instruction."

Barnard feels that both secondary science supervisors and college supervisors should share the responsibility for developing productive research efforts which will promote the advancement of science education in our schools. He is, however, in general agreement with the results of the above research studies in stating that "the present crop of super-

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visors share with many college professors a critical deficiency. Few, if any, of them, are actively involved in research designed to advance our understanding of problems related to science teaching. 60 This view is shared by Stotler, and others. 61

The supervisor's responsibility for the interpretation of research has received little mention in the literature. Stotler sees the interpretation phase as providing the classroom teacher with an awareness of "the findings of science education research." 62 In delimiting the interpretation of research to pre-service supervision, Washton states that "the college supervisor is a resource person who knows of research and curriculum developments that occur on a broader scale. He will give the student teacher assistance that goes beyond the immediate classroom situation." 63

Providing Released Time

Providing released time is a supervisory activity reported to be important in promoting professional growth. Teachers should, in addition to being provided with released time to prepare for activities unique to science instruction, be provided with the necessary time, leadership and materials for keeping up-to-date with the rapid changes

61 Stotler, op. cit., pp. 68-70.
62 Ibid., p. 73.
63 Washton, loc. cit., p. 366.
that occur in science teaching. Proposed uses of such time by teachers are as follows:

1. preparation
   a. setting up demonstrations.
   b. organizing an effective laboratory program.

2. keeping up-to-date in science education.
   a. attending conferences of professional organizations.
   b. reading extensively in science education.
   c. enrolling in in-service training courses.
   d. enrolling in summer institutes.

3. classroom intervisitation

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64Bongarzone, op. cit., p. 22.
65Ibid., p. 22.
67Association for Student Teaching, The Thirty-eighth Yearbook, p. 85.
69Berkheimer, op. cit., p. 78.
71Ibid., p. 64.
72Ibid., p. 64.
73Ibid., p. 64.
a. observing outstanding co-workers in action. 74, 75

b. sharing ideas related to the school science program. 76

The Use of Group Process

The use of the concept of group process has extensive application for promoting effective supervision. "The goal of group process is group productivity, that is, getting something done which could not be done by a single individual." 77 "The importance of group process...lies in its ability to broaden the base of involvement and commitment to instructional improvement, to focus the resources of the group on the problem, to increase the ability and satisfaction of individuals in working cooperatively, and to effect significant and lasting changes." 78

McKean describes the benefits of group process as follows:

1. "Teacher satisfaction and morale are known to be enhanced when teachers actively participate

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74 Ibid., p. 64.
75 Association for Student Teaching, Forty-fifth Yearbook, p. 35.
76 Ibid., p. 35.
78 McKean, op. cit., p. 53.
in educational planning and decision making."

2. this type of situation encourages the development of individual personnel by encouraging the emergence of leadership. "In this context, individual teachers are seen to develop personally and professionally, and unsuspected leadership is encouraged to emerge."

3. "Democratic group problem solving results in a deeper understanding of the problem being considered and the bases for the decision reached."

4. if the entire group is given a problem of general concern, participates in its exploration, and shares the responsibility for its resolution, the "staff is likely to follow through with procedures to implement the decision made."

The supervisor must perform a difficult role in group process. First of all, he must remain a participating member of the group. At times he may grow impatient with others less experienced in group procedures, but he cannot exert autocratic leadership without destroying, or at least impairing, the process. In general his responsibil-

79 Ibid., p. 54.
80 Ibid., p. 55.
81 Ibid., p. 55.
82 Ibid., p. 54-55.
ities become that of:

1. using the internal structure of the group to foster the potential within it.

2. helping the group feel able and free to make group decisions, even if significant later choices are to be made individually.

3. helping the group accept change as a desirable goal.

4. encouraging the group to consider new and different techniques in an open-minded manner.

5. conducting group conferences and work sessions in ways that maximize the contributions of participants.

Curriculum Development

"A major task of the supervisor is that of providing leadership in curriculum development." The first job of the science supervisor


84Ibid., p. 185.

85Ibid., p. 185.


87Barnard, op. cit., p. 4. (N.S.T.A. Convention Speech)

88Battle, op. cit., pp. 303-304.
in carrying out this responsibility is to identify a committee representative of individuals who are interested in science education and have unique contributions to make to the science program. This "curriculum committee should be composed of a cross section of the community, representing teachers, administrators,...industrial leaders,\(^89\) and...science-based lay persons such as agricultural agents, hospital technicians, industrial chemists, metallurgists, bacteriologists, and many more."\(^90\)

The next task of the supervisor becomes that of orienting "them to the role they have been asked to fill."\(^91\) The supervisor, in fulfilling this as well as subsequent portions of his leadership role with the committee, must keep himself up-to-date on all the trends in science education by reading pertinent literature and studying new courses developed by other groups. This type of preparation is essential so that the supervisor can act as "the bridge between the mass of published material and the local committee, interpreting trends, and pointing out significant items that should be considered in making plans for curriculum improvement."\(^92\)

The supervisor and his curriculum committee should not deliver a completed edition of a new curriculum to teachers and expect them to accept it with enthusiasm and without question. Supervisors

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\(^{89}\) Eiss, op. cit., p. 71.

\(^{90}\) Johnson, op. cit., p.

\(^{91}\) Eiss, loc. cit., p. 71.

\(^{92}\) Ibid., p. 72.
should, to insure that a new curriculum proposal will be accepted, acquaint teachers with the philosophy and planning that lie behind it. The teachers should also be encouraged to react to the program as it is developed. "If the curriculum is to be effectively implemented by the teachers, they must feel that it was developed by their curriculum committee and that it reflects their ideas and interests."  

An in-service program for the teachers who will implement the program should be carried out before a new curriculum can be made operational. A well conducted in-service program must be an action program where teachers take an active part in learning about the goals of the project, and have an opportunity to suggest ways of improving and implementing it. "To be most effective, the in-service program should parallel, and not follow, the curriculum development project."  

An effective and continuous evaluation program must be carried out as the new curriculum program progresses to insure that the original goals are being achieved. This type of evaluation is difficult and quite frustrating, but is essential for the continuance of an effective program.  

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93 Ibid., p. 72.  
94 Ibid., p. 74.  
95 Ibid., p. 75.
Legal Aspects of Science Teaching

The literature on general and science supervision provides little guidance for the supervisor on the legal aspects of science teaching. Several publications on school law, however, stress the importance of the legal implications of supervision. 96, 97, 98


CHAPTER III

DESIGN OF THE STUDY

The procedures used to carry out this study can be divided into four phases. The first phase of the study was devoted to developing the instrument; the second phase, to identifying the populations to be studied; the third phase, to developing a sampling technique for studying the populations; and the fourth phase, to arriving at a technique for analyzing the data. Descriptions of the above procedures are included in this chapter.

Development of the Instrument

No research comparing role perceptions of secondary science supervisors in the pre-service and the in-service phase was reported in the literature.

The activities reviewed in Chapter II were used as the nucleus for the development of the instrument. Each activity was then worded in the form of a possible supervisory responsibility:

1. making classroom observations of teachers.
2. conducting individual conferences with teachers.
3. conducting seminars with teachers on selected areas of content in science.
4. conducting orientation sessions with beginning
teachers.

5. coordinating research related to the activities of the science program.

6. providing teachers with released time from classroom responsibilities.

7. utilizing the concept of "group process" (refers to the democratic procedures by which a group of individuals identifies, explores, attacks, and attempts to solve a problem of common concern) when dealing with problems relevant to the operation of the school program.

8. assuming an active role in curriculum planning.

The reasons offered in the literature for pursuing the above activities were used as a preliminary list of suggested reasons in the instrument. A deliberate attempt was made to select, for each activity, reasons which represented a broad spectrum of points of view concerning the importance of the activity. The section concerning the conducting of orientation sessions with beginning teachers was presented as follows to illustrate the resulting format:

1. inform them about rules and regulations regarding school policy.

2. make arrangements for them to observe experienced teachers in other science classes.

1The explanation of group process was included to avoid misinterpretation of the term.
3. arrange for the observation of science classes they will teach.
4. acquaint them with available science apparatus and equipment.
5. assist in the location of additional reference and supplementary reading material.
6. introduce them to community resources.
7. discuss ideas and procedures regarding daily lesson plans.

Next, the list of supervisory activities and their accompanying statements of reason were organized into a tentative questionnaire. The instructions requested the prospective respondent to rate each activity and accompanying list of reasons according to the degree of importance he thought they had for carrying out supervision in his particular situation.

The tentative questionnaire was then subjected to a series of personal interviews with the investigator's advisors and several other college professors who represented the fields of science and teacher education. The purpose of the interviews was to:

1. insure that the supervisory activities were understandable and not inclusive of more than one important supervisory responsibility.
2. obtain suggestions concerning additional activities that might be common to all three supervisory groups.
3. obtain suggestions concerning additional
reasons that might be included under the
supervisory activities.

4. obtain suggestions for wording the instructions.

5. to attempt to identify a satisfactory rating
scale.

A series of interviews with the investigator's major advisor
resulted in the decision that the activity "conducts classroom obser-
vations of his teachers" was too general and should be broken down
into two supervisory activities. Part of the rationale for this
decision was based on the fact that the term classroom observation
was used in the literature to denote a spectrum of meanings which
ranged from sitting quietly in back of the room and rating teachers
to working actively in the classroom with teachers. The two
activities developed were to:

1. take part in class activities when making
classroom observations of teachers (partici-
pating observer).

2. make classroom observations of teachers by
assuming a non-participating identity (quiet
observer).

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4John Harman, "Supervision in Selected Secondary Schools" (un-
The interviews produced agreement that an activity which deals with the legal aspects of science teaching should be added. Thus, with the addition of the activity "hold meetings on the legal aspects of various activities with which teachers are involved," the original list of supervisory activities was increased to ten.5

Subsequent interviews with a professor of teacher education and a professor of botany at The Ohio State University, and the chairman of the science education department and the chairman of the department of instruction at the State University of New York at Albany resulted in revising part of the instructions, rewording some of the supervisory activities, and adding several reasons for most of the supervisory activities.

The instrument was then administered to three individuals who represented the three supervisory groups used in the study. These people were asked to fill out the questionnaire as it pertained to their supervisory responsibilities. Follow-up interviews were conducted with each individual after they completed the questionnaire to determine:

1. the amount of time required to complete the questionnaire.
2. any problems in clarity of instructions.
3. ambiguity in any of the items.
4. the degree to which the supervisory activities

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5 Interviews with Dr. John S. Richardson, Professor of Science Education, College of Education, Ohio State University, June 22 - August 5, 1967.
listed had potential for applying to all three groups involved in the study.

These interviews yielded suggestions which resulted in the deletion of two statements of reason, and the addition of three others. The respondents also indicated that approximately twenty minutes were required to complete the questionnaire.

A pilot study which included representatives of each of the three supervisory groups to be involved in the study was used to test the tentative instrument on a broader scale. The questionnaire was structured to serve two functions. First, it contained a rating scale which enabled the respondent to indicate the applicability of the items in the questionnaire to his supervisory responsibilities. Second, it contained blank spaces which provided the respondent with an opportunity to:

1. insert additional supervisory activities and statements of reason pertinent to his situation that were not included in the questionnaire.

2. react to any items that might be ambiguous.

3. assess the clarity of the instructions.

Copies of the pilot study questionnaire and a cover letter were sent on January 23, 1968 to ten supervising teachers, six college science supervisors, and twelve secondary science supervisors who served as department chairmen. Twenty completed questionnaires had been received by February 11th. On February 12th, a follow-up letter was sent to the eight individuals who had not returned their question-
naires. The final number of completed questionnaires received was twenty-four: an eighty per cent return. A copy of the pilot study, the cover letters, and the follow-up letter are included in Appendix A.

The results of the pilot study indicated the need for several major changes in the instrument. Respondents noted that Part A of the instructions did not indicate clearly whether the respondent was to react to the questionnaire in terms of the degree to which he actually carried out the activities, or in terms of the degree of importance he feels they should have for carrying out his supervisory responsibilities. Since the latter was the intent of this study, appropriate changes were made in the instructions on the final instrument. These changes are described in full in Appendix A.

The final form of the questionnaire, which evolved from the previously discussed review of the literature, personal interviews, and the pilot study described, contained two separate sections. The first section requested background data and contained appropriate variations for each group of intended respondents. The second section was the same for all three groups. This section consisted of ten supervisory activities and their accompanying statements of reason. Both activities and reasons were to be rated according to the judgment of the respondent. A nine-point rating scale was provided: 9 indicated an item of great importance; 5, an item of moderate importance; and 1, an item of little importance. The final form of this instrument as actually used in the study appears in Appendix B.
Covering Letter Accompanying the Questionnaire

A letter was developed and sent to each prospective respondent to explain the nature and purpose of the study. Each letter was individually typed on an I.B.M. tape typewriter in an attempt to personalize the letters as much as possible. A statement was included in the body of each letter that identified the prospective respondent with his particular group. Copies of the three forms of the cover letter that were used in this study are included in Appendix B.

Selection of the Individuals to be Included in the Study

Secondary Science Supervisors

The largest sample of individuals used in this study was composed of one hundred twenty-five secondary science supervisors who served as department chairmen in secondary schools. The list of names from which this sample was drawn was obtained from the United States Registry. According to Mr. John F. Crosson, Director of the Registry, this list ("dick strip") of nine hundred thirty names represented virtually all the secondary science supervisors in New York State who were serving as science department chairmen in secondary schools.

The technique of random sampling was used to insure that the sample would be representative of the total population. 6 The

practice used in this study to insure randomness was to assign each member of a population a number, and then select the desired number of individuals for the sample by using a table of random numbers.  

Supervising Teachers and College Science Supervisors

The identification of the populations of college science supervisors and supervising teachers presented a different problem because no lists were available. The first step in locating members of both groups was to identify all the colleges and universities in New York State certified to prepare secondary science teachers. Next, the college catalogues for each of these institutions were used to determine the name of the director of education and the name of the coordinator of student teaching at each institution. Letters were then sent to the directors of education asking them to furnish the names, titles, and addresses of the college supervisors at their institutions who supervised student teachers in science. A letter was sent to the science methods instructor in schools from which no response was received from the director of education. One hundred fifty college supervisors were identified as being actively involved in secondary science supervision. Fifteen of the forty-five institutions certified to prepare secondary science teachers were unable to furnish any names because of inactive programs. A sample of fifty-two college science supervisors was selected from this population using the previously

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discussed technique of random sampling. Copies of the letters sent to the directors of education and the science methods instructors appear in Appendix C.

The population of supervising teachers was identified by sending letters to the directors of student teaching at institutions that had active programs for secondary science teacher preparation. These letters requested the directors of student teaching to furnish the names, titles, and addresses of the cooperating teachers used in their off-campus student teaching programs in secondary science. The total number of names received was three hundred fifty-one. This figure represented responses from all but three of the institutions that were actively preparing science teachers. A sample of seventy-five supervising teachers was selected from this population using the same technique of random sampling that was applied to the other two groups. A copy of the letter sent to the directors of student teaching appears in Appendix C.

**Collection and Processing of Data**

Two hundred fifty-two questionnaires and accompanying letters were sent out on April 29, 1968 to members of the sample of each supervisory group. Each return was checked against the list of prospective respondents and a record was made of those who returned their questionnaires. Each return was also checked to ascertain that the personal data sheet had been completed and that all the items had been rated. An attempt was made to increase the percentage who responded to the questionnaire by sending follow-up letters to individ-
uals who had not responded by May 18, 1968. A copy of this reminder appears in Appendix B.

Table 1 contains a tabulation of the number of questionnaires sent out and the usable returns received.

TABLE 1.--Analysis of the number of questionnaires returned by the supervisory groups

<table>
<thead>
<tr>
<th></th>
<th>Number Sent</th>
<th>Number Returned</th>
<th>Percent Returned</th>
<th>Number Usable</th>
<th>Percent Usable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary Science</td>
<td>129</td>
<td>106</td>
<td>79</td>
<td>90</td>
<td>70</td>
</tr>
<tr>
<td>Supervisors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervising Teachers</td>
<td>75</td>
<td>58</td>
<td>78</td>
<td>55</td>
<td>73</td>
</tr>
<tr>
<td>College Science</td>
<td>52</td>
<td>37</td>
<td>71</td>
<td>34</td>
<td>65</td>
</tr>
<tr>
<td>Supervisors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>256</td>
<td>201</td>
<td>78</td>
<td>179</td>
<td>70</td>
</tr>
</tbody>
</table>

The reduction in the number of usable returns resulted in part from eliminating those completed by individuals who were not members of one of the three supervisory groups to be studied. Five individuals who held the title of department chairman were eliminated from the study because their particular position did not involve any supervisory responsibilities. Three other individuals were eliminated from the same group because they had moved from the position of science department chairman to that of high school principal. The ninety secondary science supervisors actually included in the study held the position of science department chairman and supervised teachers in secondary science. Two college science supervisors were removed from the study because they held the position of general supervisor, and their supervisory responsibilities were not chiefly in science. Thus,
the thirty-four college science supervisors used in the study supervised primarily, and in most cases entirely, in secondary science. The returns from the supervising teachers indicated that their supervision of student teachers was restricted to secondary science. The balance of the non usable returns were incomplete.

Consultations with a professor of statistics in the Department of Educational Psychology and Statistics at the State University of New York at Albany resulted in the selection of a statistical technique for analyzing the information requested on the questionnaires. The data was prepared for analysis by placing it on Fortran computer sheets and transferring it to I.B.M. punch cards. Two cards were used for each respondent. Demographic data appeared in coded form on one card. A second card recorded responses to the instrument.

The statistical technique used for analyzing the data was multiple discriminant analysis using the multiple discriminant function. Two discriminant functions were derived for each group on each set of variables. Graphs were then constructed as a basis for comparing the three groups of supervisors with respect to the seventy-one variables rated on the questionnaires.

The program used to compute the "weights" and subsequent discriminant functions was developed by Dr. Robert Pruzek and Mr. Richard Hoffman at the State University of New York at Albany. A copy of this program is on file at this university.

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9 Discriminant Function Analysis, File Name "Discrim." On File at the State University of New York at Albany, New York.
CHAPTER IV

Findings

Discriminant function analysis of responses was used to ascertain similarities and differences among groups in viewing the importance of the ten supervisory activities and reasons given for engaging in the activities. The graphic representations in this chapter illustrate extent of agreement among groups on the importance of the reasons and the activities.

Eleven sets of variables—reasons and activities—were used in the computations. Group means and a grand mean are included in the tables with each analysis. Group means are the averages of the ratings of the variables within each group. The grand mean is the mean of all the individual observations for a variable; it is the weighted average of the group means.

Two discriminant functions on each set of variables were computed for each supervisory group. The first discriminant function derived ($Y_1$) was the best explainer of group variance. The second discriminant function ($Y_2$) served "as the second best explainer of variance."¹

These discriminant functions represented "that linear combination of variables which maximizes the ratio of the between-means variance to

the within-group variance."

Roots of the determinental equation of discriminant function analysis ($C_1$ and $C_2$) were computed to ascertain the importance of the first discriminant function in relation to the second. The second discriminant function was not useful in distinguishing among the three groups if $C_1$ was more than five times greater than $C_2$.

The values of the discriminant functions and the values of the weights used to compute each discriminant function were the bases for interpreting the data. Weights indicated which variables were the most important for distinguishing among the groups. The values of the discriminant functions indicated the relative importance each group placed on each set of variables.

The first part of this chapter contains separate analyses of the ten sets of reasons that accompanied the supervisory activities and analyses of the ten supervisory activities. Each analysis includes:

1. a table which contains the means and discriminant function weights for each of the variables.
2. a table containing the discriminant function values and the $C$ values for each group.
3. a graphic representation which shows the relative values of the discriminant functions.
4. a listing of the set of variables being analyzed.
5. a semantic interpretation of the relationships between the three supervisory groups.

Pronounced similarities and differences among the supervisory groups in their rating of activities and reasons are presented and discussed on pages 78 - 88 in the second part of the chapter.

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\(^2\text{Ibid.},\ p.\ 393.\)
FIRST ANALYSIS

TABLE 2.--Means and discriminant function weights for each of the statements of reason listed under Activity I

<table>
<thead>
<tr>
<th>Reason</th>
<th>Group I Mean</th>
<th>Group II Mean</th>
<th>Group III Mean</th>
<th>Grand Mean</th>
<th>Y1</th>
<th>Y2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2.41</td>
<td>3.89</td>
<td>3.69</td>
<td>3.51</td>
<td>1.21</td>
<td>-2.58</td>
</tr>
<tr>
<td>B</td>
<td>2.44</td>
<td>3.16</td>
<td>2.76</td>
<td>2.82</td>
<td>-0.29</td>
<td>1.41</td>
</tr>
<tr>
<td>C</td>
<td>3.41</td>
<td>5.42</td>
<td>4.49</td>
<td>4.57</td>
<td>2.05</td>
<td>0.92</td>
</tr>
<tr>
<td>D</td>
<td>2.59</td>
<td>3.76</td>
<td>3.12</td>
<td>3.22</td>
<td>0.07</td>
<td>0.86</td>
</tr>
</tbody>
</table>

TABLE 3.--Discriminant function values and C values for the groups on the reasons listed under Activity I

<table>
<thead>
<tr>
<th>Discriminant Function</th>
<th>Group I C1</th>
<th>Group II C1</th>
<th>Group III C1</th>
<th>C1</th>
<th>C2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1</td>
<td>.093</td>
<td>.152</td>
<td>.130</td>
<td>.0702</td>
<td>.0093</td>
</tr>
<tr>
<td>Y2</td>
<td>.0261</td>
<td>.026</td>
<td>.012</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1.--Graph of discriminant function values for the supervisory groups on the set of reasons under activity I.
SUPERVISORY ACTIVITY

I. TAKE PART IN CLASS ACTIVITIES WHEN MAKING CLASSROOM OBSERVATIONS OF TEACHERS (PARTICIPATING OBSERVER)
in order to:

(Reasons)

A. demonstrate a particular concept or technique to a teacher by teaching part of the class period.

B. determine the degree of student interest and understanding by asking individual class members questions.

C. serve as an additional resource for the teacher to utilize as the class situation dictates.

D. maintain a personal involvement with secondary school students.

Interpretation of Data:

The discriminant function weights listed for discriminant function $Y_1$ in table 2 indicate that reasons A and C are the most important, of those listed, for distinguishing between the three supervisory groups. Examination of the group coordinates with respect to the horizontal axis $Y_1$ in figure 1 indicates that group II has a higher discriminant function value than group III, and group III has a higher discriminant function value than group I. The relative importance each group places on reasons A and C is proportional to the value of its discriminant function. Thus, the following interpretation can be made:

Supervising teachers (Group II) considered demonstrating a concept by teaching part of the class (Reason A) and serving as a resource to the teacher (Reason C) to be of greater importance when making classroom observations of teachers (Activity I) than did science department chairmen (Group III). The science department chairmen in
turn considered these reasons to be of greater importance than college supervisors (Group I) for carrying out this activity. An examination of the group means in Table 2 serves to substantiate the above analysis.

Table 3 indicates that the $C_1$ value of the first discriminant function was greater than five times the $C_2$ value for the second discriminant function. Therefore, only the $Y_1$ values for the "weights" and the discriminant functions were used in the interpretation of the data.
SECOND ANALYSIS

TABLE 4.--Means and discriminant function weights for each of the statements of reason listed under Activity II

<table>
<thead>
<tr>
<th>Reason</th>
<th>Group I Mean</th>
<th>Group II Mean</th>
<th>Group III Mean</th>
<th>Grand Mean</th>
<th>Weights for $Y_1$</th>
<th>$Y_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8.08</td>
<td>7.27</td>
<td>7.41</td>
<td>7.49</td>
<td>0.07</td>
<td>2.58</td>
</tr>
<tr>
<td>B</td>
<td>7.15</td>
<td>6.75</td>
<td>7.18</td>
<td>7.04</td>
<td>-0.44</td>
<td>1.54</td>
</tr>
<tr>
<td>C</td>
<td>8.38</td>
<td>8.25</td>
<td>7.86</td>
<td>8.07</td>
<td>3.3</td>
<td>-1.89</td>
</tr>
<tr>
<td>D</td>
<td>7.94</td>
<td>8.02</td>
<td>8.00</td>
<td>7.99</td>
<td>-1.31</td>
<td>-2.76</td>
</tr>
<tr>
<td>E</td>
<td>6.76</td>
<td>6.58</td>
<td>6.52</td>
<td>6.59</td>
<td>0.092</td>
<td>-0.541</td>
</tr>
<tr>
<td>F</td>
<td>8.18</td>
<td>7.55</td>
<td>7.62</td>
<td>7.70</td>
<td>0.88</td>
<td>3.61</td>
</tr>
<tr>
<td>G</td>
<td>5.74</td>
<td>6.18</td>
<td>7.39</td>
<td>6.70</td>
<td>-3.97</td>
<td>0.168</td>
</tr>
<tr>
<td>H</td>
<td>6.41</td>
<td>6.11</td>
<td>5.80</td>
<td>6.01</td>
<td>2.30</td>
<td>-0.821</td>
</tr>
<tr>
<td>I</td>
<td>7.35</td>
<td>7.09</td>
<td>7.18</td>
<td>7.18</td>
<td>0.005</td>
<td>0.212</td>
</tr>
<tr>
<td>J</td>
<td>6.64</td>
<td>6.40</td>
<td>6.38</td>
<td>6.44</td>
<td>-0.041</td>
<td>-0.299</td>
</tr>
</tbody>
</table>

TABLE 5.--Discriminant function values and $C_1$ and $C_2$ values for the groups on the reasons listed under Activity II

<table>
<thead>
<tr>
<th>Discriminant Function</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>$C_1$</th>
<th>$C_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Y_1$</td>
<td>0.146</td>
<td>0.111</td>
<td>0.042</td>
<td>0.23</td>
<td>0.046</td>
</tr>
<tr>
<td>$Y_2$</td>
<td>0.152</td>
<td>0.107</td>
<td>0.1335</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 2.--Graph of discriminant function values for the supervisory groups on the set of reasons under activity II.
SUPERVISORY ACTIVITY

II. MAKE CLASSROOM OBSERVATIONS OF TEACHERS BY ASSUMING A NON-PARTICIPATING IDENTITY (QUIET OBSERVER) in order to:

(Reasons)

A. determine if the teaching methods being used are compatible with the objectives of the course.

B. judge the level of subject matter in relation to course objectives.

C. determine the amount of teacher and pupil interaction.

D. judge the teacher's ability to promote creative thinking by his students.

E. judge the effectiveness of evaluation procedures being used by the teacher.

F. determine if teachers can translate their knowledge of how students learn into effective teaching.

G. evaluate new procedures or instructional materials.

H. identify problems related to learning difficulties of individual students.

I. observe the implementation of approaches previously suggested to the teacher by the supervisor.

J. rate teachers according to their effectiveness.

Interpretation of Data:

Supervising teachers considered reason G as being of greater importance than did science department chairmen. College supervisors considered reasons A, C, F, and H to be of greater importance than did science department chairmen and supervising teachers.

The three supervisory groups showed relatively little difference in their ratings of reasons B, E, I, and J.
THIRD ANALYSIS

TABLE 6.--Means and discriminant function weights for each of the statements of reason listed under Activity III

<table>
<thead>
<tr>
<th>Reason</th>
<th>Group I Mean</th>
<th>Group II Mean</th>
<th>Group III Mean</th>
<th>Grand Mean</th>
<th>Weights for $Y_1$</th>
<th>$Y_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.32</td>
<td>5.69</td>
<td>6.24</td>
<td>5.71</td>
<td>3.78</td>
<td>.658</td>
</tr>
<tr>
<td>B</td>
<td>5.26</td>
<td>6.78</td>
<td>6.26</td>
<td>6.23</td>
<td>-2.01</td>
<td>1.62</td>
</tr>
<tr>
<td>C</td>
<td>5.76</td>
<td>7.18</td>
<td>6.40</td>
<td>6.52</td>
<td>1.99</td>
<td>-1.53</td>
</tr>
</tbody>
</table>

TABLE 7.--Discriminant function values and $C_1$ and $C_2$ values for each group on the reasons listed under Activity III

<table>
<thead>
<tr>
<th>Discriminant Function</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>$C_1$</th>
<th>$C_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Y_1$</td>
<td>.172</td>
<td>.221</td>
<td>.237</td>
<td>.0894</td>
<td>.0655</td>
</tr>
<tr>
<td>$Y_2$</td>
<td>.025</td>
<td>.037</td>
<td>.044</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 3.--Graph of discriminant function values for the supervisory groups on the set of reasons under activity III.
SUPERVISORY ACTIVITY

III. HOLD MEETINGS ON THE LEGAL ASPECTS OF VARIOUS ACTIVITIES IN WHICH TEACHERS ARE INVOLVED
in order to:

(Reasons)

A. identify and request the removal of activities from the curriculum that pose appreciable safety hazards.

B. help them arrive at a decision concerning the use of learning activities that have both potential safety hazards and educational value.

C. provide pertinent information so teachers can arrive at their own decisions concerning the use of instructional activities that have a potential safety hazard.

Interpretation of Data:

Supervising teachers and science department chairmen considered reason A as being of greater importance than did college supervisors.

The mean ratings of variables B and C indicated that the supervising teachers considered these reasons to be more important than did the college supervisors and science department chairmen. The discriminant function weights, however, did not support this analysis. Such a discrepancy can occur if the C value of the second discriminant function is close to the C value of the second discriminant function as was the case in this analysis. The conflicting data for variables B and C negated their consideration in this study.

1 Interview with Dr. Robert Pruzek, Associate Professor of Educational Psychology and Statistics, School of Education, State University of New York at Albany, December, 1968.
FOURTH ANALYSIS

TABLE 8.--Means and discriminant function weights for each of the statements of reason listed under Activity IV

<table>
<thead>
<tr>
<th>Reason</th>
<th>Group I Mean</th>
<th>Group II Mean</th>
<th>Group III Mean</th>
<th>Grand Mean</th>
<th>Weights for $Y_1$</th>
<th>Weights for $Y_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5.58</td>
<td>6.56</td>
<td>6.60</td>
<td>6.39</td>
<td>.26</td>
<td>2.24</td>
</tr>
<tr>
<td>B</td>
<td>5.44</td>
<td>5.60</td>
<td>5.71</td>
<td>5.62</td>
<td>- .59</td>
<td>- .962</td>
</tr>
<tr>
<td>C</td>
<td>6.41</td>
<td>6.60</td>
<td>6.75</td>
<td>6.64</td>
<td>- .54</td>
<td>- .176</td>
</tr>
<tr>
<td>D</td>
<td>5.56</td>
<td>6.18</td>
<td>6.08</td>
<td>6.01</td>
<td>.69</td>
<td>1.81</td>
</tr>
<tr>
<td>E</td>
<td>5.97</td>
<td>6.73</td>
<td>7.59</td>
<td>7.02</td>
<td>2.38</td>
<td>- .439</td>
</tr>
<tr>
<td>F</td>
<td>6.35</td>
<td>7.58</td>
<td>7.81</td>
<td>7.46</td>
<td>2.95</td>
<td>2.50</td>
</tr>
<tr>
<td>G</td>
<td>6.00</td>
<td>5.53</td>
<td>5.67</td>
<td>5.69</td>
<td>- 2.62</td>
<td>1.03</td>
</tr>
</tbody>
</table>

TABLE 9.--Discriminant function values and $C_1$ and $C_2$ values for the groups on the reasons listed under Activity IV

<table>
<thead>
<tr>
<th>Discriminant Function</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>$C_1$</th>
<th>$C_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Y_1$</td>
<td>.156</td>
<td>.227</td>
<td>.248</td>
<td>.212</td>
<td>.047</td>
</tr>
<tr>
<td>$Y_2$</td>
<td>.121</td>
<td>.145</td>
<td>.112</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 4.--Graph of discriminant function values for the supervisory groups on the set of reasons under activity IV.
SUPERVISORY ACTIVITY

IV. CONDUCT MEETINGS WITH TEACHERS ON SELECTED AREAS OF CONTENT 
IN SCIENCE 
in order to:

(Reasons)

A. help teachers improve their science backgrounds in areas
   of inadequacy.

B. aid in the selection of content appropriate for teaching
   the social implications of science.

C. help teachers relate the content they are teaching to
   other courses in the science program.

D. show how the content they are teaching relates to the
   entire school program.

E. help teachers up-date the content of their courses.

F. show how new equipment and/or newly proposed techniques
   can be related to the content.

G. help teachers select professional reading materials.

Interpretation of Data:

Science department chairmen and, to a lesser extent, supervis-
ing teachers considered reasons E and F to be more important than
did college supervisors. College supervisors considered reason G
to be more important than did supervising teachers and science de-
partment chairmen. Supervising teachers considered reasons A and D
to be more important than did college supervisors and department
chairmen. The discriminant function weights indicated very little
difference in the way the three groups rated reasons B and C.
FIFTH ANALYSIS

TABLE 10.—Means and discriminant function weights for each of the statements of reason listed under Activity V

<table>
<thead>
<tr>
<th>Reason</th>
<th>Group I Mean</th>
<th>Group II Mean</th>
<th>Group III Mean</th>
<th>Grand Mean</th>
<th>Y^1</th>
<th>Y^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>6.62</td>
<td>7.15</td>
<td>7.81</td>
<td>7.38</td>
<td>-.70</td>
<td>3.11</td>
</tr>
<tr>
<td>B</td>
<td>5.41</td>
<td>7.80</td>
<td>8.18</td>
<td>7.54</td>
<td>2.72</td>
<td>-.471</td>
</tr>
<tr>
<td>C</td>
<td>5.53</td>
<td>8.15</td>
<td>8.34</td>
<td>7.75</td>
<td>2.56</td>
<td>-.586</td>
</tr>
<tr>
<td>D</td>
<td>7.65</td>
<td>7.71</td>
<td>7.67</td>
<td>7.69</td>
<td>- .659</td>
<td>2.19</td>
</tr>
<tr>
<td>E</td>
<td>7.38</td>
<td>7.91</td>
<td>7.14</td>
<td>7.42</td>
<td>- .829</td>
<td>-3.72</td>
</tr>
<tr>
<td>F</td>
<td>5.53</td>
<td>7.64</td>
<td>7.73</td>
<td>7.28</td>
<td>1.09</td>
<td>- .231</td>
</tr>
<tr>
<td>G</td>
<td>7.62</td>
<td>7.95</td>
<td>7.74</td>
<td>7.78</td>
<td>- .954</td>
<td>1.15</td>
</tr>
</tbody>
</table>

TABLE 11.—Discriminant function values and C values for the groups on the reasons listed under Activity V

<table>
<thead>
<tr>
<th>Discriminant Function</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>C_1</th>
<th>C_2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y^1</td>
<td>.118</td>
<td>.262</td>
<td>.282</td>
<td>.686</td>
<td>.078</td>
</tr>
<tr>
<td>Y^2</td>
<td>.116</td>
<td>.086</td>
<td>.129</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 5.—Graph of discriminant function values for the supervisory groups on the set of reasons under activity V.
SUPERVISORY ACTIVITY

V. CONDUCT ORIENTATION MEETINGS WITH BEGINNING TEACHERS OR STUDENT TEACHERS in order to:

(Reasons)

A. assist them in understanding the implications of the total school policy for their individual teaching situations.

B. acquaint them with science department policies and objectives.

C. acquaint them with available science supplies and equipment.

D. encourage them to observe experienced teachers in other science classes.

E. arrange for them to observe science classes they will teach.

F. introduce them to other members of the staff.

G. discuss ideas and procedures regarding daily lesson plans and long range planning.

Interpretation of Data:

Science department chairmen and supervising teachers considered reasons B, C, and F to be of greater importance than did college science supervisors. The discriminant function weights indicated that there was relatively little difference in the way the three groups rated reason D. The second discriminant function was not used in this analysis because of the relatively low $C_2$ value.
SIXTH ANALYSIS

TABLE 12.—Means and discriminant function weights for each of the statements of reason listed under Activity VI

<table>
<thead>
<tr>
<th>Reason</th>
<th>Group I Mean</th>
<th>Group II Mean</th>
<th>Group III Mean</th>
<th>Grand Mean</th>
<th>Weights for Y1</th>
<th>Y2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5.97</td>
<td>4.49</td>
<td>5.77</td>
<td>5.41</td>
<td>1.02</td>
<td>2.35</td>
</tr>
<tr>
<td>B</td>
<td>6.74</td>
<td>5.67</td>
<td>7.02</td>
<td>6.55</td>
<td>.86</td>
<td>-.0011</td>
</tr>
<tr>
<td>C</td>
<td>6.03</td>
<td>5.07</td>
<td>6.57</td>
<td>6.01</td>
<td>2.17</td>
<td>-1.61</td>
</tr>
<tr>
<td>D</td>
<td>5.26</td>
<td>3.80</td>
<td>4.20</td>
<td>4.28</td>
<td>-.235</td>
<td>2.61</td>
</tr>
<tr>
<td>E</td>
<td>6.00</td>
<td>4.91</td>
<td>5.78</td>
<td>5.55</td>
<td>-.374</td>
<td>-.0051</td>
</tr>
</tbody>
</table>

TABLE 13.—Discriminant function values and C values for the groups on the reasons listed under Activity VI

<table>
<thead>
<tr>
<th>Discriminant Function</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>C1</th>
<th>C2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1</td>
<td>.104</td>
<td>.097</td>
<td>.142</td>
<td>.096</td>
<td>.059</td>
</tr>
<tr>
<td>Y2</td>
<td>.150</td>
<td>.098</td>
<td>.110</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 6.—Graph of discriminant function values for the supervisory groups on the set of reasons under activity VI.
SUPERVISORY ACTIVITY

VI. CONDUCT SEMINARS ON RESEARCH THAT RELATES TO SECONDARY SCIENCE TEACHING
in order to:

(Reasons)

A. report pertinent implications to the teachers.

B. provide stimulation, encouragement, and guidance for teachers who wish to develop new courses and new methods of instruction.

C. provide a basis for conducting systematic studies to evaluate current conditions and make recommendations for change.

D. help train teachers in research techniques.

E. develop a variety of resources which can be placed at the disposal of teachers who are interested in research and experimentation.

Interpretation of Data:

College supervisors and science department chairmen considered all reasons under this activity to be more important than did supervising teachers. College supervisors considered reason D to be more important than did science department chairmen. The latter group considered reason C to be more important than did college supervisors. The science department chairmen and college supervisors showed close agreement in their rating of reason A.
SEVENTH ANALYSIS

TABLE 14.—Means and discriminant function weights for each of the statements of reason listed under Activity VII

<table>
<thead>
<tr>
<th>Reason</th>
<th>Group I Mean</th>
<th>Group II Mean</th>
<th>Group III Mean</th>
<th>Grand Mean</th>
<th>Weights for Y₁</th>
<th>Y₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.79</td>
<td>5.11</td>
<td>7.01</td>
<td>6.00</td>
<td>2.54</td>
<td>-1.24</td>
</tr>
<tr>
<td>B</td>
<td>5.44</td>
<td>4.75</td>
<td>5.78</td>
<td>5.39</td>
<td>.860</td>
<td>-2.09</td>
</tr>
<tr>
<td>C</td>
<td>5.26</td>
<td>5.96</td>
<td>6.39</td>
<td>6.04</td>
<td>.379</td>
<td>1.92</td>
</tr>
<tr>
<td>D</td>
<td>6.15</td>
<td>6.95</td>
<td>7.03</td>
<td>6.84</td>
<td>1.25</td>
<td>2.03</td>
</tr>
<tr>
<td>E</td>
<td>4.71</td>
<td>4.22</td>
<td>5.47</td>
<td>4.94</td>
<td>.172</td>
<td>-1.17</td>
</tr>
<tr>
<td>F</td>
<td>6.35</td>
<td>6.82</td>
<td>8.00</td>
<td>7.32</td>
<td>2.33</td>
<td>.428</td>
</tr>
</tbody>
</table>

TABLE 15.—Discriminant function values and C values for the groups on the reasons listed under Activity VII

<table>
<thead>
<tr>
<th>Discriminant Function</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>C₁</th>
<th>C₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y₁</td>
<td>.134</td>
<td>.145</td>
<td>.212</td>
<td>.227</td>
<td>.056</td>
</tr>
<tr>
<td>Y₂</td>
<td>.078</td>
<td>.130</td>
<td>.106</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 7.—Graph of discriminant function values for the supervisory groups on the set of reasons under activity VII.
SUPERVISORY ACTIVITY

VII. MAKE PROVISIONS FOR TEACHERS TO HAVE RELEASED TIME FROM CLASSROOM RESPONSIBILITIES in order to:

(Reasons)

A. promote their participation in local, regional, state, and national science and educational organizations.

B. encourage individual or cooperative research projects.

C. provide an opportunity to explore and incorporate community resources into teaching programs.

D. provide opportunities to observe other classes.

E. encourage professional writing concerning activities in which they are involved.

F. provide an opportunity to develop more effective laboratory experiences.

Interpretation of Data:

Science department chairmen considered reasons A and F and, to a lesser extent, reason E to be of greater importance than did college supervisors and supervising teachers. College supervisors and science department chairmen considered reason B to be of greater importance than did supervising teachers. Supervising teachers and science department chairmen considered reason D and, to a lesser extent, reason C to be of greater importance than did college supervisors.
EIGHTH ANALYSIS

TABLE 16.--Means and discriminant function weights for each of the statements of reason listed under Activity VIII

<table>
<thead>
<tr>
<th>Reason</th>
<th>Group I Mean</th>
<th>Group II Mean</th>
<th>Group III Mean</th>
<th>Grand Mean</th>
<th>Weights for $Y_1$</th>
<th>$Y_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>7.06</td>
<td>6.87</td>
<td>7.43</td>
<td>7.19</td>
<td>.014</td>
<td>-.124</td>
</tr>
<tr>
<td>B</td>
<td>5.29</td>
<td>5.16</td>
<td>5.54</td>
<td>5.38</td>
<td>.153</td>
<td>-.396</td>
</tr>
<tr>
<td>C</td>
<td>6.35</td>
<td>6.43</td>
<td>7.10</td>
<td>6.86</td>
<td>1.30</td>
<td>3.05</td>
</tr>
<tr>
<td>D</td>
<td>6.00</td>
<td>6.36</td>
<td>7.33</td>
<td>6.80</td>
<td>4.11</td>
<td>-1.55</td>
</tr>
</tbody>
</table>

TABLE 17.--Discriminant function values and C values for the groups on the reasons listed under Activity VIII

<table>
<thead>
<tr>
<th>Discriminant Function</th>
<th>Group I $Y_1$</th>
<th>Group II $Y_1$</th>
<th>Group III $Y_1$</th>
<th>$C_1$</th>
<th>$C_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Y_1$</td>
<td>.361</td>
<td>.369</td>
<td>.420</td>
<td>.072</td>
<td>.0185</td>
</tr>
<tr>
<td>$Y_2$</td>
<td>.219</td>
<td>.192</td>
<td>.210</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 8.--Graph of discriminant function values for the supervisory groups on the set of reasons under activity VIII.
SUPERVISORY ACTIVITY

VIII. USE THE CONCEPT OF GROUP PROCESS WHEN DISCUSSING EFFECTIVE SCIENCE TEACHING
in order to:

(Reasons)

A. involve teachers in the expression, sharing, and evaluation of individual ideas.

B. provide an opportunity for the supervisor to evaluate teachers in relation to interest and productivity in group activities.

C. provide teachers with a deeper understanding of the problem being considered and the basis for the decision reached.

D. relate activities of teachers who are teaching different courses.

E. increase the probability that decisions reached by the group will be implemented.

Interpretation of Data:

Science department chairmen considered reason E more important than did supervising teachers and college supervisors. College supervisors and science department chairmen considered reasons C and D more important than did supervising teachers. The three groups showed relatively little difference in their ratings of reasons A and B.
NINTH ANALYSIS

TABLE 18.—Means and discriminant function weights for each of the statements of reason listed under Activity IX

<table>
<thead>
<tr>
<th>Reason</th>
<th>Group I Mean</th>
<th>Group II Mean</th>
<th>Group III Mean</th>
<th>Grand Mean</th>
<th>Weights for Y₁</th>
<th>Y₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>7.71</td>
<td>7.56</td>
<td>8.40</td>
<td>8.01</td>
<td>.59</td>
<td>-1.33</td>
</tr>
<tr>
<td>B</td>
<td>6.47</td>
<td>5.96</td>
<td>7.23</td>
<td>6.70</td>
<td>.579</td>
<td>1.53</td>
</tr>
<tr>
<td>C</td>
<td>7.44</td>
<td>7.11</td>
<td>7.91</td>
<td>7.57</td>
<td>- .659</td>
<td>.350</td>
</tr>
<tr>
<td>D</td>
<td>6.59</td>
<td>6.38</td>
<td>7.87</td>
<td>7.17</td>
<td>.718</td>
<td>1.63</td>
</tr>
<tr>
<td>E</td>
<td>6.00</td>
<td>6.25</td>
<td>7.88</td>
<td>7.02</td>
<td>2.97</td>
<td>-3.08</td>
</tr>
<tr>
<td>F</td>
<td>7.56</td>
<td>6.85</td>
<td>7.80</td>
<td>7.46</td>
<td>.438</td>
<td>3.54</td>
</tr>
</tbody>
</table>

TABLE 19.—Discriminant function values and C values for the groups on the reasons listed under Activity IX

<table>
<thead>
<tr>
<th>Discriminant Function</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>C₁</th>
<th>C₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y₁</td>
<td>.226</td>
<td>.234</td>
<td>.296</td>
<td>.188</td>
<td>.0395</td>
</tr>
<tr>
<td>Y₂</td>
<td>.213</td>
<td>.169</td>
<td>.188</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 9.—Graph of discriminant function values for the supervisory groups on the set of reasons under activity IX.
SUPERVISORY ACTIVITY

IX. KEEP UP-TO-DATE ON LOCAL, STATE, AND NATIONAL CURRICULUM PROGRAMS THAT RELATE TO SECONDARY SCIENCE TEACHING in order to:

(Reasons)

A. be in a position to recommend programs better adapted to pupil needs.

B. provide a basis for organizing committees to study and develop curriculum materials.

C. help maintain curricular continuity by the selection of appropriate curriculum materials.

D. better represent the department in communications with the school administration.

E. provide a basis for recommending adjustments in the curriculum as personnel changes occur in the department.

F. be in a position to recommend curriculum materials that are compatible with community needs and resources.

Interpretation of Data:

Science department chairmen considered reason E and, to a lesser extent, reasons A, B, and D to be more important than did supervising teachers and college supervisors. Science department chairman and college supervisors considered reason F to be more important than did supervising teachers.
TENTH ANALYSIS

TABLE 20.--Means and discriminant function weights for each of the statements of reason listed under Activity X

<table>
<thead>
<tr>
<th>Reason</th>
<th>Group I Mean</th>
<th>Group II Mean</th>
<th>Group III Mean</th>
<th>Grand Mean</th>
<th>Weights for $Y_1$</th>
<th>$Y_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>7.56</td>
<td>7.16</td>
<td>7.37</td>
<td>7.34</td>
<td>-.628</td>
<td>2.47</td>
</tr>
<tr>
<td>B</td>
<td>7.47</td>
<td>7.73</td>
<td>7.76</td>
<td>7.70</td>
<td>-.0176</td>
<td>-2.22</td>
</tr>
<tr>
<td>C</td>
<td>8.44</td>
<td>8.24</td>
<td>8.38</td>
<td>8.35</td>
<td>.359</td>
<td>.419</td>
</tr>
<tr>
<td>D</td>
<td>7.35</td>
<td>7.40</td>
<td>7.39</td>
<td>7.39</td>
<td>.606</td>
<td>.135</td>
</tr>
<tr>
<td>E</td>
<td>6.29</td>
<td>6.04</td>
<td>6.69</td>
<td>6.41</td>
<td>.002</td>
<td>1.63</td>
</tr>
<tr>
<td>F</td>
<td>5.94</td>
<td>6.80</td>
<td>6.98</td>
<td>6.73</td>
<td>.255</td>
<td>-3.08</td>
</tr>
<tr>
<td>G</td>
<td>7.59</td>
<td>7.51</td>
<td>7.84</td>
<td>7.69</td>
<td>-.852</td>
<td>.906</td>
</tr>
<tr>
<td></td>
<td>5.91</td>
<td>5.69</td>
<td>8.24</td>
<td>7.01</td>
<td>3.67</td>
<td>.159</td>
</tr>
</tbody>
</table>

TABLE 21.--Discriminant function values and C values for the groups on the reasons listed under Activity X

<table>
<thead>
<tr>
<th>Discriminant Function</th>
<th>Group I $C_1$</th>
<th>Group II $C_1$</th>
<th>Group III $C_1$</th>
<th>$C_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Y_1$</td>
<td>.104</td>
<td>.101</td>
<td>.191</td>
<td>.357</td>
</tr>
<tr>
<td>$Y_2$</td>
<td>.233</td>
<td>.172</td>
<td>.194</td>
<td>.077</td>
</tr>
</tbody>
</table>

Fig. 10.--Graph of discriminant function values for the supervisory groups on the set of reasons under activity X.
SUPERVISORY ACTIVITY

X. CONDUCT INDIVIDUAL CONFERENCES WITH TEACHERS
in order to:

(Reasons)

A. help each teacher understand how his activities contribute to the entire science program.

B. improve a teacher's attitude towards a particular responsibility with which he is involved.

C. identify difficulties and help teachers find a means of overcoming them.

D. help teachers determine the progress of their students in relation to the objectives of the entire science program.

E. provide increased understanding of the role of the supervisor in developing a more effective science program.

F. discuss the degree to which past suggestions of the supervisor have been implemented.

G. discuss a particular concept or technique that a teacher wants to incorporate into his science course.

H. serve as a channel of communication between the teacher and the school administration.

Interpretation of Data:

Science department chairmen considered reason H to be of greater importance than did college supervisors and supervising teachers. Supervising teachers and science department chairmen considered reasons B and F to be of more importance than did college supervisors. College supervisors considered reason A to be more important than supervising teachers and science department chairmen. The discriminant function weights indicated little difference in the ways the three groups rated reasons C, D, and G.
TABLE 22.—Means and discriminant function weights for each of the supervisory activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Group I Mean</th>
<th>Group II Mean</th>
<th>Group III Mean</th>
<th>Grand Mean</th>
<th>Weights for $Y_1$</th>
<th>Weights for $Y_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>2.29</td>
<td>4.05</td>
<td>3.06</td>
<td>3.22</td>
<td>-1.16</td>
<td>- .786</td>
</tr>
<tr>
<td>II</td>
<td>8.29</td>
<td>7.60</td>
<td>7.93</td>
<td>7.90</td>
<td>.874</td>
<td>-.480</td>
</tr>
<tr>
<td>III</td>
<td>4.08</td>
<td>5.67</td>
<td>5.56</td>
<td>5.31</td>
<td>-1.55</td>
<td>-.384</td>
</tr>
<tr>
<td>IV</td>
<td>5.67</td>
<td>6.58</td>
<td>7.34</td>
<td>6.79</td>
<td>-.485</td>
<td>2.06</td>
</tr>
<tr>
<td>V</td>
<td>7.32</td>
<td>8.25</td>
<td>8.30</td>
<td>8.10</td>
<td>-1.76</td>
<td>.635</td>
</tr>
<tr>
<td>VI</td>
<td>6.12</td>
<td>4.05</td>
<td>5.56</td>
<td>5.20</td>
<td>2.91</td>
<td>.039</td>
</tr>
<tr>
<td>VII</td>
<td>5.50</td>
<td>6.05</td>
<td>7.13</td>
<td>6.49</td>
<td>-.685</td>
<td>1.43</td>
</tr>
<tr>
<td>VIII</td>
<td>6.68</td>
<td>6.35</td>
<td>7.12</td>
<td>6.80</td>
<td>-.226</td>
<td>.195</td>
</tr>
<tr>
<td>IX</td>
<td>7.97</td>
<td>7.52</td>
<td>8.50</td>
<td>8.10</td>
<td>1.36</td>
<td>2.22</td>
</tr>
<tr>
<td>X</td>
<td>8.56</td>
<td>8.02</td>
<td>8.36</td>
<td>8.29</td>
<td>1.41</td>
<td>-.511</td>
</tr>
</tbody>
</table>

TABLE 23.—Discriminant function values and C values for each group on the supervisory activities

<table>
<thead>
<tr>
<th>Discriminant Function</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>C1</th>
<th>C2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Y_1$</td>
<td>.182</td>
<td>.034</td>
<td>.099</td>
<td>.468</td>
<td>.179</td>
</tr>
<tr>
<td>$Y_2$</td>
<td>.318</td>
<td>.325</td>
<td>.385</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 11.—Graph of discriminant function values for the supervisory groups on the ten supervisory activities.
SUPERVISORY ACTIVITY

I. TAKE PART IN CLASS ACTIVITIES WHEN MAKING CLASSROOM OBSERVATIONS OF TEACHERS (PARTICIPATING OBSERVER).

II. MAKE CLASSROOM OBSERVATIONS OF TEACHERS BY ASSUMING A NON-PARTICIPATING IDENTITY (QUIET OBSERVER).

III. HOLD MEETINGS ON THE LEGAL ASPECTS OF VARIOUS ACTIVITIES IN WHICH TEACHERS ARE INVOLVED.

IV. CONDUCT MEETINGS WITH TEACHERS ON SELECTED AREAS OF CONTENT IN SCIENCE.

V. CONDUCT ORIENTATION MEETINGS WITH BEGINNING TEACHERS OR STUDENT TEACHERS.

VI. CONDUCT SEMINARS ON RESEARCH THAT RELATES TO SECONDARY SCIENCE TEACHING.

VII. MAKE PROVISIONS FOR TEACHERS TO HAVE RELEASED TIME FROM CLASSROOM RESPONSIBILITIES.

VIII. USE THE CONCEPT OF GROUP PROCESS (THE DEMOCRATIC PROCEDURES BY WHICH A GROUP OF INDIVIDUALS IDENTIFIES, EXPLORSES, ATTACKS, AND ATTEMPTS TO SOLVE A PROBLEM OF COMMON CONCERN) WHEN DISCUSSING EFFECTIVE SCIENCE TEACHING.

IX. KEEP UP-TO-DATE ON LOCAL, STATE, AND NATIONAL CURRICULUM PROGRAMS THAT RELATE TO SECONDARY SCIENCE TEACHING.

X. CONDUCT INDIVIDUAL CONFERENCES WITH TEACHERS.

Interpretation of Data:

Supervising teachers considered activities I and III to be more important than did science department chairmen and college supervisors. College supervisors considered activity VI and, to a lesser extent, activities II and X to be more important than did supervising teachers and science department chairmen. The latter group considered activities IV, VII, and IX to be more important than did college supervisors and supervising teachers. College supervisors and science department
chairmen considered activity IX to be more important than did supervising teachers. Science department chairmen and supervising teachers considered activity V to be more important than did college supervisors. The discriminant function weights indicated the least amount of difference in the ways the three groups rated activity VIII.
Summary of Data

The interpretation of the data indicated distinct differences and similarities among the groups in their ratings of activities and supporting reasons. Five grids are used to present these comparisons. Each activity is included. The activities are ranked and paired in the grids in descending order of difference in ratings by the three groups. Since the objective is to contrast the view of college supervisors, supervising teachers, and science department chairmen, only those reasons corresponding to strong similarities and differences are shown. Within categories, those reasons on which the groups differed most are listed near the top of the grid. Each grid contains a row of symbols for each of the listed variables. A key to the symbols used appears at the top of each grid.
**Relationships between the supervisory groups on Activities VI and IX**

(+) considered the variable to be of the most relative importance  
(-) considered the variable to be of the least relative importance  
(*) considered the variable to be of intermediate relative importance  
(=) considered the variable to be of the same relative importance

<table>
<thead>
<tr>
<th>Groups</th>
<th>CS I</th>
<th>ST II</th>
<th>SDC III</th>
</tr>
</thead>
<tbody>
<tr>
<td>VI. Conduct seminars on research that relates to science teaching</td>
<td>(+)</td>
<td>(-)</td>
<td>(*)</td>
</tr>
<tr>
<td>D. to help train teachers in research techniques</td>
<td>(+)</td>
<td>(-)</td>
<td>(*)</td>
</tr>
<tr>
<td>A. to report pertinent implications to the teachers</td>
<td>(=)</td>
<td>(=)</td>
<td>(*)</td>
</tr>
<tr>
<td>C. to provide a basis for conducting systematic studies to evaluate current conditions and make recommendations for change</td>
<td>(*)</td>
<td>(-)</td>
<td>(+)</td>
</tr>
<tr>
<td>IX. Keep up-to-date on local, state, and national curriculum programs that relate to secondary science teaching</td>
<td>(-)</td>
<td>(*)</td>
<td>(+)</td>
</tr>
<tr>
<td>E. to provide a basis for recommending adjustments in the curriculum as personnel changes occur in the department</td>
<td>(=)</td>
<td>(=)</td>
<td>(+)</td>
</tr>
<tr>
<td>F. to be in a position to recommend curriculum materials that are compatible with community needs and resources</td>
<td>(=)</td>
<td>(-)</td>
<td>(=)</td>
</tr>
</tbody>
</table>

Fig. 12.--Grid of activities and VI and IX²

**Activity VI.** - The three supervisory groups showed the most difference in their rating of this activity. College supervisors considered conducting seminars for training teachers in research techniques to be

²See pages 65, 71 and 75 for detailed numerical data
more important than did science department chairmen. The latter group viewed conducting seminars on research for evaluating current conditions and for stimulating the development of new courses to be more important than did college supervisors. Science department chairmen and college supervisors showed close agreement on the importance of conducting seminars on research for the purpose of reporting pertinent findings to their teachers. Cooperating teachers viewed all aspects of this activity as less important than did the other two groups.

IX. - Science department chairmen considered keeping up-to-date on curriculum programs to be more important for recommending adjustments in the curriculum than did college supervisors and supervising teachers. College supervisors and science department chairmen regarded keeping informed on curriculum programs to be more important for recommending curriculum materials commensurate with community needs and resources than did supervising teachers.
Relationships between the supervisory groups on Activities IV and V

(+) considered the variable to be of the most relative importance  
(-) considered the variable to be of the least relative importance  
(*) considered the variable to be of intermediate relative importance  
(=) considered the variable to be of the same relative importance

<table>
<thead>
<tr>
<th>Groups</th>
<th>CS I</th>
<th>ST II</th>
<th>SDC III</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV. Conduct meetings with teachers on selected areas of content in science.</td>
<td>-</td>
<td>*</td>
<td>+</td>
</tr>
<tr>
<td>F. to show how new equipment and/or newly proposed techniques can be related to the content.</td>
<td>-</td>
<td>*</td>
<td>+</td>
</tr>
<tr>
<td>G. to help teachers select professional reading materials.</td>
<td>+</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>E. to help teachers up-date the content of their courses.</td>
<td>-</td>
<td>*</td>
<td>+</td>
</tr>
<tr>
<td>B. to aid in the selection of content appropriate for teaching the social implications of science.</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>C. to help teachers relate the content they are teaching to other courses in the science program.</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>V. Conduct orientation meetings with beginning teachers or student teachers.</td>
<td>-</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>B. to acquaint them with science department policies and objectives.</td>
<td>-</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>C. to acquaint them with available science supplies and equipment.</td>
<td>-</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>D. to encourage them to observe experienced teachers in other science classes.</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
</tbody>
</table>

Fig. 13.—Grid of activities IV and V

See pages 61, 63 and 75 for detailed numerical data
Activity IV. - Secondary science supervisors viewed helping teachers up-date course content and showing how new equipment and techniques can be related to content as being more important reasons for conducting meetings on selected areas of content than did the other two groups. College supervisors considered helping teachers select professional reading materials as a more important reason for conducting content-oriented meetings than did the other groups. All three groups regarded selecting content for teaching the social implications of science and helping teachers relate their course content to other courses in the science program as equally important reasons for conducting this type of meeting.

Activity V. - Science department chairmen and supervising teachers considered acquainting teachers with departmental policies and objectives, and acquainting teachers with science supplies and equipment to be more important reasons for conducting orientation sessions than did college supervisors. All three groups considered conducting orientation meetings for encouraging beginning teachers to observe experienced teachers to be of equal importance.
Relationships between the supervisory groups on Activities VII and I

(+) considered the variable to be of the most relative importance
(-) considered the variable to be of the least relative importance
(*) considered the variable to be of intermediate relative importance
(={) considered the variable to be of the same relative importance

<table>
<thead>
<tr>
<th>Groups</th>
<th>CS I</th>
<th>ST II</th>
<th>SDC III</th>
</tr>
</thead>
<tbody>
<tr>
<td>VII. Make provisions for teachers to have released time from classroom responsibilities.</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>A. to promote their participation in local, regional, state, and national science and education organizations.</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>F. to provide an opportunity to develop more effective laboratory experiences.</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>I. Take part in class activities when making classroom observations of teachers</td>
<td>-</td>
<td>+</td>
<td>*</td>
</tr>
<tr>
<td>C. to serve as an additional resource for the teacher to utilize as the class situation dictates.</td>
<td>-</td>
<td>+</td>
<td>*</td>
</tr>
<tr>
<td>A. to demonstrate a particular concept or technique to a teacher by teaching part of the class period.</td>
<td>-</td>
<td>+</td>
<td>*</td>
</tr>
</tbody>
</table>

Fig. 14.–Grid of activities VII and I

Activity VII. - Science department chairmen considered encouraging teachers to participate in professional organizations and providing teachers with an opportunity to develop more effective laboratory experiences as more important reasons for providing teachers with released time than did college supervisors and supervising teachers. The latter two groups

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4See pages 54, 67 and 75 for detailed numerical data
showed very little difference in their rating of this activity and the above two reasons.

Activity I. - Supervising teachers regarded serving as an additional resource and demonstrating a particular technique to be more important reasons for taking part in class activities when making observations than did the other groups. College supervisors rated this activity and all its reasons lower than did the other two groups.
Relationships between the supervisory groups on Activities III and X

(+) considered the variable to be of the most relative importance
(-) considered the variable to be of the least relative importance
(*) considered the variable to be of intermediate relative importance
(=) considered the variable to be of the same relative importance

<table>
<thead>
<tr>
<th>Groups</th>
<th>CS I</th>
<th>ST II</th>
<th>SDC III</th>
</tr>
</thead>
<tbody>
<tr>
<td>III.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hold meetings on the legal aspects of various activities in which teachers are involved.</td>
<td>-</td>
<td>+</td>
<td>*</td>
</tr>
<tr>
<td>A. to identify and request the removal of activities from the curriculum that pose appreciable safety hazards.</td>
<td>-</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>X. Conduct individual conferences with teachers</td>
<td>+</td>
<td>-</td>
<td>*</td>
</tr>
<tr>
<td>H. to serve as a channel of communication between the teacher and school administration.</td>
<td>=</td>
<td>=</td>
<td>+</td>
</tr>
<tr>
<td>F. to discuss the degree to which past suggestions of the supervisor have been implemented.</td>
<td>-</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>D. to help teachers determine the progress of their students in relation to the objectives of the entire science program.</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>C. to identify difficulties and help teachers find a means of overcoming them.</td>
<td>=</td>
<td>=</td>
<td>=</td>
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</tbody>
</table>

Fig. 15.--Grid of activities III and X

Activity III. - Supervising teachers and science department chairmen considered the identification and removal of potentially hazardous instructional activities a more important reason for holding meetings on the legal aspects of teaching than did college supervisors.

See pages 59, 73 and 75 for detailed numerical data.
Activity X. - Science department chairmen viewed serving as a communications link between the teacher and school administration as a more important reason for conducting individual conferences than did the other two groups. Supervising teachers and science department chairmen considered implementation of past suggestions of the supervisor to be a more important reason for conducting individual conferences than did college supervisors. All three groups showed close agreement on conducting individual conferences for the purpose of helping teachers relate the progress of their students to the objectives of the science program and for helping teachers to identify difficulties and finding a means of overcoming them.
Relationships between the supervisory groups on Activities II and VIII

(+): considered the variable to be of the most relative importance
(-): considered the variable to be of the least relative importance
(*) : considered the variable to be of intermediate relative importance
(=): considered the variable to be of the same relative importance

<table>
<thead>
<tr>
<th>Groups</th>
<th>CS I</th>
<th>ST II</th>
<th>SDC III</th>
</tr>
</thead>
<tbody>
<tr>
<td>II. Make classroom observations of teachers by assuming a non-participating identity.</td>
<td>+</td>
<td>-</td>
<td>*</td>
</tr>
<tr>
<td>G. to evaluate new procedures or instructional materials.</td>
<td>-</td>
<td>*</td>
<td>+</td>
</tr>
<tr>
<td>C. to determine the amount of teacher and pupil interaction.</td>
<td>+</td>
<td>*</td>
<td>-</td>
</tr>
<tr>
<td>I. to observe the implementation of approaches previously suggested to the teacher by the supervisor.</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>J. to rate teachers according to their effectiveness.</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>VIII. Use the concept of group process when discussing effective science teaching.</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>E. to increase the probability that decisions reached by the group will be implemented.</td>
<td>=</td>
<td>=</td>
<td>+</td>
</tr>
<tr>
<td>C. to provide teachers with a better understanding of the problem being considered and the basis for the decision reached.</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>A. to involve teachers in the expression, sharing, and evaluation of individual ideas.</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
</tbody>
</table>

Fig. 16.--Grid of activities II and VIII

Activity II. - Science department chairmen viewed the evaluation of new procedures and instructional materials as a more important reason

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6 See pages 57, 69 and 75 for detailed numerical data
for making classroom observations of teachers than did college supervisors and supervising teachers. College supervisors considered making classroom observations of teachers for determining the amount of teacher and pupil interaction to be more important than did the other two groups. All three supervisory groups showed close agreement on the importance of making classroom observations to observe the implementation of approaches previously suggested to the teacher by the supervisor, and to rate teachers according to their effectiveness.

Activity VIII. - Science department chairmen regarded the use of group process for promoting the implementation of decisions related to effective science teaching to be more important than the other groups. College supervisors and science department chairmen viewed the use of group process as being more important for providing teachers with a better understanding of the problem being considered than did supervising teachers. The groups showed little difference in their rating of using group process for the purpose of involving teachers in the expression, sharing, and evaluation of individual ideas.

Examination of the mean ratings of the activities in the previous grids indicates that no group viewed taking part in class activities when making classroom observations of teachers as an important activity. Science department chairmen assigned higher relative ratings to a larger number of activities than did the college supervisors and the supervising teachers. Science department chairmen rated all the activities except I, III, and VI as being of great importance. College supervisors and supervising teachers rated fewer than half of the activities in this study as being of great importance.
CHAPTER V

Conclusions and Implications

The latter part of chapter four was devoted to an analysis of the similarities and differences that existed among the supervisory groups with respect to their ratings of the supervisory activities and reasons. This analysis did not indicate any clear accord on the rationale supporting the activities. In no instance did all the groups show strong agreement on the degree of importance that should be given a single activity or all of its reasons. In the case of six activities, there was little agreement among the groups on any of the listed reasons. The groups did, however, show close agreement on some of the reasons for the other activities.

If these groups did have a common philosophy, then there were internal inconsistencies. If a philosophy of supervision is not shared in common, then one should be able to hypothesize the existence of elements in the background and experience of the supervisory groups which account for the divergent views.

The conclusions drawn in this study are based on a comparison of the thinking of the supervisory groups in this study with recommendations for effective pre-service and in-service supervision as presented in the literature. Each series of conclusions is followed by a brief discussion of its implications for secondary science supervision.
Participating during classroom observations

Is it important for the supervisor and teacher to work together in the classroom to remedy problems and initiate change? The writers in the literature assert that this is the case.\(^1\) The three supervisory groups in this study, however, did not support this viewpoint. They rated this activity relatively low and showed very little agreement on the reasons why this type of activity should be carried out. College supervisors rated all aspects of this activity lower than did the other groups. Pre-service and in-service supervisors did not endorse participation in the classroom activities of their teachers.

This response may derive from administrative or academic limitations on the supervisor's position. It is also possible that the supervisor believes there is insufficient time to implement this type of activity effectively. Most of the college supervisors in this study taught two or more other college courses, the supervising teachers taught four or more classes, and most of the science department chairmen taught two or more classes in addition to their administrative responsibilities.

Non-participation during classroom observations

Current writers hold that it is more important to make constructive recommendations for improving instruction than it is to engage in the inspectional function of rating teachers.\(^2\) The three super-

\(^1\)Supra, pp. 16-20.

\(^2\)Supra, p. 16.
visory groups rated making non-participating classroom observations relatively high. They were in closest agreement on making classroom observations for the purpose of rating teachers with mean ratings signifying moderate importance.

Note the lack of correspondence between the theory and the thinking of practitioners. Supervisory groups may be acting under local pressures such as those associated with assigning a grade to a student teacher or making recommendations for merit pay or tenure.

Meetings on the legal aspects of classroom activities

Should the supervisor spend part of his time conducting meetings on the legal aspects of activities with which his teachers might become involved? The literature on supervision provides little guidance for the supervisor regarding this question. The legal responsibilities of supervisors are, however, given considerable attention in books on school law. Science department chairmen and supervising teachers considered this activity more important than did college supervisors for identifying and requesting the removal from the curriculum of activities that pose appreciable safety hazards.

College supervisors may view this activity as one of the cooperating school's responsibilities.

Meetings on science content

Writers in the literature viewed in-service meetings related to
science content as important in building laboratory experiences, new science programs, and projecting science equipment utilization. Science department chairmen showed closer agreement with the literature on this activity than did the other groups. They regarded helping teachers update course content and relating new equipment and techniques to content to be more important reasons for conducting meetings on content than did college supervisors and supervising teachers. College supervisors viewed conducting meetings on content to help teachers select professional reading materials to be more important than did the other groups. All three groups showed close accord on the importance of conducting meetings to select content for teaching the social implications of science, and to help teachers relate the content they are teaching to other courses in the science program.

The importance given to the above diverse array of supervisory responsibilities suggests that when discussing the theory of supervision, one should consider not only the theoretical parameters of learning, testing, and group process, but also practical considerations such as selection of classroom equipment, sequencing of content, relating content to other courses in the school curriculum, and discussing social implications of course content.

Conducting orientation meetings with beginning or student teachers

Is it necessary for the supervisor to provide orientation meet-

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4 Supra, pp. 24, 26.
ings for beginning or student teachers? Writers in the literature claim this type of activity can forestall problems and convey useful information to both the beginning pre-service and in-service teacher. Encouraging and arranging for the observation of experienced teachers was seen as an important aspect of this type of meeting. All three supervisory groups agreed with the writers in the literature on the importance of encouraging the observation of experienced science teachers when conducting orientation meetings with beginning or student teachers. Neither the literature nor this study supplies adequate information on how the observation of experienced teachers can be made a meaningful experience.

College supervisors' lower rating for conducting orientation meetings to discuss the availability of science materials and to acquaint teachers with departmental policies may be indicative of the feeling that there is a unique contribution for the staff of a cooperating school in orienting a new teacher. Both of the other groups may be more aware of potential and real deficiencies of the staff.

Conducting seminars on research

Writers' views of the supervisor's responsibilities for research can be divided into two categories: participation in research and interpretation of research. Both the participation and interpretatio-
tion phases of research are regarded as important responsibilities of the in-service supervisor. In the case of the pre-service supervisor, more emphasis is placed on the interpretation phase of research. The greatest difference in rating by the supervisory groups was in this activity. College supervisors and science department chairmen rated all the reasons for carrying out this activity higher than did supervising teachers.

Support is given to Washton's view that the college supervisor should provide the student teacher with information on relevant research activities. Likewise, the ratings of science department chairmen and college supervisors reflect agreement with Barnard's advocacy of the need for productive field research efforts to promote the advancement of science education.

Providing released time from classroom responsibilities

Providing released time is considered by writers in the literature to be important for teachers to prepare classroom materials, keep up-to-date in science education, and share ideas by means of classroom intervisitations. Science department chairmen judged all aspects of this activity to be of greater importance than did the other groups. They considered providing released time to promote teacher participation in professional organizations and to provide

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8 Supra, p. 32.
9 Supra, p. 32.
10 Supra, pp. 32-34.
teachers with an opportunity to develop more effective laboratory work as being of much greater importance than did college supervisors and supervising teachers. The science department chairmen's concern for improving instruction in the classroom is apparent. All three groups rated providing teachers with released time to observe other classes to be of at least moderate importance. The concern of all groups for classroom intervisitation is apparent.

This concern for seeing teaching strategies developed in a variety of situations might reflect the supervisory groups' understanding of the need for their teachers to have generalizing experiences.

Use of group process

Most of the information related to the use of group process was found in the literature on general supervision and did not specifically relate to either pre-service or in-service supervision. Group process was discussed as a means of increasing the ability and satisfaction of individuals by having them work together as a group.¹¹ Science department chairmen viewed most aspects of this activity to be more important than did the other groups. The greatest difference in rating occurred for reason E: using group process to increase the probability that decisions reached by the group will be implemented. Science department chairmen considered that reason to be of greater importance than did college supervisors and supervising teachers.

¹¹Supra, p. 34.
Apparently the implementation of change is a cooperative and non-authoritative venture in the thinking of science department chairmen and the writers in the literature. To the other respondents, changes do not seem to be made through group process.

**Keeping up-to-date on curriculum programs**

The literature related to this activity was quite general. One writer did mention, however, that it is essential for the supervisor to keep up-to-date on curriculum developments so that he can interpret trends and point out significant items that should be considered in making plans for curriculum improvement. Science department chairmen viewed this activity and most of its reasons to be more important than did college supervisors and supervising teachers.

The generally higher rating of this activity by science department chairmen might be explained by their supposedly more active role in curriculum development.

**Conducting individual conferences with teachers**

This type of meeting is described in the literature as one of the most productive supervisory practices for both pre-service and in-service supervision. Science department chairmen viewed conducting individual conferences to serve as a channel of communication between the teacher and school administration as being much

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12 Supra, p. 37.

13 Supra, pp. 20-24.
more important than did the college supervisors and supervising teachers. All three groups considered very important the conducting of individual conferences with teachers to identify difficulties and help teachers find a means of overcoming them. Mean ratings by the three groups indicated that this was the most important supervisory practice in the entire study.

The amount of importance all groups gave to conducting individual conferences with teachers to identify difficulties and help teachers find a means of overcoming them raises the following question: are the supervisory groups in agreement on the procedures for conducting effective individual conferences as much as they are for their importance?
Suggestions for Further Research

This study was designed to investigate and compare some of the ways pre-service and in-service secondary science supervisors perceive their supervisory roles. The groups of persons selected for this study were college science supervisors, supervising teachers in secondary science, and secondary school science department chairmen. The supervisory activities included in the study were selected from the literature on pre-service and in-service supervision, from personal interviews with college professors and practicing science supervisors, and from a pilot study.

To what extent is there an internally consistent theory of supervision in secondary science? Differences have been discussed between the literature and the people actively participating in supervision. Differences have also been discovered among and within supervisory groups. The existence of these differences establishes clearly the need for further exploration of the following questions regarding supervisory training, rationale, and practice:

Training

What assumptions are made by those who write articles concerning the training of supervisors? Are the backgrounds and the perceptions of people working in the field consistent with those presumed by authors?

Rationale

Do science supervisory groups in other geographical regions have the same view of supervision as that of the population studied? Do
the supervisory groups in this study perceive their responsibilities in ways similar to supervisory groups in other disciplines such as English, social studies, and mathematics? Is there a model of supervision in the literature which accounts for the parameters which actually exist in science instruction?

**Practice**

Do supervisory groups identified in this study operate according to their perceptions of what should constitute effective science supervision? A case study approach should reveal: (1) the types of activities these groups carry out, (2) the relative amount of time supervisors spend on these activities, and (3) the techniques and procedures employed by supervisors in carrying out supervisory roles.
APPENDIX A

PILOT STUDY, CHANGES DEVELOPED FROM THE PILOT STUDY,
ACCOMPANYING COVER LETTERS, AND FOLLOW-UP LETTER

100
The Development of an Instrument For Determining Some of The Major Pre-Service and In-Service Secondary Science Supervisory Practices

When you have completed this questionnaire, please return it in the enclosed stamped envelope at your earliest convenience.
Part I

This section of the questionnaire contains ten supervisory activities (I-X) that represent potential responsibilities of individuals who supervise teachers in secondary science. Under each activity are listed reasons why you as a supervisor might perform this activity.

Instructions

A. Indicate by circling the appropriate letter, for each of the ten supervisory activities, the degree of importance you feel it has for carrying out science supervision in your situation. Please use:

L for an activity of little or no importance
M for an activity of moderate importance
G for an activity of great importance

B. If your evaluation of a supervisory activity is M or G, rate each reason for carrying out that activity by circling the appropriate letter. Please use:

1 for a reason of little or no importance
m for a reason of moderate importance
g for a reason of great importance

Note: Blank spaces under each supervisory activity give you an opportunity to write in and rate additional reasons pertinent to your situation which are not included in the questionnaire.

SUPERVISORY ACTIVITY

I. TAKE PART IN CLASS ACTIVITIES WHEN MAKING CLASSROOM OBSERVATIONS OF TEACHERS (PARTICIPATING OBSERVER) in order to:

1 m g A. enable teachers to work with students on an individual basis or in small groups during a pre-planned activity.

1 m g B. demonstrate a particular concept or technique to a teacher by teaching part of the class period.

1 m g C. determine the degree of student interest and understanding by asking individual class members questions.

1 m g D. serve as an additional resource for the teacher to utilize as the class situation dictates.

1 m g E. ________________________________
SUPERVISORY ACTIVITY

M G II. MAKE CLASSROOM OBSERVATIONS OF TEACHERS BY ASSUMING A NON-PARTICIPATING IDENTITY (QUIET OBSERVER) in order to:

lm g A. identify problems teachers are having.
lm g B. rate teachers according to their effectiveness.
lm g C. evaluate new procedures or instructional materials.
lm g D. identify problems related to learning difficulties of individual students.
lm g E. observe the implementation of approaches suggested to the teacher by the supervisor.
lm g F. _______________________________________________________.

SUPERVISORY ACTIVITY

M G III. CONDUCT INDIVIDUAL CONFERENCES WITH TEACHERS in order to:

lm g A. help each teacher understand how his role contributes to the entire science program.
lm g B. improve a teacher's attitude towards a particular responsibility with which he is involved.
lm g C. identify difficulties and help teachers find a means of overcoming them.
lm g D. help teachers determine their progress in relation to the objectives of the entire science program.
lm g E. provide increased understanding of the role of the supervisor in developing a more effective science program.
lm g F. discuss the degree to which past suggestions of the supervisor have been implemented.
lm g G. _______________________________________________________.
SUPERVISORY ACTIVITY

LMG IV. CONDUCT GROUP MEETINGS WITH TEACHERS ON SELECTED AREAS OF CONTENT IN SCIENCE in order to:

lmg A. help teachers improve their science backgrounds in areas of inadequacy.

lmg B. aid in the selection of content appropriate for teaching the social implications of science.

lmg C. help teachers relate the content they are teaching to other courses in the science program.

lmg D. show how the content they are teaching relates to the entire school program.

lmg E. help teachers up-date the content of their courses.

lmg F. ____________________________

SUPERVISORY ACTIVITY

LMG V. CONDUCT ORIENTATION SESSIONS WITH BEGINNING TEACHERS in order to:

lmg A. assist them in understanding the implications of total school policy for their individual teaching situations.

lmg B. acquaint them with science department policies and objectives.

lmg C. acquaint them with available science supplies and equipment.

lmg D. make arrangements for them to observe experienced teachers in other science classes.

lmg E. arrange for them to observe science classes they teach.

lmg F. introduce them to other members of the staff.

lmg G. introduce them to community resources.

lmg H. discuss ideas and procedures regarding daily lesson plans.

lmg I. ____________________________
SUPERVISORY ACTIVITY

VI. COORDINATE RESEARCH ON ACTIVITIES IN THE SCIENCE PROGRAM in order to:

1. m. g. A. report pertinent implications to the teachers.

1. m. g. B. provide stimulation, encouragement, and guidance for teachers who wish to develop new courses and new methods of instruction.

1. m. g. C. conduct systematic studies as a basis for evaluating current conditions and establishing recommendations for change.

1. m. g. D. help train teachers in research techniques.

1. m. g. E. develop a variety of resources which can be placed at the disposal of teachers who are interested in research and experimentation.

1. m. g. F. ______________________________

SUPERVISORY ACTIVITY

VII. PROVIDE TEACHERS WITH RELEASED TIME FROM CLASSROOM RESPONSIBILITIES in order to:

1. m. g. A. promote their participation in local, regional, state, and national science and education organizations.

1. m. g. B. encourage the carrying out of individual or cooperative research projects.

1. m. g. C. provide opportunities to observe other classes.

1. m. g. D. give an opportunity to explore and incorporate community resources into teaching programs.

1. m. g. E. encourage professional writing concerning activities with which they are involved.

1. m. g. F. ______________________________

______________________________
SUPERVISORY ACTIVITY

M G VIII. USE THE CONCEPT OF "GROUP PROCESS" (REFERS TO THE DEMOCRATIC PROCEDURES BY WHICH A GROUP OF INDIVIDUALS IDENTIFIES, EXPLORES, ATTACKS, AND ATTEMPTS TO SOLVE A PROBLEM OF COMMON CONCERN) WHEN DEALING WITH PROBLEMS RELEVANT TO THE OPERATION OF THE SCIENCE PROGRAM in order to:

1 mg A. involve teachers in the expression, sharing, and evaluation of individual ideas.

1 mg B. provide an opportunity for the supervisor to evaluate teachers in terms of interest and productivity in group activities.

1 mg C. provide teachers with a deeper understanding of the problems being considered and the basis for the decision reached.

1 mg D. articulate activities of teachers in different courses.

1 mg E. increase the probability that decisions reached by the group will be implemented.

1 mg F. ________________________________________________________________

SUPERVISORY ACTIVITY

M G IX. HOLD DEPARTMENTAL MEETINGS ON THE LEGAL ASPECTS OF VARIOUS ACTIVITIES WITH WHICH TEACHERS ARE INVOLVED in order to:

1 mg A. identify and request the removal of activities from the curriculum which represent any appreciable degree of risk.

1 mg B. help them arrive at a decision concerning the risk of a learning activity versus its educational value.

1 mg C. provide pertinent information so teachers can arrive at their own decisions concerning the use of these activities.

1 mg D. ________________________________________________________________
SUPERVISORY ACTIVITY

MG X. Assume a leadership role in science curriculum planning in order to:

1 mg A. help teachers organize committees for the study and development of curriculum materials.
1 mg B. promote the analysis of pupil needs as a basis for structuring the curriculum.
1 mg C. help coordinate the science program with community needs and resources.
1 mg D. help select outside consultants to discuss pertinent research and curriculum projects.
1 mg E. maintain curricular continuity as personnel changes occur in the department.
1 mg F. better represent the department in communications with the school administration.
1 mg G. ____________________________________________________________

Part II

List below any supervisory activities that are appropriate to your situation but are not described above. Under each, indicate the reason(s) why you would carry out the activity. Please rate each activity and accompanying reason(s) according to the previously used code.

SUPERVISORY ACTIVITY

MG XI. ______________________________________________________________

1 mg A. _____________________________________________________________
1 mg B. _____________________________________________________________
1 mg C. _____________________________________________________________
1 mg D. _____________________________________________________________
SUPERVISORY ACTIVITY

L M G XII.

1 mg A.

1 mg B.

1 mg C.

1 mg D.

When you have completed this preliminary questionnaire, please use this space and the back of the sheet for any criticisms you might have. Thank you very much for your cooperation.
Changes of the Instrument Resulting from its Use in the Pilot Study

Supervisory Activity II - Make Classroom Observations of Teachers by Assuming a Non-Participating Identity (Quiet Observer).

Reason A. (identify problems teachers are having) proved to be too general because it did not identify any specific problems teachers might be involved with. Therefore, this reason was replaced by a set of more meaningful reasons extracted from responses on the questionnaires. These reasons were to:

1. ascertain if the teaching methods being used are compatible with the objectives of the course.
2. judge the sophistication of subject matter in terms of course objectives.
3. determine the amount of teacher and pupil interaction.
4. judge the teacher's ability to promote creative thinking by his students.
5. judge the effectiveness of evaluation procedures used by the teacher.
6. determine if teachers can translate their knowledge of how students learn into effective classroom teaching.
Supervisory Activity IV - Conduct Group Meetings with Teachers on Selected Areas of Content in Science.

The wording of this activity was changed to "Conduct Meetings with Teachers on Selected Areas of Content in Science." The word group was deleted because some of the supervising teachers felt that, since they work with only one student teacher at a time, this activity could not apply to them. Also, two reasons for carrying out this activity were added. They were to:

1. show how new equipment and/or newly proposed techniques can be related to the content.
2. help teachers select professional reading materials.

Supervisory Activity V - Conduct Orientation Sessions with Beginning Teachers.

Several supervising teachers and college science supervisors considered a beginning teacher to be a person who had completed student teaching and had assumed his first full-time teaching position. In order to insure that this activity could also include the student teacher, it was restated as "Conduct Orientation Meetings with Beginning Teachers or Student Teachers."

Supervisory Activity VI - Coordinate Research on Activities in the Science Program.

College science supervisors indicated that this activity could not apply to them because the research was limited to activities in a particular school system. Its wording was changed to "Conduct Seminars on Research that Relates to Secondary Science Teaching."
Supervisory Activity IX - Hold Departmental Meetings on the Legal Aspects of Various Activities with which Teachers are Involved.

This activity was changed to "Hold Meetings on the Legal Aspects of Various Activities in which Teachers are Involved." The word departmental was deleted so that the activity could apply to situations where the science supervisor works with just one teacher.

Supervisory Activity X - Assume a Leadership Role in Science Curriculum Planning.

This activity was eliminated from the study because supervisors' ratings and comments indicated that its applicability was restricted to the secondary science supervisor. A new activity which related to science curriculum planning was developed and substituted in the revised questionnaire. This new activity and accompanying spectrum of reasons why it might be carried out was stated as follows:

Supervisory Activity - Keep Up-to-date on Local, State, and National Curriculum Programs that Relate to Secondary Science Teaching in order to:

Reasons - 1. be in a position to recommend programs better adapted to pupil needs.

2. provide a sound basis for organizing committees to study and develop curriculum materials.

3. help maintain curricular continuity by the selection of appropriate curriculum materials.
4. better represent the department in communications with the school administration.

5. provide a sound basis for recommending adjustments in the curriculum as personnel changes occur in the department.

6. be in a position to recommend curriculum materials that are compatible with community needs and resources.
Dear

My experience for ten years as a supervisor of student teaching leads me to an interest in finding out if the science supervisory practices in on- and off-campus student teaching are similar to those found for experienced science teachers. I hope to make this comparison as part of a doctoral program with Professor John Richardson at The Ohio State University. I hope that you can help me with a pilot study of the problem.

The literature, as well as experience, has given some leads on the general processes of supervision. These have been categorized into ten activities on the enclosed questionnaire. Activities have some purpose, so a number of statements have been prepared to give a rationale for each activity. I now need some able and insightful individuals to check the questionnaire for completeness, clarity, and usefulness. It would be helpful if you would complete the questionnaire as it applies to your role as a college supervisor of student teachers in secondary science.

The findings of the pilot study will help to construct a refined instrument. The main study, to be completed in the spring, should have implications for defining the role of science supervision in pre-service and in-service training, for structuring a university course in supervision of the sciences, and for developing better supervisory practices in general.

I plan to send an abbreviated statement of the findings to those who assist with the study. Is the address correct? Your cooperation is both appreciated in and necessary for the furtherance of this study.

Yours truly,

Thomas Boehm
Science Supervisor
The Milne School
S. U. N. Y. at Albany

ef
Enc.
Dear

My experience for ten years as a supervisor of student teaching leads me to an interest in finding out if the science supervisory practices in on- and off-campus student teaching are similar to those found for experienced science teachers. I hope to make this comparison as part of a doctoral program with Professor John Richardson at The Ohio State University. I hope that you can help me with a pilot study of the problem.

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I plan to send an abbreviated statement of the findings to those who assist with the study. Is the address correct? Your cooperation is both appreciated in and necessary for the furtherance of this study.

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Science Supervisor
The Milne School
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The literature, as well as experience, has given some leads on the general processes of supervision. These have been categorized into ten activities on the enclosed questionnaire. Activities have some purpose, so a number of statements have been prepared to give a rationale for each activity. I now need some able and insightful individuals to check the questionnaire for completeness, clarity, and usefulness. It would be helpful if you would complete the questionnaire as it applies to your role as a supervisor of secondary science teachers and/or science department chairman.

The findings of the pilot study will help to construct a refined instrument. The main study, to be completed in the spring, should have implications for defining the role of science supervision in pre-service and in-service training, for structuring a university course in supervision of the sciences, and for developing better supervisory practices in general.

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Yours truly

Thomas Boehm
Science Supervisor
The Milne School
S. U. N. Y. at Albany

ef
Enc.
February 12, 1968

Dear (Supervising Teacher, College Science Supervisor, Science Department Chairman)

A few weeks ago I sent you a questionnaire which consisted of a pilot study for determining some of the major pre-service and in-service secondary science supervisory practices. The sample being used in this preliminary study is small and selective. It is very important that your judgments be included in the data collected. If your copy failed to arrive or has since been lost, please request another on the enclosed post card.

Thank you for considering my request.

Yours truly,

Thomas Boehm
Star Route
Ravena, New York 12143
APPENDIX B

FINAL INSTRUMENT, ACCOMPANYING

COVER LETTERS AND FOLLOW-UP LETTER
An Investigation of The Ways Pre-Service and In-Service Secondary Science Supervisors Perceive Their Supervisory Roles

Thomas Boehm
Science Supervisor
The Milne School
S. U. N. Y. at Albany
Albany, New York 12203

When you have completed this questionnaire, please return it in the enclosed stamped envelope.
Personal Data Sheet

1. Name _____________________________________

2. Title of position ________________________________

3. Name of college or university _______________________

4. Approximate number of secondary science teachers your institution prepares each year ______

5. Number of years of secondary science teaching ______

6. Number of student teachers you supervised in secondary science this year ______

7. If you supervise in any content areas other than science, please list them:

   ____________________________ ____________________________
   ____________________________ ____________________________

8. College or university courses you are teaching this year:

   ____________________________ ____________________________
   ____________________________ ____________________________

9. Degrees held: Year received: Major Minor

   B.A. ______ B.S. ________________________ _______ _______
   M.A. ______ M.S. ________________________ _______ _______
   Ph.D. ______ Ed.D. ________________________ _______ _______
   other (specify) ________________________ _______ _______

   Please place an X on this line if you would like a copy of the results of this study.

1 The term secondary science, as it is used in this study, refers to grades seven through twelve.
1. Name __________________________________

2. Title of position ________________________________

3. Name of school ________________________________

4. Check type of school setting:
   _ urban, _ suburban, _ rural, ________ combination (specify)

5. Number of years of secondary science teaching ______

6. Courses you are supervising this year:

<table>
<thead>
<tr>
<th>Name of course</th>
<th>Number of teachers</th>
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7. Science courses you are teaching this year:

<table>
<thead>
<tr>
<th>Name of course</th>
<th>Number of sections</th>
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8. Degrees held:

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<th>Degree</th>
<th>Year received</th>
<th>Major</th>
<th>Minor</th>
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<td>B.A.</td>
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<td>other (specify)</td>
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   _____ Please place an X on this line if you would like a copy of the results of this study.

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The term secondary science, as it is used in this study, refers to grades seven through twelve.
Personal Data Sheet

1. Name _________________________________

2. Title of position _________________________________

3. Name of school _________________________________

4. Check type of school setting:
   __ urban, __ suburban, __ rural, _____________ combination (specify)

5. Number of years of secondary science teaching ______

6. Approximate date you last supervised a student teacher
   in secondary science __________

7. Approximate number of student teachers you have worked with in science
   during your career as a teacher __________

8. Science courses you are teaching this year:

<table>
<thead>
<tr>
<th>Name of course</th>
<th>Number of sections</th>
<th>Total number of students</th>
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<table>
<thead>
<tr>
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<th>Major</th>
<th>Minor</th>
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<tbody>
<tr>
<td>B.A. _</td>
<td>B.S.</td>
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<tr>
<td>M.A. _</td>
<td>M.S.</td>
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<tr>
<td>other (specify)</td>
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<td></td>
</tr>
</tbody>
</table>

   Please place an X on this line if you would like a copy of the results
   of this study.

1 The term secondary science, as it is used in this study, refers to grades
   seven through twelve.
This questionnaire contains ten supervisory activities (Roman numerals I-X) that represent potential responsibilities of individuals who supervise student teachers in secondary science. Under each activity are listed reasons why a science supervisor might perform this activity.

Instructions

A. Indicate by circling the appropriate number, for each of the supervisory activities (I-X), the degree of importance you feel it should have for carrying out your role as a cooperating teacher (supervising teacher) who works with student teachers in secondary science. Please use the rating scale at the left of each supervisory activity and assume that:

1 represents an activity of little importance
5 represents an activity of moderate importance
9 represents an activity of great importance

Additional numbers are included between the ratings listed above to provide more flexibility when making a judgement.

B. Under each supervisory activity is a list of reasons which indicate why you as a cooperating teacher might carry out this activity. Circle the appropriate number at the left of each reason to express your feeling concerning its importance. Please assume that:

1 represents a reason of little importance
5 represents a reason of moderate importance
9 represents a reason of great importance

Additional numbers are included between the ratings listed above to provide more flexibility when making a judgement.

SUPERVISORY ACTIVITY

1 2 3 4 5 6 7 8 9 I. TAKE PART IN CLASS ACTIVITIES WHEN MAKING CLASSROOM OBSERVATIONS OF TEACHERS (PARTICIPATING OBSERVER) in order to:

(Reasons)

1 2 3 4 5 6 7 8 9 A. demonstrate a particular concept or technique to a teacher by teaching part of the class period.

1 2 3 4 5 6 7 8 9 B. determine the degree of student interest and understanding by asking individual class members questions.

1 2 3 4 5 6 7 8 9 C. serve as an additional resource for the teacher to utilize as the class situation dictates.

1 2 3 4 5 6 7 8 9 D. maintain a personal involvement with secondary school students.
This questionnaire contains ten supervisory activities (Roman numerals I-X) that represent potential responsibilities of individuals who supervise teachers in secondary science. Under each activity are listed reasons why a science supervisor might perform this activity.

Instructions

A. Indicate by circling the appropriate number, for each of the supervisory activities (I-X), the degree of importance you feel it should have for carrying out your role as a supervisor of secondary science teachers and/or science department chairman. Please use the rating scale at the left of each supervisory activity and assume that:

1 represents an activity of little importance
5 represents an activity of moderate importance
9 represents an activity of great importance

Additional numbers are included between the ratings listed above to provide more flexibility when making a judgement.

B. Under each supervisory activity is a list of reasons which indicate why you as a science supervisor might carry out this activity. Circle the appropriate number at the left of each reason to express your feeling concerning its importance. Please assume that:

1 represents a reason of little importance
5 represents a reason of moderate importance
9 represents a reason of great importance

Additional numbers are included between the ratings listed above to provide more flexibility when making a judgement.

I. TAKE PART IN CLASS ACTIVITIES WHEN MAKING CLASSROOM OBSERVATIONS OF TEACHERS (PARTICIPATING OBSERVER) in order to:

(Reasons)

A. demonstrate a particular concept or technique to a teacher by teaching part of the class period.
B. determine the degree of student interest and understanding by asking individual class members questions.
C. serve as an additional resource for the teacher to utilize as the class situation dictates.
D. maintain a personal involvement with secondary school students.
This questionnaire contains ten supervisory activities (Roman numerals I-X) that represent potential responsibilities of individuals who supervise student teachers in secondary science. Under each activity are listed reasons why a science supervisor might perform this activity.

**Instructions**

A. Indicate by circling the appropriate number, for each of the supervisory activities (I-X), the degree of importance you feel it should have for carrying out your role as a college supervisor of student teachers in secondary science. Please use the rating scale at the left of each supervisory activity and assume that:

\[
\begin{align*}
1 & \text{ represents an activity of little importance} \\
5 & \text{ represents an activity of moderate importance} \\
9 & \text{ represents an activity of great importance}
\end{align*}
\]

Additional numbers are included between the ratings listed above to provide more flexibility when making a judgement.

B. Under each supervisory activity is a list of reasons which indicate why you as a college science supervisor might carry out this activity. Circle the appropriate number at the left of each reason to express your feeling concerning its importance. Please assume that:

\[
\begin{align*}
1 & \text{ represents a reason of little importance} \\
5 & \text{ represents a reason of moderate importance} \\
9 & \text{ represents a reason of great importance}
\end{align*}
\]

Additional numbers are included between the ratings listed above to provide more flexibility when making a judgement.

**SUPERVISING ACTIVITY**

1. **TAKE PART IN CLASS ACTIVITIES WHEN MAKING CLASSROOM OBSERVATIONS OF TEACHERS (PARTICIPATING OBSERVER)** in order to:

\[
\begin{align*}
123456789 & \text{ A. demonstrate a particular concept or technique to a teacher by teaching part of the class period.} \\
123456789 & \text{ B. determine the degree of student interest and understanding by asking individual class members questions.} \\
123456789 & \text{ C. serve as an additional resource for the teacher to utilize as the class situation dictates.} \\
123456789 & \text{ D. maintain a personal involvement with secondary school students.}
\end{align*}
\]
SUPERVISORY ACTIVITY

II. MAKE CLASSROOM OBSERVATIONS OF TEACHERS BY ASSUMING A NON-PARTICIPATING IDENTITY (QUIET OBSERVER) in order to:

(Reasons)

A. determine if the teaching methods being used are compatible with the objectives of the course.

B. judge the level of subject matter in relation to course objectives.

C. determine the amount of teacher and pupil interaction.

D. judge the teacher's ability to promote creative thinking by his students.

E. judge the effectiveness of evaluation procedures being used by the teacher.

F. determine if teachers can translate their knowledge of how students learn into effective teaching.

G. evaluate new procedures or instructional materials.

H. identify problems related to learning difficulties of individual students.

I. observe the implementation of approaches previously suggested to the teacher by the supervisor.

J. rate teachers according to their effectiveness.

SUPERVISORY ACTIVITY

III. HOLD MEETINGS ON THE LEGAL ASPECTS OF VARIOUS ACTIVITIES IN WHICH TEACHERS ARE INVOLVED in order to:

(Reasons)

A. identify and request the removal of activities from the curriculum that pose appreciable safety hazards.

B. help them arrive at a decision concerning the use of learning activities that have both potential safety hazards and educational value.

C. provide pertinent information so teachers can arrive at their own decisions concerning the use of instructional activities that have a potential safety hazard.
SUPERVISORY ACTIVITY

IV. CONDUCT MEETINGS WITH TEACHERS ON SELECTED AREAS OF CONTENT IN SCIENCE in order to:

(Reasons)

A. help teachers improve their science backgrounds in areas of inadequacy.
B. aid in the selection of content appropriate for teaching the social implications of science.
C. help teachers relate the content they are teaching to other courses in the science program.
D. show how the content they are teaching relates to the entire school program.
E. help teachers update the content of their courses.
F. show how new equipment and/or newly proposed techniques can be related to the content.
G. help teachers select professional reading materials.

SUPERVISORY ACTIVITY

V. CONDUCT ORIENTATION MEETINGS WITH BEGINNING TEACHERS OR STUDENT TEACHERS in order to:

(Reasons)

A. assist them in understanding the implications of the total school policy for their individual teaching situations.
B. acquaint them with science department policies and objectives.
C. acquaint them with available science supplies and equipment.
D. encourage them to observe experienced teachers in other science classes.
E. arrange for them to observe science classes they will teach.
F. introduce them to other members of the staff.
G. discuss ideas and procedures regarding daily lesson plans and long range planning.
VI. CONDUCT SEMINARS ON RESEARCH THAT RELATES TO SECONDARY SCIENCE TEACHING in order to:

(Reasons)

A. report pertinent implications to the teachers.
B. provide stimulation, encouragement, and guidance for teachers who wish to develop new courses and new methods of instruction.
C. provide a basis for conducting systematic studies to evaluate current conditions and make recommendations for change.
D. help train teachers in research techniques
E. develop a variety of resources which can be placed at the disposal of teachers who are interested in research and experimentation.

VII. MAKE PROVISIONS FOR TEACHERS TO HAVE RELEASED TIME FROM CLASSROOM RESPONSIBILITIES in order to:

(Reasons)

A. promote their participation in local, regional, state, and national science and education organizations.
B. encourage individual or cooperative research projects.
C. provide an opportunity to explore and incorporate community resources into teaching programs.
D. provide opportunities to observe other classes.
E. encourage professional writing concerning activities in which they are involved.
F. provide an opportunity to develop more effective laboratory experiences.
VIII. USE THE CONCEPT OF "GROUP PROCESS" (THE DEMOCRATIC PROCEDURES BY WHICH A GROUP OF INDIVIDUALS IDENTIFIES, EXPLORES, ATTACKS, AND ATTEMPTS TO SOLVE A PROBLEM OF COMMON CONCERN) WHEN DISCUSSING EFFECTIVE SCIENCE TEACHING
in order to:

(Reasons)

A. involve teachers in the expression, sharing, and evaluation of individual ideas.

B. provide an opportunity for the supervisor to evaluate teachers in relation to interest and productivity in group activities.

C. provide teachers with a deeper understanding of the problem being considered and the basis for the decision reached.

D. relate activities of teachers who are teaching different courses.

E. increase the probability that decisions reached by the group will be implemented.

IX. KEEP UP-TO-DATE ON LOCAL, STATE, AND NATIONAL CURRICULUM PROGRAMS THAT RELATE TO SECONDARY SCIENCE TEACHING in order to:

(Reasons)

A. be in a position to recommend programs better adapted to pupil needs.

B. provide a basis for organizing committees to study and develop curriculum materials.

C. help maintain curricular continuity by the selection of appropriate curriculum materials.

D. better represent the department in communications with the school administration.

E. provide a basis for recommending adjustments in the curriculum as personnel changes occur in the department.

F. be in a position to recommend curriculum materials that are compatible with community needs and resources.
X. CONDUCT INDIVIDUAL CONFERENCES WITH TEACHERS
in order to:

(Reasons)

A. help each teacher understand how his activities contribute to the entire science program.

B. improve a teacher's attitude towards a particular responsibility with which he is involved.

C. identify difficulties and help teachers find a means of overcoming them.

D. help teachers determine the progress of their students in relation to the objectives of the entire science program.

E. provide increased understanding of the role of the supervisor in developing a more effective science program.

F. discuss the degree to which past suggestions of the supervisor have been implemented.

G. discuss a particular concept or technique that a teacher wants to incorporate into his science course.

H. serve as a channel of communication between the teacher and the school administration.
Dear (College Science Supervisor)

My experience as a supervisor of student teachers has led me to an interest in finding out if there is any similarity in the ways college science supervisors, secondary science supervisors, and cooperating teachers perceive their supervisory roles. I hope to make this comparison as part of a doctoral study with Professor John S. Richardson at The Ohio State University. I would sincerely appreciate your helping me with a study of this problem.

The literature, as well as experience, has given me some leads on the general processes of supervision. These processes have been categorized into ten activities on the enclosed questionnaire. Each activity is followed by a list of possible reasons why the supervisor might perform the activity. I now need some perceptive individuals who are actively involved in secondary science supervision to respond to the questionnaire. It would be most helpful if you would complete the questionnaire as it applies to your role as a college supervisor of student teachers in secondary science. On a pilot trial, the average time required for completion was twenty minutes.

The findings of this study should have implications for defining the role of science supervision in pre-service and in-service training, for structuring a university course in supervision of the sciences, and for developing better supervisory practices in general.

Your cooperation will be greatly appreciated and if at the conclusion of this study you would like a copy of the results, please place an X on the line provided at the bottom of the personal data sheet.

Yours truly,

Thomas Boehm
Science Supervisor
The Milne School
S.U.N.Y. at Albany
Albany, New York
April 29, 1968

Dear (Science Department Chairman)

My experience as a supervisor of student teachers has led me to an interest in finding out if there is any similarity in the ways college science supervisors, secondary science supervisors, and cooperating teachers perceive their supervisory roles. I hope to make this comparison as part of a doctoral study with Professor John S. Richardson at The Ohio State University. I would sincerely appreciate your helping me with a study of this problem.

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Yours truly,

Thomas Boehm
Science Supervisor
The Milne School
S.U.N.Y. at Albany
Albany, New York
April 29, 1968

Dear (Supervising Teacher)

My experience as a supervisor of student teachers has led me to an interest in finding out if there is any similarity in the ways college science supervisors, secondary science supervisors, and cooperating teachers perceive their supervisory roles. I hope to make this comparison as part of a doctoral study with Professor John S. Richardson at The Ohio State University. I would sincerely appreciate your helping me with a study of this problem.

The literature, as well as experience, has given me some leads on the general processes of supervision. These processes have been categorized into ten activities on the enclosed questionnaire. Each activity is followed by a list of possible reasons why the supervisor might perform the activity. I now need some perceptive individuals who are involved in secondary science supervision to respond to the questionnaire. It would be most helpful if you would complete the questionnaire as it applies to your role as a cooperating teacher (supervising teacher) who works with student teachers in secondary science. On a pilot trial, the average time required for completion was twenty minutes.

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Your cooperation will be greatly appreciated and if at the conclusion of this study you would like a copy of the results, please place an X on the line provided at the bottom of the personal data sheet.

Yours truly,

Thomas Boehm
Science Supervisor
The Milne School
S.U.N.Y. at Albany
Albany, New York
May 18, 1968

Dear (Supervising Teacher, College Science Supervisor, Science Department Chairman)

A few weeks ago I sent you a questionnaire regarding science supervisory activities. If your copy failed to arrive or has since been lost, please request another by signing your name on the back of the enclosed, addressed post card. Your completion and return of this questionnaire would be greatly appreciated.

Thank you for considering my request.

Yours truly,

Thomas Boehm
Science Supervisor
The Milne School
S.U.N.Y. at Albany
Albany, New York
APPENDIX C

LETTERS USED TO IDENTIFY THE POPULATIONS
January 31, 1968

Dear (Dean, School of Education)

I am currently initiating a research study that will attempt to identify the degree of continuity that exists between in-service and pre-service secondary science supervision. It would be greatly appreciated if you would send me the names, titles, and addresses of the college supervisors at your institution who supervise student teachers in secondary science teaching. In cases where a staff member is a supervisor in a campus school, please put an (X) after his name. An addressed and stamped envelope has been enclosed for your convenience.

Thank you very much for your consideration of this request.

Yours truly,

Thomas Boehm
Science Supervisor
The Milne School
S. U. N. Y. at Albany
February 8, 1968

Dear (Science Methods Instructor)

I am currently initiating a research project that will attempt to determine if the science supervisory practices in on- and off-campus student teaching are similar to those found for experienced science teachers. It would be greatly appreciated if you would send me the names, titles, and addresses of the college supervisors at your institution who supervise student teachers in secondary science teaching. In the event a staff member supervises in a campus school, please put an (X) after his name. A stamped, self-addressed envelope has been enclosed for your convenience.

Thank you very much for your consideration of this request.

Yours truly,

Thomas Boehm
Science Supervisor
S. U. N. Y. at Albany
The Milne School
Albany, New York 12203
February 23, 1968

Dear (Director of Student Teaching)

I am currently initiating a research project that will attempt to determine if the science supervisory practices in on- and off-campus student teaching are similar to those found for experienced science teachers. Part of this study will include a sample of cooperating teachers (supervising teachers) who supervise student teachers in secondary science teaching. It would be greatly appreciated if you would send me the names, titles, and addresses of the cooperating teachers used in your off-campus student teaching program in secondary science. A stamped self-addressed envelope has been enclosed for your convenience.

Thank you very much for your consideration of my request.

Yours truly,

Thomas Boehm
Science Supervisor
The Campus School
S. U. N. Y. at Albany

Enc.
BIBLIOGRAPHY

Books


Booklets


Periodicals


Carlton, Robert H. "An Investigation of the Director or Supervisor of Science in the Public Schools," *Science Education,* (February 1946), p. 17.


Unpublished Material


Richardson, John S. "A Lecture on Science Supervision." The Ohio State University, May 1966.