December 1977

A Description of the Role of the Public School Science Supervisor: 1895 to 1976

Judy Harmon

East Tennessee State University

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A DESCRIPTION OF THE ROLE OF THE PUBLIC SCHOOL

SCIENCE SUPERVISOR: 1895 TO 1976

A Dissertation
Presented to
the Department of Education
East Tennessee State University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Education

by
Judy Harmon
December 1977
APPROVAL

This is to certify that the Advanced Graduate Committee of

JUDY HARMON

met on the

29th day of November, 1977.

The committee read and examined her dissertation, supervised her defense of it in an oral examination, and decided to recommend that her study be submitted to the Graduate Council and the Dean of the School of Graduate Studies in partial fulfillment of the requirements for the degree Doctor of Education.

Chairman, Advanced Graduate Committee

Dean, School of Graduate Studies
A DESCRIPTION OF THE ROLE OF THE PUBLIC SCHOOL
SCIENCE SUPERVISOR: 1895 TO 1976

An Abstract
Presented to
the Graduate Faculty
East Tennessee State University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Education

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Judy Harmon
December 1977
The Problem. The problem was to investigate the role of the public school science supervisor in the United States as perceived by recognized authorities, through the identification and description of beginnings, developments, trends, and projections found in scientific and educational literature.

Method. A survey of published research isolated several studies focusing on the role of the public school science supervisor. Any role or concept must pass through five levels of development or concern before it is accepted. The five levels of awareness, development, simulation, implementation, and evaluation were used to stratify or determine the concepts in each article. The articles which met the criteria for each level helped form the description of the science supervisor's role. Specific characteristics under the five levels of concern were applied to each of the articles.

One hundred six articles related to the role of the public school science supervisor were located. Each article was examined closely to determine the level of concern for which it met the criteria. Articles meeting the criteria for the awareness level were discussed as beginnings; those classified in the development and implementation levels were presented as developments; those classified under simulation were grouped to determine projections; and those articles classified under evaluation were used to determine trends pertaining to the role of the public school science supervisor. A chronological classification was tabulated to specify when the phases of science supervision occurred.

Findings. The following significant findings emerged:

1. The majority of articles concerned science supervision as limited to one author's opinion or experience, and consisted primarily of a listing of the duties of the science supervisor.

2. Science supervisors were employed initially to assist superintendents with curriculum development and implementation. Although the presence of a science supervisor was reported as early as 1895, there was disagreement concerning the desirability of having a system-wide supervisor. Some school administrators preferred department heads, assistant superintendents, or principals to supervise science.
3. Lack of a clear role definition seemed to limit the effectiveness of the first science supervisors in working with teachers and administrators.

4. As the United States prepared for World War II, teachers modified their courses to respond to conditions; therefore, the duties of the science supervisor were modified.

5. After Russia launched Sputnik in 1957, the science program was suddenly flooded with federal money to be used for the improvement of the science program.

6. Few authors have published articles proposing models or any type of study concerning projections for the role of the science supervisor.

Dissertation prepared under the direction of Dr. A. Keith Turkett, Dr. George A. Finchum, Dr. Gem Kate Greninger, Dr. Robert G. Shepard, and Dr. Wallace A. Tarpley.
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Finally, to the writer's father, Eugene Harmon, goes the deepest affection and untold appreciation for his devotion and unquenchable faith.
DEDICATION

To the best Mother and Daddy in the world, who made my education possible.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>ii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>vi</td>
</tr>
<tr>
<td><strong>Chapter</strong></td>
<td></td>
</tr>
<tr>
<td>1. <strong>THE PROBLEM</strong></td>
<td>1</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>STATEMENT OF THE PROBLEM</td>
<td>2</td>
</tr>
<tr>
<td>STATEMENT OF THE SUBPROBLEMS</td>
<td>2</td>
</tr>
<tr>
<td>SIGNIFICANCE OF THE STUDY</td>
<td>3</td>
</tr>
<tr>
<td>DEFINITIONS OF TERMS</td>
<td>5</td>
</tr>
<tr>
<td>LIMITATIONS OF THE STUDY</td>
<td>6</td>
</tr>
<tr>
<td>SOURCES OF DATA</td>
<td>7</td>
</tr>
<tr>
<td>PROCEDURES</td>
<td>8</td>
</tr>
<tr>
<td>ORGANIZATION OF THE STUDY AND SUMMARY</td>
<td>9</td>
</tr>
<tr>
<td>2. <strong>REVIEW OF RELATED LITERATURE</strong></td>
<td>10</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>10</td>
</tr>
<tr>
<td>EARLY PHASES OF SCIENCE SUPERVISION</td>
<td>10</td>
</tr>
<tr>
<td>HISTORICAL ASPECTS OF SCIENCE SUPERVISION</td>
<td>17</td>
</tr>
<tr>
<td>CONTEMPORARY STUDIES CONCERNING SCIENCE SUPERVISION</td>
<td>30</td>
</tr>
<tr>
<td>SUMMARY</td>
<td>74</td>
</tr>
<tr>
<td>3. <strong>METHOD AND PRESENTATION OF DATA</strong></td>
<td>75</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>75</td>
</tr>
<tr>
<td>Chapter</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
</tr>
<tr>
<td>PROCEDURES FOR COLLECTING DATA</td>
<td>75</td>
</tr>
<tr>
<td>DESIGN OF THE CRITERIA FOR ANALYSIS OF RESEARCH STUDIES</td>
<td>76</td>
</tr>
<tr>
<td>SCHEMA OF DATA</td>
<td>78</td>
</tr>
<tr>
<td>Awareness Level</td>
<td>79</td>
</tr>
<tr>
<td>Development Level</td>
<td>79</td>
</tr>
<tr>
<td>Simulation Level</td>
<td>80</td>
</tr>
<tr>
<td>Implementation Level</td>
<td>81</td>
</tr>
<tr>
<td>Evaluation Level</td>
<td>81</td>
</tr>
<tr>
<td>SUMMARY</td>
<td>82</td>
</tr>
<tr>
<td>4. ANALYSIS AND RESULTS</td>
<td>102</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>102</td>
</tr>
<tr>
<td>BEGINNINGS OF SCIENCE SUPERVISION</td>
<td>103</td>
</tr>
<tr>
<td>DEVELOPMENTS IN SCIENCE SUPERVISION</td>
<td>105</td>
</tr>
<tr>
<td>PROJECTIONS FOR SCIENCE SUPERVISION</td>
<td>108</td>
</tr>
<tr>
<td>TRENDS IN SCIENCE SUPERVISION</td>
<td>109</td>
</tr>
<tr>
<td>SUMMARY</td>
<td>122</td>
</tr>
<tr>
<td>5. SUMMARY</td>
<td>124</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>124</td>
</tr>
<tr>
<td>FINDINGS</td>
<td>124</td>
</tr>
<tr>
<td>CONCLUSIONS</td>
<td>126</td>
</tr>
<tr>
<td>RECOMMENDATIONS</td>
<td>127</td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td>128</td>
</tr>
</tbody>
</table>
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. An Analysis of the Role of the Science Supervisor as Revealed in Literature</td>
<td>83</td>
</tr>
<tr>
<td>2. Frequency of Science-Related Instructional Activities Occurring from 1895 through 1976 in Literature Examined</td>
<td>111</td>
</tr>
</tbody>
</table>
### LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Distribution and Quantity of Articles Written from 1895 through 1976</td>
<td>110</td>
</tr>
<tr>
<td>2.</td>
<td>A Summary of the Frequencies of Science-Related Instructional Activities Occurring Most Often in the Literature Examined from 1895 through 1976</td>
<td>114</td>
</tr>
<tr>
<td>3.</td>
<td>Frequency of Curriculum Development Occurring from 1895 through 1976 in Literature Examined</td>
<td>115</td>
</tr>
<tr>
<td>4.</td>
<td>Frequency of Providing Supplies Occurring from 1895 through 1976 in Literature Examined</td>
<td>116</td>
</tr>
<tr>
<td>5.</td>
<td>Frequency of Classroom Teaching Occurring from 1895 through 1976 in Literature Examined</td>
<td>117</td>
</tr>
<tr>
<td>6.</td>
<td>Frequency of Encouraging Teachers Occurring from 1895 through 1976 in Literature Examined</td>
<td>118</td>
</tr>
<tr>
<td>7.</td>
<td>Frequency of In-Service Education Occurring from 1895 through 1976 in Literature Examined</td>
<td>120</td>
</tr>
<tr>
<td>8.</td>
<td>Frequency of Curriculum Evaluation Occurring from 1895 through 1976 in Literature Examined</td>
<td>121</td>
</tr>
</tbody>
</table>
Chapter 1

THE PROBLEM

INTRODUCTION

The need for supervision was recognized even in earliest days of the educational history of the United States. Supervision was one of the initial forms of educational leadership. A rudimentary and nonprofessional type of supervision was the foundation upon which the modern supervisory program was built.

During the colonial period a committee of laymen instituted the first type of supervision. Toward the middle of the nineteenth century, the principal, and then the superintendent became responsible for supervising teachers. When special subjects were introduced into the schools toward the end of the nineteenth century, supervision began to assume a new meaning. Special supervisors, including the science supervisor, appeared in the public schools.

The present problem was an outgrowth of a discussion in an education class which revealed a lack of information on the present status and evolution of science supervision. This investigation, tracing the development of the role of the public school science supervisor in the United States, should enable the supervisor of science to perceive the factors and forces which have led to the development of the present purposes and methods of the profession. The significance of many of the practices in science supervision could not be fully
understood without knowing something of the past out of which these practices developed.

A majority of the articles written on science supervision, which were reviewed in this study, dealt solely with personal opinions or experiences of individual authors. When research techniques were employed, usually only one or two phases of science supervision were considered. Attention was given in this study to all phases of the role of the science supervisor in order to develop a comprehensive picture of the status of science supervision at various intervals of time since its beginning.

STATEMENT OF THE PROBLEM

The problem was to investigate the role of the public school science supervisor in the United States as perceived by recognized authorities, through the identification and description of beginnings, developments, trends, and projections found in scientific and educational literature.

STATEMENT OF THE SUBPROBLEMS

The investigation of the problem considered the following subproblems:

1. to identify characteristics of beginnings of science supervisory efforts,

2. to define criteria for identification of the developments in science supervision,

3. to note important trends in the development of supervision in science, and
4. to describe elements which indicate possible directions for trends and projections for the profession.

SIGNIFICANCE OF THE STUDY

The profound significance of the position held by science education in the curriculum of the public schools of the 1970's is unquestioned. Continuous improvement of science instruction in the classroom is a vital concern of many individuals, and is of particular concern to the science supervisor, who is influential in directing the future of science education in schools. A survey of available literature revealed an abundance of publications on supervision and the role of a supervisor; however, literature on the role of the science supervisor was limited. Mary Blatt Harbeck has edited a valuable educational tool for science supervisors: Sourcebook for Science Supervisors; section I is an in-depth study of the role of the science supervisor. Lewin A. Wheat, one of the authors cited in this section, states that the entire attention directed toward an improved comprehension of science supervision will result in one basic outcome: better science education for students. According to J. Darrell Barnard, research designed to advance the comprehension of problems related to science teaching would elevate significant contributions to the discipline of science education, and


endeavors to alter the intellectual climate of science education should commence with available research findings.\(^4\)

The need for an accurate role definition for the science supervisor was recognized by several authors. Maurice Eash, expressing a concern for supervisors regarding their lack of role definition, conducted an investigation which attempted to provide science supervisors with an interpretation of their role.\(^5\) The title, "Science Supervisor" being comparatively recent and not clearly defined, Herbert A. Smith proposed that a study dealing with science supervision would be a contribution to the profession.\(^6\) William C. Ritz and Martin F. Felsen stated that accurate information regarding all aspects of science supervision would be beneficial to numerous educators.\(^7\) Larry Selland indicated that the supervisor should be concerned with the past, present, and future.\(^8\) Paul A. Bender emphasized that it was essential to place the contemporary state of knowledge of science supervision in perspective.\(^9\)

In "A Methodological Review of Research in Rural Sociology since 1965," C. Shannon Stokes and Michael K. Miller stated that the improvement of

\(^{4}\)Barnard, p. 17.


any science was contingent upon a perceptive appraisal of previous circumstances.¹⁰

A descriptive analysis based on research would help fill the void in educational literature in the area of science supervision. Based upon preceding statements and a review of literature which disclosed a meager number of descriptive analyses of the science supervisor, it was determined that an investigation which synthesized and analyzed research concerning the science supervisor would be helpful to teachers, administrators, and supervisors.

DEFINITIONS OF TERMS

The following terms were defined for the purposes of this study:

Descriptive Analysis Technique

Descriptive analysis technique is a method of characterizing constituent parts, or elements, in relation to the whole.

Projection

Projection is a forecast of the total population on some basis of trends in the past.

Science

Science is an activity to make the sense experiences correspond to a uniform system of thought. Experiences are correlated with a

theoretical structure of thought and understanding to make the resulting
coordination congruent with all observed properties or behavior.\textsuperscript{11}

\textbf{Science Supervisor}

Science supervisor is the professional person accountable for
the promotion, development, maintenance, and improvement of instruction
in science.\textsuperscript{12}

\textbf{Teacher Supervision}

Teacher supervision consists of the efforts of school officials
to provide leadership to teachers for the improvement of instruction.
This supervision involves the encouragement of professional growth,
the development of educational objectives, the selection of materials
and methods of teaching, and the evaluation of instruction.\textsuperscript{13}

\textbf{Trend}

A trend is a predominant tendency which affects the character
of prevailing institutions over a relatively long time span.

\textbf{LIMITATIONS OF THE STUDY}

This study was limited to an investigation of beginnings,
developments, trends, and projections of the role of the public school
science supervisors as revealed in available publications from 1895
through 1976. An analysis was made of articles or books pertaining to

\textsuperscript{11}Carter V. Good, ed., \textit{Dictionary of Education} (New York:

\textsuperscript{12}Good, p. 541.

\textsuperscript{13}Good, p. 574.
public school science supervision located in libraries at East Tennessee State University, Johnson City, Tennessee; University of Georgia, Athens, Georgia; University of Tennessee, Knoxville, Tennessee; University of Miami, Coral Gables, Florida; Florida International University, Miami, Florida; University of Florida, Gainesville, Florida; and Tusculum College, Tusculum, Tennessee.

SOURCES OF DATA

The basic sources of data were books, periodicals, dissertations, and ERIC reports. **Sourcebook for Science Supervisors** and **Second Sourcebook for Science Supervisors**, published by the National Science Supervisors Association, and **Supervision of School Science Programs**, by Donald W. Stotler, John S. Richardson, and Stanley Williamson, were utilized. Typical periodicals researched were **Science Activities**, **School Science and Mathematics**, **Science Education**, and **The Science Teacher**. Representative dissertations included "The Evaluation of Supervision of Secondary-School Science Instruction," by Verlin Wiley Lee; "A Study of Science Supervision in the Public High Schools of Louisiana," by Jesse McClendon Hutchinson, Jr.; and "The Development of an Instrument to Evaluate Certain Practices in Science Supervision," by John Merton Goode. **Addresses and Proceedings of the National Education Association**, as well as reports and pamphlets resulting from the ERIC search, were also examined.

Supplementary sources consisted of books, periodicals, and dissertations related in content or format to this study. **The Curriculum in Health and Physical Education**, by Leslie W. Irwin; **A Guide to Effective Music Supervision**, by Rudolph W. Weyland; and **Supervision of English Grades K-12: A Resource Book for State and Local Systems**, edited by
Sue M. Britt, were representative books used as guidelines for the format followed in this dissertation. *Journal of Research and Development in Education*, *Rural Sociology*, and *Art Education* were searched for studies similar to the format used in this study. Dissertations such as "Roles and Responsibilities in General Supervision of Instruction: A Synthesis of Research Findings, 1955-1969," by Beatrice Davis Carman; and "An Analytical Review of Representative Studies in Curriculum Evaluation from 1929 to 1970," by Edward Clark Dobson, Jr., were examined for format.

**PROCEDURES**

The following steps were utilized in applying the descriptive analysis technique in the collection and treatment of the data:

1. Studies related specifically to the role of the public school science supervisor were isolated by consulting various indexes and making ERIC and DATRIX computer searches.

2. The method of analysis included identification of relevant factors which described the role of the public school science supervisor. These factors were classified according to the awareness, development, simulation, implementation, or evaluation levels of concern.

3. Application of the criteria in the designed technique was made to the data collected.

4. The data were analyzed to determine the advent, degree of emphasis, and duration of developments and trends concerning the public school science supervisor.

5. Finally, based on the findings of this study, conclusions
were drawn and recommendations for further study were made.

ORGANIZATION OF THE STUDY AND SUMMARY

This study was organized in the following manner: Chapter 1 is a description of the problem, including specifications. A review of the research and literature related to science supervision is presented in Chapter 2. Chapter 3 is a detailed description of the methodology used in conducting the study. Chapter 4 shows the analyses necessary following the application of method. A summary of the study, including the findings, conclusions, and recommendations constitutes Chapter 5.

Chapter 1 presented an introduction and statement of the problem and subproblems. Guidelines for conducting the study were given in procedures, sources of data, and limitations of the study. The significance of the study was documented by reference to recognized authorities. Each of the divisions in this chapter was necessary in order to prepare the reader for the study. The following chapter will present the literature which served as the basis for the study.
Chapter 2

REVIEW OF RELATED LITERATURE

INTRODUCTION

The purpose of this chapter is to organize chronologically (1895-1976) an annotated review of literature pertaining to the role of the science supervisor. The 106 articles selected for this review are specifically related to beginnings, developments, trends, or projections in science supervision. Sections of books, theses, dissertations, and articles from periodicals were utilized in this study.

EARLY PHASES OF SCIENCE SUPERVISION

The first author encountered in this study to mention the supervisor of science was Thomas M. Balliet in 1895, who stated that although some cities had a supervisor of science, more special supervisors were needed, because most superintendents did not have sufficient time for supervision and could not become experts in all fields.¹ William Estabrook Chancellor, in 1904, agreed with Balliet concerning the inadequacy of most superintendents to do detailed supervision in all areas. Chancellor pointed out that a special supervisor in

science was needed to assist teachers with new subjects which were being incorporated into the curriculum.  

    Chancellor observed that a school system with numerous special supervisors usually had high educational standards. Since science supervision was a recent development and supervisors' salaries were minimal, supervision was usually a deficient area in the majority of small school systems. The duties of the first science supervisors, at the beginning of the twentieth century, were to: (1) represent the superintendent and his department; (2) conduct instructional meetings for teachers; (3) correlate science with other subjects; (4) organize exhibits from science students; (5) supervise all science teachers and report to the superintendent; (6) demonstrate lessons to students and/or teachers; and (7) be mature in knowledge and in skill.

    According to Charles B. Gilbert, the authority of science supervisors was not clearly defined. This deficiency led to much friction between supervisors and regular teachers; although science supervisors were representatives of the superintendent, difficulties arose because they were not properly coordinated within the school system.  

    Both Gilbert in 1906, and Chancellor in 1908, proposed that additional science supervisors be employed since more teachers than formerly were teaching science. Chancellor showed that new science


courses were being introduced and existing ones were undergoing alterations; few teachers were equipped for such modifications.5

Ellwood P. Cubberly argued that the number of special supervisors was inadequate in his book, published in 1916, based on an investigation of the Salt Lake City School Survey in 1915. Cubberly showed that Salt Lake City, with a school enrollment of 22,635, needed a supervisor of school gardens and elementary science. Junior high schools were then being developed in that city, and Cubberly advocated that science supervision be extended to the seventh and eighth grades.6

One year after Cubberly's publication, P. P. Claxton studied the San Francisco public school system, and found that San Francisco was undersupervised. Claxton recommended the establishment of a department which included the supervision of elementary science.7 During this same year, George Ransom Twiss, in A Textbook in the Principles of Science Teaching, reported an absence of supervisors of science instruction in most other cities. He considered this an alarming indictment against city school administrations.8

According to Twiss, competent science teachers were produced by the science supervisor. The functions of the supervisor included

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designing science courses, presenting science lessons, and supervising science teachers. The supervisor was expected to assist teachers in coordinating science lessons in the elementary grades with science courses in high school.9 This articulation was also shown in Organization and Supervision, by Fred C. Ayer and A. S. Barr. Since science was taught in both elementary and high schools, one supervisor of science became the representative of a special supervisory department.10 Cubberly reported in 1923 that some cities had appointed special supervisors and created bureaus for the examination of supervisory problems. Science supervisors, who were traveling supervisors, were repeatedly sources of distress for principals: supervisors regarded the principals as subordinates, and frequently disconcerted an entire school day without apprising the principal. Cubberly suggested that science supervisors respect the position and authority of principals by keeping them informed. The prime purpose of the special supervisor was to instruct teachers to succeed independently. Model lessons were often used to accomplish this purpose.11

E. W. Tiegs observed a general change in supervisory organization, and undertook an investigation in 1927, the results of which were reported in "A Study in Special Supervision." The study involved twenty special supervisors in eight diverse fields. For one week, each supervisor kept a daily report of supervisory activities. The

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9Twiss, pp. 428-431.


total number of teachers served ranged from 20 to 447. The supervisor assisting the most teachers was the supervisor of nature study. This supervisor expended 78 percent of his time in demonstration teaching, class observations, building and sectional meetings, and conferences with principals and teachers. The remaining 22 percent of his time was spent preparing bulletins and courses of study.12

Elliot R. Downing expressed the view that the advancement of science was difficult for science supervisors. The prime obligation of the supervisor was the formulation of a course of study. Supervisors observed the students in the classroom and around their homes, thus enabling them to appraise the effectiveness of science teachers. Responsibilities of the science or nature study supervisor included counseling teachers on the experimental method and suggesting aides for classroom work.13

Ten cities which were leaders in the development of supervision were invited to participate in a study in 1929. "Teachers' Evaluation of Types and Sources of Supervisory Aid," by Velda Bamesberger, presented the details and findings of this investigation. Teachers of selected schools were requested to evaluate each supervisory officer with whom they were associated. In the four cities reporting special supervisors in science, only 4 percent of the teachers rated the science supervisor as giving supervisory aid. A large portion of the supervisory

12E. W. Tiegs, "A Study in Special Supervision," The American School Board Journal, LXXV (September, 1927), 44.

endeavor in science was characterized as supplementary teaching service, rather than supervisory service. Bamesberger proposed that school systems reorganize their supervisory programs to obtain maximum service from supervisory officers.\textsuperscript{14}

When George C. Kyte wrote \textit{How to Supervise} in 1930, the list of special supervisors included supervisors of health education, kindergarten supervisors, and supervisors of nature study. The supervisor and principal were still trying to determine how to separate their assignments of responsibility and authority. Since science supervisors were experts in science, they were technical advisers of the superintendent, assistant superintendent, and principals. They were employed to assist in improving teaching, and offered expert assistance, counsel, and constructive suggestions to teachers. Supervisory visits, convenient office hours, group assemblies, and publishing bulletins and outlines were specific means of helping teachers. Larger school systems, with two or more science supervisors, designated one supervisor chairman of the other science supervisors.\textsuperscript{15}

The results of a four-year investigation of special supervision in Minneapolis public schools were reported by Ellen C. Nystrom in 1931. The study was conducted by superintendents, directors of departments, and supervisors. One of the principal objectives was to formulate a statement of the major functions of the supervisors and principals in


science and other special subjects. The group concluded that the main purpose of supervision was the improvement of instruction, and that the demonstration lesson was the major supervisory activity of the nature study supervisor. During the four-year period covered in Nystrom's study, supervisory activities expanded from mere announced visits of a demonstration type to include services established by teacher and pupil needs.16

In 1932, Wilber L. Beauchamp pointed out that larger cities employed supervisors of science to govern the formulation of courses of study or revision of existing courses, usually accomplished by committees appointed by the supervisor of science. Courses of study prepared by committees under the direction of a supervisor were often superior to those that were prepared without supervision, as evidenced in courses of study prepared by junior and senior high school teachers. Junior high school teachers were accustomed to supervision and welcomed assistance. The majority of senior high school teachers were specialists in some field of science, and did not regard the supervisor as an expert. Beauchamp concluded that the majority of senior high school teachers would profit by more assistance from the science supervisor.17

16Ellen C. Nystrom, "The Functions of Special Supervision in the Minneapolis Public Schools," Educational Method, XI (December, 1931), 143-149.

Two articles written in 1939, which dealt with the role of the science supervisors in large school systems, emphasized improvement of science instruction as a major goal of science supervision. George M. Rawlins, Jr., described the duties of a science supervisor responsible for ninety elementary schools, eighteen junior and senior high schools, and three vocational schools in Washington, D. C. The responsibilities of the science supervisor were classified as: (1) contact with teachers; (2) office work; (3) preparing and scoring examinations; (4) assisting in compilation of apparatus, equipment, and supply lists; (5) attending meetings; and (6) professional readings.\(^\text{18}\)

Rawlins listed contacting the teachers through classroom visitation as the most important activity among the duties of the science supervisor. Offering constructive suggestions, rather than inspecting, accomplished the most improvement in science instruction. Other important contacts of the supervisor were group meetings with teachers.\(^\text{19}\)

Rawlins also reported that routine office work, such as preparing reports, reading and answering mail, required much of a supervisor's time. Reviews of all visits and conferences were retained by the supervisor, and a copy was forwarded to the building principal. Seasonal office work consisted of interviewing prospective science teachers and representatives from publishing and scientific supply companies. New or transferring teachers were required to pass written examinations;


\(^\text{19}\)Rawlins, pp. 439-442.
therefore, the science supervisor was busiest at examination time.20

Other routine activities of the science supervisor were compiling apparatus and supply inventories, previewing films prior to their acquisition, distributing alcohol to all schools, and checking and assorting microscope slides for the city. The science supervisor was a staff officer, and was required to attend meetings with the superintendent of schools, heads of departments, study groups, committees, and science clubs. Professional reading, which was time consuming and expensive, was an important feature of the supervisor's work. Rawlins advised that since some teachers were more knowledgeable about a particular subject than the supervisor, the supervisor should take a reasonable amount of course work in each science field.

The depression in the early 1930's and a subsequent drop in industrial activity resulted in problems in the science instructional program, according to Edward S. Wildman. Urgent economic problems appeared in Pennsylvania, where a dozen new junior high schools and six new senior high schools had been constructed. In 1925, the superintendent of Philadelphia's schools had recommended creation of a division of science education because science was being taught to 39,000 students in Philadelphia. By 1939, 52,000 students were enrolled in science classes and per capita expenditure for instruction was less than in 1925. Wildham stated that in order to work with teachers of these science students, the supervisor had to recognize scholarship in science among teachers and acknowledge good craftsmanship in teaching. The science

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20Rawlins, pp. 439-442.

21Rawlins, pp. 439-442.
supervisor also had to demonstrate a stimulating leadership and a positive force for the advancement of the best interests of his community.22

The relation of a science coordinator to a science supervisor was discussed in 1939 by A. N. Zechiel. His report showed that the duties of a science supervisor were rapidly expanding to include the duties of a coordinator as well as supervisor. Although the science supervisor needed a high degree of competence in the science field, he was responsible for perceiving his special field in relation to other fields and to students' needs.23

Orra E. Underhill, in his book The Origins and Development of Elementary School Science, showed many instances of inadequately trained elementary science teachers. This inadequacy prevented such teachers from utilizing the potentialities of science; Underhill suggested that school systems make provisions for science supervisors.24

A lack of comprehension of science was also noted by W. R. Teeters, in 1942, as he discussed inadequacy among science teachers and ways by which science supervisors could render valuable assistance to help broaden the comprehension of such teachers. He suggested that supervisors recommend slides and films, summarize relevant materials


from periodicals, and share their knowledge of outstanding procedures of experts.25

Teeters' article echoed the 1930 opinion of Kyte that many of the difficulties facing science supervisors focused on the need for delineating the specific differences between the lines of responsibility and authority assigned to supervisors and principals. The science supervisor had his own program, which was different from the principal's program, and many teachers were following the principal instead of the supervisor; many times heavy administrative duties were required of supervisors. The science supervisor in large systems was usually responsible for repairing, inventorying, and purchasing new apparati. Teeters reported that one large system had relieved the science supervisor of many of his supervisory duties to permit time for administrative duties.26

The basis of the study by Franklin J. Mathewson, in 1943, was 586 questionnaire responses from all states in the United States. Representatives who completed this questionnaire included department heads, classroom teachers, city science supervisors, professors of science education, principals, and superintendents. The survey showed that in 1942, city supervisors of science and state supervisors did not achieve the possibilities of their profession.27 The city


26Teeters, pp. 291-295.

supervisor ranked second in importance in supervisory agencies. The head of the science department ranked first. Mathewson recommended that science supervisors be available to each teacher. Science education was changing to make a greater contribution to the war effort; Mathewson argued that although an economic problem existed, science supervisors were needed more than ever to assist teachers in modifying courses, to teach new units, and to acquire up-to-date supplemental materials.28

Robert H. Carleton, in 1946, submitted a questionnaire to the science supervisor or superintendent of schools in forty-eight cities having a population of at least 150,000. Of the thirty-one systems replying, twenty-two delegated responsibility for science supervision to one person who served the entire school system. One science supervisor reported serving as secretary to a principal's science committee. Policies were implemented through department heads, but suggestions originated with teachers. Other duties of science supervisors included: (1) visiting and observing; (2) reviewing or developing a philosophy of science education; (3) organizing courses in science; (4) preparing lists of demonstrations; (5) preparing visual aids; (6) encouraging, guiding, directing, or conducting research in science education; (7) reviewing techniques for evaluating outcomes; and (8) encouraging research attitudes and writings by teachers.29

28Mathewson, pp. 684-790.

The respondents to Carleton's questionnaire listed poorly trained teachers and a conservative or apathetic attitude of traditional teachers as the chief obstacles facing science supervisors. Only five systems had full time science supervisors. Supervisory duties of these supervisors included working with grades one through twelve, seven through twelve, and nine through twelve. One of the respondents reported that his system was not convinced of the desirability of a science supervisor and did not contemplate employing one.\textsuperscript{30}

Attitudes of junior and senior high school teachers that Beauchamp reported twelve years earlier than the Carleton study were still present. Carleton noted, as did Beauchamp, that the majority of senior high school teachers would profit by assistance from the science supervisor. The trend of providing a system-wide science supervisor for guidance and direction in science instruction was not very widespread and did not seem to be accelerating. Such supervision was usually received from an assistant superintendent or research director.\textsuperscript{31}

In 1949, Grace Curry Maddux described her supervision of elementary science teachers in the Cleveland, Ohio, Schools. Her periodic visits to 114 elementary schools indicated teacher insecurity. She helped relieve teachers of their fear of teaching science by supplying necessary subject matter and serving as a consultant and co-worker. Maddux could not visit each teacher in the 114 elementary schools personally; therefore, two or three times each semester a

\textsuperscript{30}Carleton, pp. 11-19.

\textsuperscript{31}Carleton, pp. 11-19.
mimeographed bulletin was distributed. These publications reviewed several of the superior teaching techniques the supervisor had observed, announced lectures or field trips sponsored by clubs or groups in other cities, and contained a digest of science meetings attended by the supervisor. High points from current professional journals or reviews of new science books were often issued in such publications. Meetings and other activities which the supervisor provided were designed to assist teachers in developing confidence and enthusiasm for the teaching of science.32

The science supervisor's role in guidance was explored in 1953 by Archie J. MacLean. The science supervisor called to the attention of school administrators and school counselors the vocational opportunities in the science field. Newer vocational materials to be introduced to classes were provided by the science supervisor. Arranging visits to universities and industries for pupils and teachers, and encouraging industries to provide scholarships were other opportunities for science supervisors to promote guidance.33

John R. Mayor, in 1957, reported an investigation on the far too limited use of science counselors. Mayor's research was established upon the recognition that competent supervisors could provide valuable assistance to teachers.34


J. Myron Atkin concluded in 1957 that the elementary school was the logical starting point for a strong science program. The elementary science program was weak in many school systems; therefore, larger systems employed supervisory personnel to give primary attention to elementary science. The efforts of science supervisors were largely directed toward the preparation of curriculum aids. Contact with individual teachers in large school systems was restricted, but science supervisors encouraged greater attention to elementary science through their meetings with key school personnel.35

Edward Victor reported a growing shortage of qualified secondary school science teachers at a time when competent science teachers were badly needed. His study was based upon opinions of 103 Massachusetts science teachers during the 1954-1955 school year. Victor showed the necessity of close supervision to augment the effectiveness of science teachers in secondary schools.36

One of the most comprehensive evaluations of secondary science supervision was made by Verlin Wiley Lee in 1958. The twofold purpose of the research for his dissertation, "The Evaluation of Supervision of Secondary-School Science Instruction," was to: (1) ascertain the present [1958] status of secondary school science supervision at state and local levels, and (2) evaluate the performance of supervisory activities.37

Lee employed the jury technique to establish desired criteria for the functioning of a supervisor of secondary-school science instruction. The most common supervisory activities were assigned to eight major categories. Returns from the participating jurors determined the importance of each activity. A value was assigned each activity and a questionnaire was prepared, which was submitted to science supervisors in four types of school organizations: (1) state departments of education; (2) consolidated school districts; (3) city school systems; and (4) county school systems.  

Scores given to activities by the jury of twenty-five science educators at local levels were compared. The data obtained from the jury showed that the order of importance was: (1) methods; (2) curriculum study; (3) research; (4) in-service growth of teachers; (5) self-growth; (6) public relations; (7) administration; and (8) equipment. A significant coefficient of correlation of +53 was obtained between the values assigned activities by the jury and the performance of activities by local supervisors.  

Lee's study also showed that committee work by teachers and good communication among school personnel were strong points of local supervisory programs. Curriculum revision, followed closely by work with television and radio, constituted the major portion of the supervisor's time.  

Lee concluded that supervision of secondary-school science seldom satisfied the standards established by leading science educators. Apathy among administrators toward science supervision was still present.  

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Although more supervisors of science were being employed than previously, the need for competent people in the field was still widespread. He recommended that local school boards evaluate their needs for science supervision and that action be taken to meet the needs.\textsuperscript{41}

Keith Johnson's 1960 article presented more positive conclusions: (1) more attention was being given to the supervision of science teachers than previously; (2) the number of science supervisors had greatly increased just prior to 1960; and (3) the Traveling Science Teacher Program of the Oak Ridge Institute of Nuclear Studies was presenting considerable assistance to science supervisors.\textsuperscript{42}

The typical elementary science supervisor was described by Harold E. Tannenbaum in 1960 as a teacher of teachers who taught subject matter and method. Specific functions of the elementary science supervisor were numerous; Tannenbaum enumerated functional areas as: (1) conducting science in-service programs; (2) preparing curricula; (3) guiding classroom teachers; (4) coordinating the science program of a school or school system; (5) administering science programs; (6) evaluating the work of science teachers; and (7) consulting teachers and children.\textsuperscript{43}

Tannenbaum concluded that most supervisors considered instruction in content and methods necessary for practicing teachers. In-service science education courses were used most often to fulfill this need.

\textsuperscript{41}Lee, p. 258.

\textsuperscript{42}Keith Johnson, "New Developments in the Teaching of Science," The Bulletin of the National Association of Secondary-School Principals, XLIV (April, 1960), 89.

\textsuperscript{43}Harold E. Tannenbaum, "Supervision of Elementary School Science: In-Service Courses," The Science Teacher, XXVII (April, 1960), 50-51.
The methodology of in-service courses varied, but two general procedures were followed: (1) sometimes the supervisor taught the course; other in-service programs were organized by the supervisor but presented by an expert. A variety of techniques for conducting in-service programs contributed to the challenge of supervising elementary science.44

"The Supervision of the Science Program," by Donald Stotler, gave a comprehensive picture of supervisory roles at the state, county, and local levels. He showed that a supervisor was consulted for suggestions and assistance in planning. In 1958, Stotler sent an inquiry concerning the status of science supervision at the county level to all state departments of education. His data showed that science supervision was provided by general supervisors or county superintendents in most counties. Leaders in a number of state departments reported a need for science supervisors at the county level, while others indicated a preference for general supervisors.45

Elementary science was being introduced in several sections of the country, and Stotler found that elementary teachers were not prepared to instruct science with confidence. The problem of adequate supervision became a formidable one. A science supervisor at the elementary level performed many functions; Stotler suggested the following: (1) cooperate in the formulation of a science program; (2) participate in the preparation of resource publications; (3) engage

44 Tannenbaum, pp. 50-51.

in a teacher-training program and in workshop courses; (4) recommend supplies and equipment and proper procedures for obtaining them; (5) participate in the formulation of in-service science programs; (6) participate in the formulation of programs for talented students; and (7) evaluate instruction. Stotler reported that some elementary science supervisors were performing only part of the functions.\(^46\)

Stotler suggested that in-service training for science remain a joint responsibility of the science supervisor and the principal. Elementary and secondary schools, he pointed out, influenced the same child at different stages of his development; therefore, vertical articulation was a prime responsibility of science supervisors. Stotler advised that science supervisors at the junior high school level perform the same functions enumerated for the supervisor of elementary science. He concluded that good supervision improved science instruction, raised the morale of teachers, and provided leadership that assured their professional growth.\(^47\)

Many small systems did not have a science supervisor in 1960. Science supervisors who were employed by small school systems had many responsibilities: they initiated in-service programs, supervised the acquisition of appropriate materials, served as resource persons, encouraged advanced study and research, and interpreted the science program to staff and community. The science supervisors in smaller cities had a distinct advantage in the opportunity afforded to recognize strengths and weaknesses of individual science teachers.\(^48\)

\(^{46}\text{Stotler, pp. 218-222.}\) \(^{47}\text{Stotler, p. 223.}\) \(^{48}\text{Stotler, p. 226.}\)
Stotler stressed that since emphasis upon science education was increasing, small city and suburban systems needed an adequate science supervisory service. Stotler suggested that a full-time science supervisor be employed to assist with the program in grades one through twelve. He also recommended that cities of approximately 200,000 hire assistants for elementary science. Stotler emphasized that the need for good supervision was great because the challenges were many.\textsuperscript{49}

Stuart E. Dean, in 1960, reported on a survey of the supervisory practices in urban systems. One of the four categories of data sought was related to special subject supervisors. This section was designed to determine the amount of subject-matter supervision available to the principal and his teachers. The national distribution showed that only 8 percent of the regions had specialists available. In general, the Northeast and North Central regions tended to provide more special-subject assistance than did the South or the West. Compared to health, physical education, art, speech, library, and reading, science was the subject field in which fewer specialists were provided.\textsuperscript{50}

Science supervisory roles were listed by June E. Lewis and Irene Potter. The science supervisor assumed the responsibility for administering the science program and served as leader of a team of teachers who developed the science program. Classroom teachers used the assistance of the supervisor in program planning, selecting

\textsuperscript{49}Stotler, p. 228.

content, answering unexpected science problems, locating resource materials, and working with children.51

CONTEMPORARY STUDIES CONCERNING SCIENCE SUPERVISION

The term "contemporary" as used in this study, refers to books, articles, theses, and dissertations related to science supervision and written between the years of 1961 and 1976, inclusive.

"Supervision of Science and Mathematics," byaron J. Battle, was a summary of an address given at the Sixtieth Annual Convention of the Central Association of Science and Mathematics Teachers, November 26, 1960. Battle stated that developments by the National Science Foundation and the National Defense Education Act led to an increased need for science supervision. The image of a supervisor was that of a leader and coordinator of programs and ideas.52

The science supervisor worked primarily with teachers; however, he also cooperated with principals, other supervisors, and the superintendent. The supervisor was concerned with: (1) helping in the organization and implementation of an ongoing program of curriculum development; (2) assisting in the identification and acquisition of instructional aids; (3) stimulating professional growth; (4) facilitating the teaching/learning process; (5) sharing in the evaluation of programs; and (6) participating in the examination and revision of goals and procedures.53


53Battle, p. 303.
Battle referred to the Gary Public Schools, Gary, Indiana, as an example of one approach to science supervision. During the 1930's, Gary Public Schools employed a supervisor of science and a supervisor of mathematics. In the 1940's, the move was toward the assignment of a general secondary and a general elementary supervisor. The general supervisory staff was increased to provide some degree of specialization in the 1950's. When this article was given as a speech, there was a single supervisor of both science and mathematics, whose responsibility included seventy-two mathematics teachers and fifty-one science teachers. The Gary Public Schools did have a visiting science teacher sponsored by the National Science Foundation and Michigan State University, who was responsible for most of the supervisory work in science.54

Battle discussed the importance of the supervisor of science and the responsibility of utilizing funds available through the National Defense Education Act, Title III, to strengthen instruction. In order to use this money properly, the supervisor cooperated with the finance department of the local system. A large number of people planned and developed these projects, and a well-defined set of policies and procedures had to be approved by the superintendent. The science supervisor assisted principals and committees in identifying needs.55

James W. Busch reported a definite increase in local, district, and state science supervisors from 1958 to 1961. One reason for the increased emphasis on science supervision was money available from the National Defense Education Act. A more fundamental reason for this increase was the recognition of educators and the general public of

54Battle, pp. 304-305.  
55Battle, p. 306.
the importance of a progressive science program. Busch argued that the increase in science supervisors led to a concern for a description of the role of the science supervisor.56

According to Busch, a science supervisor was responsible for the improvement of instruction, and exhibited an interest in the development of instruction by holding memberships in professional and scientific organizations. The local science supervisor worked directly with individual teachers in the development of programs.57

Busch emphasized that a prime responsibility of a science supervisor was the development of a well articulated science program for all twelve grades. In-service growth was a problem area in which the science supervisor needed to exert leadership. The supervisor conducted workshops, demonstrated teaching, and conferred with individual teachers to compensate for the meager preparation in science provided elementary teachers. In addition to major problems, the science supervisor was often involved in planning science laboratory facilities. Science supervisors dealt with problems facing everyone associated with science education; Busch expressed his concern that many more were needed.58

"Survey of the Science Supervisor," by Paul F. Ploutz, defined the role of the science supervisor. This investigation enabled boards of education, administrators, and principals to comprehend the science supervisor's contribution to the improvement of science education. One hundred supervisors of science at the elementary, secondary, and

57Busch, pp. 297-301. 58Busch, pp. 297-301.
state levels participated in the study, which provided employers with a guide to the responsibilities of the science supervisor, a role Ploutz found to be vague and undefined.\textsuperscript{59}

Ploutz's survey pointed out definite activities performed by supervisors at all levels. Arranged in descending order of frequency, these activities were: (1) assisting teachers in the classroom; (2) providing materials, supplies, and information; (3) developing curricula; (4) organizing programs with department heads, principals, and superintendents; (5) providing in-service education; (6) teaching demonstration classes; and (7) adhering to the National Defense Education Act. The science supervisor's role was determined by the size and needs of the school. Ploutz stated that a model supervisor probably did not exist because school systems throughout the United States differed greatly.\textsuperscript{60}

Supervisors reported that they should spend more time in the following activities, but were unable to do so: (1) conferring with teachers; (2) reading, preparing bulletins and newsletters, and improving communication; (3) providing workshops and demonstrations to improve in-service education; (4) incorporating techniques and teaching materials into the science curriculum; (5) providing and preparing materials and equipment for classroom instruction; (6) organizing and conducting research; and (7) attending professional meetings.\textsuperscript{61}

Supervisors expressed a concern that too much of their time was demanded for administrative duties. Handicaps to their effectiveness


\textsuperscript{60}Ploutz, "Survey of the Science Supervisor," p. 43.

\textsuperscript{61}Ploutz, "Survey of the Science Supervisor," p. 43.
were classified by the supervisors into seven categories. These were: (1) participating in too many areas; (2) insufficient status or authority to properly effect change; (3) staying within line-of-authority rules; (4) lack of proficiency in all areas of science; (5) poorly trained teachers; (6) unconcerned administrators; and (7) no clearly defined framework within which to operate. Ploutz recommended that school systems which desired an improvement in science programs should employ a science supervisor as soon as feasible.62

In "Science Supervisors in Elementary School," Ploutz reported that the continuing emphasis on science was being partially satisfied by the employment of science supervisors. He identified different ways in which the elementary science supervisor's role was different from the science supervisor at other levels.63

A poll of one hundred supervisors compared the elementary science supervisor with the supervisor of kindergarten through twelfth grades, secondary supervisors, and state science supervisors. The survey revealed that elementary science supervisors: (1) had more duties unrelated to science; (2) instructed more non-science classes; (3) made fewer contributions to equipment or construction details; (4) attended professional meetings less frequently; (5) wrote fewer professional articles; and (6) influenced instructional methods in science teaching less frequently.64

Elementary science was still receiving inadequate emphasis in 1962. Although elementary supervisors had made significant gains, the situation still required more improvement. Several comparisons were made between the elementary science supervisors and the secondary and state science supervisors. Elementary science supervisors: (1) worked with individual teachers more frequently than other supervisors; (2) were in charge of teachers more frequently than other supervisors; (3) arranged or conducted science field trips more frequently; (4) had more authority to select science textbooks; (5) specified materials for school libraries more often; and (6) had more responsibility for the administration of standardized tests related to science.  

Ploutz further stated that the individual science supervisor's role was determined by the needs of instructional programs. Many school systems were employing science supervisors to organize, increase, and stimulate science instruction in elementary schools. Ploutz reported that administrators needed to be informed of the benefits of employing science supervisors. School systems in 1962 were aware of the increasing importance of science and were attempting to improve science programs to make them more effective. Ploutz suggested that a science supervisor was essential for the evaluation and implementation of a well organized science program.  

A concern for the future of science education was expressed by H. Seymour Fowler. Evidence of the realization that supervision in science instruction was advantageous was shown by Fowler by pointing  

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out the increasing number of available positions, such as science supervisors, listed in educational placement bureaus. 67

"The First Problem: Helping the Teacher" was an article written by John Woodburn, in which he advanced his idea of the most important problem of supervision in science. Woodburn recognized that the science supervisor should help teachers comprehend the spirit, structure, and function of science. Teachers required guidance in implementing small-scale experiments. Woodburn encouraged supervisors to show teachers that the processes of science should be the target of courses of study. He stated that a science supervisor was in a position to coordinate assets of the past with resources of the present to give teachers leadership. 68

Paul Klinge emphasized the importance to the science supervisor of holding membership in professional societies. He stated that membership should be a prerequisite for advancement and professional recognition. 69

A significant trend in 1962 was the increasing number of specialists in education. Richard G. Hansen presented his reaction to this trend in "The Specialist: Threat or Challenge?" Hansen noted that one reason for this trend was the desire for stepped-up programs in science. He reported that the science supervisor served as a


consultant to the principal and other members of the staff in purchasing science equipment.\textsuperscript{70}

M. F. Vessel, in 1963, reported that science supervisors were employed to coordinate the science program from kindergarten through high school. The supervisor conducted science workshops for teachers, directed curriculum study programs, and coordinated requests for scientific equipment. Vessel noted that the American Association for the Advancement of Science recommended summer institutes and in-service institutes for science supervisors.\textsuperscript{71}

Joseph Zafforoni and Edith Selberg reported on an inquiry to a small group of science supervisors. In 1963, assistance to the elementary school science teacher was provided by science supervisors, science specialists, and science consultants. For example, the Fairbanks School System, with five thousand students, employed one full-time science supervisor for kindergarten through twelfth grade. Approximately 90 percent of his time was involved with supervision at the elementary level. The supervisor worked with teachers but did not evaluate them. Zafforoni and Selberg recognized the need for a science supervisor; they admitted their study did not include discussion on whether or not school systems should have such a position.\textsuperscript{72}

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\textsuperscript{70}Richard G. Hansen, "The Specialist: Threat or Challenge?" The National Elementary Principal, XLII (January, 1963), 7-11.
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"Science Supervision in Texas Public Schools, 1960-61," by Robert L. Cannon surveyed the services performed by science supervisors in public schools of Texas during the 1960-1961 school year. Fourteen public school systems returned partially or fully completed questionnaires designed to determine specific activities performed by supervisors in science. The foundation of Cannon's questionnaire was Tannenbaum's seven functional areas of science supervisor participation; however, Tannon supplemented Cannon's list.73

The number of science teachers with whom the supervisor worked ranged from 68 to 380. Supervisors worked with the kindergarten through the twelfth grade. The majority of the supervisors: (1) spent as much time as possible in classroom visitation; (2) guided the development of the curriculum; (3) assisted teachers in producing resource units, teaching units, curriculum guides, and/or subject guides; (4) held workshops or in-service courses for science; (5) consulted with teachers about specific problems; (6) secured and distributed free material; (7) justified needs and made recommendations for securing equipment, motion pictures, and filmstrips; (8) demonstrated the use of new materials and equipment; and (9) worked with science clubs, science fairs, and programs for academically talented students. Cannon stated that the nature and diversity of the information was such that it did not appear to present any new trends or general patterns.74

Henry J. Otto and David C. Sanders, in Elementary School Organization and Administration, reported on the administration of the


74Cannon, pp. 203-216.
educational program. The understaffed situation of elementary schools in 1964 was obvious from the 2,421 replies of their survey. Only 2 percent of the principals had full-time supervisors of science available. A science supervisor was available on a part-time basis to 10 percent of the principals.\(^7^5\)

Helen Heffernan and Leslee J. Bishop's chapter in Role of Supervisor and Curriculum Director in a Climate of Change, was entitled "The Supervisor and Curriculum Director at Work." They gave an example of a science supervisor's concern for the evaluation of new approaches to science instruction. The supervisor developed an instrument to record time spent on various activities within the classroom. Although the intent of this investigation was not to make judgments on quality of the science program, teachers and principals were able to see their styles, methods, and emphases.\(^7^6\)

A book by Glen G. Eye and Lenore A. Netzer was focused on administrative responsibilities associated with the instructional program. The authors emphasized that the specializations of the supervisor of science were easily identified and generally appreciated.\(^7^7\)

Bernard Reimisch explained that the national interest in improving science education was evidenced in part by the expenditures of funds by

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the Office of Education through the National Defense Education Act and by the National Science Foundation through its science curriculum projects. In February, 1966, elementary science was receiving more attention than any other curriculum area. Science was advancing so rapidly that teachers had a full-time job of keeping well informed. The elementary school had a real need for people with substantial knowledge to direct the program. Additional leadership was required for a more dynamic and realistic elementary school science program than existed in many schools.78

Helen Hale, in "Developing an Articulated Science Curriculum," reported an increase in articulated science programs developed by science supervisors. The development of an articulated science sequence required that the supervisor: (1) visited classrooms; (2) made arrangements for competent teachers to use new materials; (3) bought equipment and materials for teachers with special needs; (4) set up a task force of interested people and provided materials for them; (5) prepared an annotated bibliography; (6) organized and implemented a workshop; (7) produced curriculum bulletins; (8) designed system-wide in-service programs; and (9) implemented new curricula. Hale stressed the necessity for having one individual responsible for developing the overall science program.79

Lee E. Wickline reported that the special science supervisor was primarily a phenomenon of large city school systems until 1958.


79 Helen E. Hale, "Developing an Articulated Science Curriculum," The Science Teacher, XXXIII (April, 1966), 9-12.
Wickline stated that school districts needed special science supervisors with expertise in science education to keep the school curriculum abreast of current scientific developments. The position also required an understanding of implications of federal legislation for improving science instruction in elementary and secondary schools. Wickline suggested that local science supervisors stimulate the submission of imaginative project applications from science teachers. Local science supervisors were responsible for areas eligible for Title I funds. How wisely this money was spent for improving science instruction was determined primarily by the local science supervisor.

Several innovations beneficial in developing science curricula were cited by Gary R. Smith. The main responsibility of the science supervisor, according to Smith, was using a computer to establish and maintain quality control of the science program in each class.

The professional stature of science supervision was elevated by the appearance of *Sourcebook for Science Supervisors*, in 1967. Mary Blatt Harbeck served as editor for this book, which was published by the National Science Supervisors Association. Short chapters on the specialized functions of science supervision comprised the book, each chapter being written by a different author.

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Elito J. Bongarzone presented a teacher's view of the duties and responsibilities of a science supervisor. The teacher expected constructive observation and an orientation session for teachers new to the system. He also requested to be kept aware of changes in the science department, to be made a part of budget preparation, and to be informed of curriculum innovations. The supervisor, he stated, should assist the teacher in planning a long-range program of self improvement. The teacher requested that the supervisor control the size of laboratory groups to permit close supervision. Basically, the teacher expected the supervisor to remove or minimize obstacles for easier teaching of science.\textsuperscript{83}

The responsibilities associated with science supervision were listed by A. C. Brewer in 1967. School administrators recognized the supervisor as the best available source of information in science education. Advisory responsibilities of the science supervisor were related to: (1) selection and assignment of science staff; (2) design and construction of science facilities and selection of science equipment, materials, and supplies; (3) science curriculum and interpretation of the science program; (4) in-service training of teachers; (5) developments in science methods and evaluation of curriculum innovations; and (6) budgetary matters.\textsuperscript{84}


Brewer recommended that a science supervisor take advantage of every opportunity to increase his knowledge in science. The supervisor's own professional growth helped him direct the growth of science teachers in the school system. The science supervisor provided services to teachers in curriculum improvement and methods of teaching science and in the selection and utilization of materials for instruction. These areas included: (1) initiation and implementation of in-service training; (2) announcing available institutes and conferences; (3) demonstration of instructional materials; and (4) provision of opportunities for leadership development.85

"Identifying Trends and Their Implications" was written by Albert F. Eiss. He predicted that the supervisor would face new obligations and responsibilities which would require a continuing revision of existing duties. Eiss also forecast that the supervisor would be a strong link between the public schools and the universities. Increasing responsibilities and changing conditions, according to Eiss, would provide a real challenge to the ambitious science supervisor.86 In another article, Eiss presented examples of ways in which the supervisor could participate in inspiring, planning, coordinating, and implementing curriculum change.87

85Brewer, pp. 11-16.


Harbeck, in 1967, stated that funds were provided by the Congress for the employment of state and local science supervisors. A primary responsibility of these supervisors was to exert leadership in the development of programs for the improvement of science education. Supervisors needed to be aware of the current status of federal programs and procedures for securing federal funds for science projects. Guidelines for projects were given by Harbeck for the science supervisor.  

Harbeck's article, "Working with Teachers," analyzed the responsibilities of the supervisor. One of the responsibilities was to acquaint teachers with resources of the school and community. Many supervisors were expected to work directly with library, testing, guidance, and research staff members. The science supervisor also collected library requests and supplemented the list with his selections. Working with research projects and grant-seeking proposals were common responsibilities for teachers and supervisors, who also facilitated recognition of outstanding work or special talents of teachers by publicizing fellowships and awards.  

The science supervisor was often requested to plan and implement teachers' workshops, curriculum writing groups, textbook selection committees, and discussion groups, with responsibility for quality control when helping teachers design activities; the supervisor had the additional task of establishing guidelines for the activities.


which were designated. Curriculum development was a major purpose for the supervisor's work with groups of teachers; his organizational responsibilities included appointing committees, scheduling meetings, and collecting materials; when the work of the committee was completed, the science supervisor was involved in editing materials, printing and distributing them, and encouraging appropriate use and evaluation. As curriculum revisions were implemented, a supervisor was faced with continual educational needs of the teaching staff; he was responsible for the content and format of in-service sessions, as well as recruiting teachers.90

Science supervisors were requested to work with individual students or to design programs for groups of students. The supervisor served as a liaison between students and outside agencies, which involved schedule adjustments as well as publicity, science fairs, or exhibits. Supervisors were also responsible for ensuring that teachers transmitted information to their students about award programs and other activities.91

No single school system expected one supervisor to perform all responsibilities continually. An enthusiastic supervisor was not likely to operate the same way each year. Working with teachers kept supervisors close to the object of their creative thinking: students.92

According to Richard L. James, one of the major roles of a science supervisor in 1967 was serving as a liaison between schools

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and resources of the community. He recommended the establishment of a resource committee on which people from the community served, or the creation of a file of community resource people.93

Phyllis L. Magat, writing in Sourcebook for Science Supervisors published in 1967, suggested that the science supervisor represented science education to the school board, parents, and community. The professional role of the science supervisor required a full-time commitment involving continuous study and extensive reading, considered important in designing and implementing science programs and in providing service and materials to science teachers.94

LeRoy G. Moore dealt with the responsibility of the science supervisor in providing the proper environment for teachers to fulfill their roles as professional people. Moore showed how the science supervisor helped teachers to: (1) select, plan, and utilize new facilities; (2) plan and implement new curricula; and (3) order and use supplies and equipment effectively. The overall role of the science supervisor was to provide teachers with materials, opportunities for professional growth, and a challenging environment.95

Glen D. Berkheimer explained the role of the science supervisor in implementing programs. Types of science curriculum materials used


and science supervisory activities varied with local science education objectives. A more intensive in-service teacher training program was needed by science supervisors who implemented an investigative approach than those who implemented programs emphasizing science facts and principles, teacher demonstrations, and the practical nature of science.

In addition to Sourcebook for Science Supervisors, another book which dealt exclusively with science supervision was published in 1967: The Supervision of School Science Programs, by Donald W. Stotler, John S. Richardson and Stanley E. Williamson. Objectives of this book were to stimulate thought, discussion, and action. In addition to the role of the supervisor, consideration was given to aspects of a good science program, the dynamics and influence in the supervision of science programs, and modifications in the science program. Chapter 4 of this book, entitled "The Job of the Supervisor," portrayed the science supervisor as one concerned with the total curriculum and the way in which science interacted with other subject areas. Activities of the supervisor included: (1) coordinating activities for the improvement of instruction; (2) informing, encouraging, and guiding science teachers in the use of new courses and methods of instruction; (3) assisting in the guidance of students; (4) assisting school administrators with in-service programs; (5) advising plans for space facilities for science; (6) testing and evaluating programs in science; (7) encouraging student participation in extracurricular activities in science; (8)

advising in the procurement of audio-visual aids and textbooks; (9) interpreting science programs to scientific societies, organizations, institutions, and industries; and (10) helping set up criteria for allocation of funds under agencies such as the National Defense Education Act.  

John D. Cunningham, in 1967, emphasized that one of the most difficult tasks of research and supervision in science was the evaluation of instruction. Although many schemes to analyze teacher-student behavior were available, Cunningham considered interaction analysis one of the most beneficial for science teaching. The use of an interaction analysis model was the main emphasis of Cunningham's article.  

"Dialogue in Supervision," written by Michael A. Saltman and David W. Champagne, presented a conversation between a science teacher and a supervisor. The comments of each were directed to the success of the teacher in conducting two chemistry classes. The supervisor recorded observations during each class and then discussed them with the teacher. Saltman, the teacher, considered methods which Champagne, the supervisor, used to be beneficial. The supervisor was alert and interested in teaching as a profession; he not only presented his ideas on the situation, but documented his conclusions with publications.  

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Edward Victor reported that many of the larger school systems were beginning to employ full-time science supervisors, who were given a limited teaching schedule or assigned no teaching responsibilities. Time was allowed for working on the science program or assisting teachers. Other school systems had supervisors on a part-time basis. When this article was published in 1956, planned science programs in the elementary school were comparatively new. Victor reported that the trend was moving toward employing additional, full-time supervisors.100

Harold E. Tannenbaum, Nathan Stillman, and Albert Plitz gave examples of materials for evaluating the effectiveness of the elementary science program, planning in-service teacher education programs in evaluation, and measuring the effectiveness of teachers. They concluded that classroom teachers and science supervisors were faced with the responsibility for developing, using, and interpreting a variety of techniques for the teaching/learning process. Science fairs furnished the supervisor and teacher with many opportunities for evaluating pupil progress. Observation of student behavior, appraisal of student projects, and a variety of tests provided the teacher and supervisor with information on the effectiveness of the program. According to these authors, the supervisor or teacher was the ultimate evaluator of a program.101


Marjorie S. Lerner, in 1967, described various in-service activities. She argued that the most immediate source of in-service activities was the science supervisor. Her list of several ways teachers could obtain help from the science supervisor included: (1) request observations and evaluations; (2) have the science supervisor teach a science session; (3) discuss new ideas on approaches to the teaching of science and request aid in implementing them; (4) request assistance in locating or constructing equipment and instructional materials; (5) ask for specific workshops; (6) seek advice on local resources and planning field trips; (7) ask for help on using new equipment or materials; (8) request the recommendation of certain teachers to be visited and observed for competence in teaching science; (9) ask for recommendation of professional literature; (10) request aid in construction of tests; (11) seek aid in the selection of appropriate films, filmstrips, and other audio-visual materials; and (12) seek advice on summer offerings at local colleges and universities.\textsuperscript{102}

Edward Victor and Marjorie S. Lerner indicated that the increase in elementary science and in-service education in science had created a strong need for supervision. Many schools in 1967 were beginning to employ science supervisors who were usually experienced and competent teachers with leadership qualities and a strong science background. They contributed to an effective science program by: (1) demonstrating special teaching procedures; (2) preparing and distributing instructional materials;

materials; (3) developing and conducting in-service programs; (4) publicizing new developments in science education and research; (5) assisting in the selection of supplies, equipment, facilities, books, and films; (6) helping develop a continuous kindergarten-through-twelfth-grade science program for the school system; and (7) maintaining a liaison with college, university, and state department personnel in science. 103

"The Development of an Instrument to Evaluate Certain Practices in Science Supervision" was John Merton Goode's dissertation. His objectives were to determine certain functions of the science supervisor and to develop an instrument to evaluate practices that the science supervisor employed to fulfill these functions. Goode's investigation was limited to full-time science supervisors in secondary schools. The functions of the science supervisor were reviewed and an instrument to evaluate science supervisory practices was developed. Supervisory functions were categorized into the following six areas: (1) curriculum development; (2) in-service education; (3) utilization of learning materials; (4) development of personnel; (5) professional growth; and (6) promoting public relations.104

George T. O'Hearn and Rodney L. Doran reported on their investigation of science supervisors employed by departments of public instruction in each of fifty states. They reported that science


supervisory personnel were absent in over 95 percent of the districts in thirty states. Almost none of the school districts employed more than one science supervisor. They concluded that services of a science supervisor were not available to the vast majority of classroom teachers in 1968.105

Paul DeHart Hurd and James Joseph Gallagher reported that the science supervisor helped teachers by: (1) interpreting and introducing new curriculum developments; (2) suggesting ways to evaluate pupil achievement; and (3) creating a supportive climate for continual curriculum improvement. Motivating pupils and teachers in the acceptance of innovative practices was also the science supervisor's responsibility. Creating a supportive climate for continual curriculum improvement was concluded by these authors to be the supervisor's major task.106

Albert Eiss stated that in 1968 nearly seven thousand individuals were assigned the task of science supervision on either a part-time or a full-time basis. He reported that science supervisors were responsible for developing courses of study and guiding teachers in the use of materials and educational technology.107

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In 1968, Elizabeth A. Simendinger related that exponential growth in scientific knowledge, increased emphasis on science, and the proliferation of science curricular projects had brought about a new leadership role of the science supervisor. The responsibilities of science supervision ranged beyond teaching and clerical experiences. Leadership qualities in promising staff members needed nurturing and developing. Simendinger concluded that the need for many more qualified science supervisors was apparent. She also predicted that the future role of the science supervisor would include conducting in-service programs, accountability for teacher performance, and responsibility for evaluation in educational research.108

"The Role of the Science Supervisor in the Teacher Education Process," by John J. Montean, was a summary of a speech given before the General Session of the National Science Supervisors Association and the Association for the Education of Teachers in Science, held at the National Science Teachers Association meeting in October, 1969. The presentation was an examination of teacher preparation programs. Montean suggested that supervisors, committees, and science teacher organizations cooperate to improve training programs at the pre-service level. Montean stated the opinion that the science supervisor should portray a very significant role in the pre-service student teaching program, and advocated a well-organized in-service program structured and conducted by the science supervisor. He proposed that if science supervisors utilized the tremendous opportunities available at the

local level for training science teachers, the best possible training would be provided for beginning teachers.  

"The Role of the Science Supervisor as Perceived by Elementary and Secondary Science Teachers" was a thesis for a Specialist degree by Thomas Graika. A fifty-four item questionnaire was developed, which contained statements of tasks a science supervisor could perform. Five school systems in Iowa which employed a science supervisor were sampled.

The results of the questionnaire disclosed certain areas of disagreement between elementary and secondary teachers concerning the role of the science supervisor. The elementary teachers were of the opinion that the supervisor should determine the materials necessary for the science program, and teach demonstration classes. The secondary teachers considered assigning teachers to suitable schools and organizing a testing program as roles for the science supervisor. Elementary and secondary teachers agreed upon the need for a well-trained science supervisor to act as a spokesman for teachers and assist in the development of strong programs. According to this research, the supervisor's role was to:

1. visit classrooms and hold follow-up conferences,
2. conduct in-service workshops and meetings,
3. give suggestions on teaching and demonstrate teaching techniques,

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4. assist in the production of instructional materials, teaching units, and course of study manuals,
5. assist teachers in subject matter understanding, use of science equipment, and utilizing educational research,
6. prepare a newspaper on current developments and a list of science instructional materials available,
7. check inventories and purchasing of equipment and supplies,
8. visit new teachers more than experienced teachers,
9. assist in the interviewing of prospective teachers,
10. encourage teachers to write articles, conduct research, and participate in professional organizations,
11. assist talented students with individual projects,
12. conduct his own research related to the science program,
13. assist teachers in self-evaluation,
14. encourage teachers to take college or university science courses,
15. arrange for teachers to visit nearby schools,
16. locate community resources for field trips and assist in conducting them,
17. provide guidance for developing the total science curriculum,
18. assist teachers in the selection of instructional materials, reference books, and textbooks for the science program,
19. keep informed of current developments by reading professional literature and attending workshops and institutes,
20. be an active member of professional science organizations,
21. be instrumental in making recommendations to the administration regarding the science instruction budget and local science philosophy,

22. procure aides for assisting with science instruction,

23. speak to civic groups concerning the science program, and

24. assist in the planning and maintenance of new science facilities.\textsuperscript{111}

In 1971, "Science Teaching: Role of Supervisor" was written by Mary Blatt Harbeck, stating that although the role of the science supervisor was constantly changing, the primary role was to improve the quality of science education for all students. The supervisor's role was one of communicating with and coordinating the efforts of teachers, administrators, and the community in order to foster science education.\textsuperscript{112}

In the late 1950's, science instruction changed rapidly from its traditional content-oriented and teacher-centered approach to being process-oriented and student-centered. At that time many districts and states recognized the need for an initial or additional science supervisor. As additional programs were developed and innovations in the use of media increased because of the National Defense Education Act, the need for supervisory personnel became more apparent.\textsuperscript{113}

\textsuperscript{111}Graika, pp. 54-67.


\textsuperscript{113}Harbeck, "Science Teaching: Role of Supervisor," pp. 137-143.
The role of the science supervisor was subject to different interpretations; Harbeck listed numerous functions of the science supervisor, some of which were:

1. determining equipment and audio-visual aids,
2. choosing people for and coordinating the work of writing teams,
3. developing and revising curriculum,
4. planning new programs and persuading teachers to implement them,
5. planning in-service education,
6. encouraging teachers to develop more effective ways of learning,
7. teaching demonstration classes,
8. planning and evaluating the science physical plant and equipment,
9. evaluating teachers' performance,
10. working with the research program staff and librarian,
11. working with science clubs, science fairs, and science projects,
12. preparing the budget and planning a purchasing schedule for the acquisition of additional or replacement equipment,
13. working with administrators concerning major decisions within the science program,
14. cataloging and distributing equipment and supplies,
15. evaluating, recruiting, and reassigning staff,
16. presenting programs to civic groups and acting as a liaison between schools and community,
17. compiling lists of resource people and possible field trips,
18. testing new instructional and evaluation techniques, and
19. joining and participating in professional organizations.114

J. J. Koran, Jr., noted that supervisors were responsible for translating curriculum objectives into teacher behaviors, as well as accountable for designing ways and means of influencing these behaviors under training or supervisory conditions. He suggested that the analysis of the components of instructional systems could produce potential strategies. Each of the components of the instructional systems design was defined in his article. They were translated into the corresponding elements of a model for conceptualizing supervision of biology teachers. Koran stressed the necessity of using new and more effective strategies for supervision. Although the systems model was one of many approaches, the efficacy of this model was based on considerable research.115

More than seventy questionnaires served as the basis for "The Supervisor as a Catalyst for Change: A Comparative Study on the Role of the Foreign Language and Science Supervisors," by Anthony Papalia and Rodney L. Doran. The survey was designed to determine the duties and responsibilities of foreign language and science supervisors employed by public secondary schools in western New York and to identify the role of these supervisors in the improvement of instruction.116


Since 1958, the supervision of instruction in science had involved more specialized personnel. This involvement was a result of increased enrollments, subject matter specialization, and the need for field specialists to seek improvement of curriculum and instruction.\footnote{Papalia and Doran, pp. 1-10.}

A large number of the participants in the study conducted by Papalia and Doran indicated that their duties included junior high as well as secondary school science supervision; some were even responsible for the elementary school science program. They found that about 70 percent of the supervisor's time was spent in classroom teaching. The remaining time was spent in various supervisory activities such as budgeting; selecting, assigning, assisting, and evaluating new teachers; supervising classroom instruction; and articulating programs.\footnote{Papalia and Doran, pp. 1-10.}

Most of the respondents felt that additional time should be devoted to assisting new teachers, developing in-service training, supervising classroom teaching, and articulating the curriculum. They wanted to be consulted in staff selection, teacher assignments, teacher evaluation, and tenure recommendation. The majority of science leaders in western New York were interested in promoting better articulation, developing new curricula, and helping new teachers.\footnote{Papalia and Doran, pp. 1-10.}

"Review of an Encounter with Educational Technology" was the final report of a project funded by the United States Office of Education, written by Herbert A. Smith, director of the project. This project was designed to clarify the role of the science supervisor and

\footnote{Papalia and Doran, pp. 1-10.}
to provide insights and motivations that would permit the potential of the position to be realized. One of its major purposes was to provide learning techniques and materials that could be used by the science supervisor. The project considered four major areas or "sets."

These "sets" were designated as: (1) Role of the Science Supervisor; (2) Introduction to Educational Technology; (3) An Application of Educational Technology; and (4) Management. The project was successful in producing substantial blocks of material which were usable by supervisors in their own in-service programs.120

John F. Reiher gave a supervisor's viewpoint of a major concern: evaluation. In order to attack the problem, he taught classes in the school system, which provided him an opportunity to observe teachers' problems. The three middle days of the week were devoted to demonstration teaching. The teachers soon began to see the supervisor as an aide instead of a warden. A stronger relationship between the supervisor and teachers, his immediate goal, was developed. Reiher suggested that the supervisor be a highly trained resource person of inestimable value to teacher, principal, and superintendent.121

Thomas Eastman and Harris P. Goldberg observed that science supervisors rarely participated in science teacher education. They were of the opinion that the negative influence of science supervisors had weakened the total science teacher education program. The model


121 John F. Reiher, "How Do We Evaluate What is Going On?" Science Activities, VI (January, 1972), 28-29.
they proposed consisted of a team of college science education faculty, educational psychology faculty, science supervisors, and science teachers. Beginning in the sophomore year, college students helped at selected schools. During their junior year, students became science teaching assistants with their future cooperating teacher. In this model, the science supervisor and cooperating teacher became part of the team.122

Hans O. Andersen focused attention on the improvement of science instruction and on providing leadership to initiate desirable changes. He felt that teacher self-evaluation would permit the supervisor to avoid the problem of diagnosing and then convincing a teacher that improvement was necessary. He recommended that self-evaluation be initiated by using a systems model and gave a description of each step of the model. Primary emphasis was placed on means of collecting data rather than prescribing competent teaching practices.123

Special supervision in science was discussed by Stanley W. Williams in the third chapter of his New Dimensions in Supervision. He noted that greater emphasis was being placed on subject-matter specialization, particularly at the secondary level. There was a need for more persons with special skills and techniques to work with teachers in the highly specialized area of science. The science supervisor gave guidance to teachers in committees, workshops, individual


and group conferences, demonstrations, staff meetings, and through the issuance of supervisory bulletins. The supervisor was a product of an age of specialization.\textsuperscript{124}

In his dissertation, Jesse McClendon Hutchinson, Jr., identified the areas of responsibility of high school supervisors in Louisiana. He found that several supervisory functions were considered important for all science supervisors. In descending order of importance, these functions were:

1. visiting classrooms and supervising instruction,
2. providing in-service training programs and encouraging continued education,
3. keeping abreast of new techniques, objectives, and methods and incorporating them into the science curriculum,
4. procuring and disseminating current materials and information,
5. conducting conferences with teachers and setting objectives for them,
6. aiding in the selection and provision of good supplies and equipment,
7. selecting and staffing of teachers,
8. selecting and adopting textbooks,
9. evaluating programs of instruction,
10. maintaining communication among science teachers and principals,

11. conducting demonstration teaching and assisting new teachers with methods and techniques,
12. selecting and distributing materials for low achieving students,
13. attending professional meetings, and
14. maintaining public relations.125

These supervisory functions covered a broad spectrum of responsibilities and a multiplicity of duties. Hutchinson argued that Louisiana needed more science supervisors available to classroom science teachers.126

Fred R. Schlessinger and co-authors of *A Survey of Science Teaching in Public Schools of the United States* assembled data on the teaching of science to serve as a basis of comparison for trend analysis. Of the 2,485 principals responding, 36 percent had city or county supervisors. Approximately two-thirds of these supervisors were science specialists.127

Robert B. Sund and Leslie W. Trowbridge proclaimed that there would always be a need for qualified science supervisors. The role of the science supervisor had assumed an increased leadership position in recent years. This position included responsibilities for direction of in-service workshops for implementation of course curriculum projects


126Hutchinson, pp. 22-123.

in schools and for overseeing the entire science program. Other activities of science supervisors were demonstration teaching, interschool visitation, and working with beginning teachers. The role of the science supervisor was expanding. In general, the science supervisor acted as a middle man between science teachers and the administration or the public.128

"Science Teachers Association, Science Inspectors and Advisors--Their Role in the Education of Teachers in Integrated Science" was a chapter in New Trends in Integrated Science Teaching: Education of Teachers, edited by P. E. Richmond. This article focused on existing roles of science supervisors and roles needed to promote science. The following roles of a science supervisor were particularly important:

1. achieving familiarity with curriculum development,
2. providing supportive leadership for teachers,
3. catalyzing the interaction among staff members,
4. insuring that resources were available,
5. participating and promoting evaluation of science, and
6. promoting pre-service and in-service training.

Science supervisors who assumed quality leadership roles provided an effective science curriculum. The tasks were complex and time consuming, but not impossible.129


Supervisory Behavior in Education, by Ben M. Harris, was revised in 1975. In this edition Harris announced that some older programs had received renewed emphasis through federal legislation. Science was one of these programs that had been staffed with special supervisors.130

William C. Ritz and Martin F. Felsen dealt with the role of the typical science supervisor in New York State. From 1971 to 1974, the Science Education Center at Syracuse University conducted a Leadership Preparation Program in the Supervision of Science. In the spring of 1973, science supervisory personnel were sent a questionnaire concerning their typical work week. The eighteen supervisory activities respondents rated were ranked in the following order:

1. observation of classroom teaching,
2. observation of another supervisor/administrator,
3. classroom demonstration teaching,
4. conducting in-service workshops,
5. consulting with teachers,
6. co-teaching in classroom lessons,
7. consulting with administrators,
8. curriculum activities,
9. formal meetings,
10. social interaction,
11. evaluation of teaching,
12. preparation of reports and/or conducting research,
13. interschool transportation,

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14. activities related to supplies or equipment,
15. preparation time,
16. consulting with pupils,
17. teaching of pupils, and
18. miscellaneous activities.  

Many of the timely and forward-looking ideas found in A Sourcebook for Science Supervisors still applied when Second Sourcebook for Science Supervisors was published. The new volume was designed to meet many of the new challenges that had emerged since 1967. Among these new challenges were: an increasing emphasis on the evaluation of pupils and programs; demands for accountability; changing working relationships with teachers and administrators; a new emphasis on public relations; increasing concerns with safety and liability; and the need for a science supervisor to be more flexible than ever before. 

Gary L. Awkerman pictured the science supervisor as a part of the financial plan. Planning for involvement in the allocation of resources for an organization was an important facet of the supervisor's role. The chapter included sections on funding sources, communication, community resources, personal planning, and grantmanship. One of the local supervisor's roles was to demonstrate and disseminate information

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131William C. Ritz and Martin F. Felsen, "A Profile of Science Supervision in New York State," Science Education, LX (July, 1976),

to effect diffusion and acceptance of innovative educational practices.\textsuperscript{133}

Knowledge of new discoveries, theories, techniques, and principles in science formed the basis of "The Continuing Education of the Supervisor," by J. Joel Berger and Harris P. Goldberg. The authors recommended that the science supervisor evaluate and assist the staff in developing open-ended teaching styles. They further advised that science supervisors meet and confer with colleagues at local, regional, and national science conferences. The supervisor was responsible for promoting growth among the faculty and for possessing expertise in writing research grant proposals. According to Berger and Goldberg, continuing education for the science supervisor was more than incidental learning. This type of education was self-education that never ended.\textsuperscript{134}

The leadership of the science supervisor was related by D. Anita Bozardt and Roderic E. Righter. Leadership by a science supervisor consisted of assuring awareness of the law, planning for prevention and avoidance of accidents, and serving as a resource on such matters. Assisting teachers in the area of liability was a crucial responsibility of the science supervisor.\textsuperscript{135}


"Implementing Curriculum Changes," by Charles Butterfield clarified the meaning of implementing curriculum change. The chapter examined current practices of implementation and offered guidelines for implementing programs. Butterfield suggested that the supervisor consider the problem of implementing curriculum change as a selling job. This position was favored instead of an authoritative approach. Any worthwhile goal required a well-planned, carefully structured program to obtain continuing cooperation.136

David Butts and David May stated that science supervisors were essential for effective science instruction. They reviewed the duties of a science supervisor and classified them into six categories: (1) information source; (2) communication link; (3) planning and implementation; (4) model; (5) sources of feedback; and (6) manager.137

Another chapter in Second Sourcebook for Science Supervisors, "Providing the Learning Environment," by Rodger W. Bybee, related that the role of the science supervisor was some variation of two themes: maintenance of the present programs and development of new programs. Maintenance included providing equipment, replacing supplies, organizing field experiences, preparing materials, and encouraging teachers. Developments in new directions occurred through workshops on new teaching techniques, meetings to update scientific knowledge, in-service programming to implement new curriculum and released time and funds for travel


to professional meetings. The last half of the chapter gave ideas and references to help the supervisor facilitate innovations in science education.138

Albert F. Eiss described the role of the science supervisor as providing a link between administration and teachers. The supervisor helped bring the educational viewpoints of parents and students into focus and assisted in developing a philosophy and goals of education toward which all members of the community could work. The supervisor was involved in inspiring, planning, coordinating, and implementing curriculum change. Eiss also explained that the science supervisor served as a motivator or committee chairperson on a science steering committee. A resourceful supervisor was able to secure funds for projects. A systems approach to curriculum development formed the framework for a viable program. The supervisor was one of the vital factors in the system.139

Robert Fariel described the duties and responsibilities of the science supervisor in public relations. He showed that the purpose of any public relations program was a better understanding and a closer working relationship between school and community; the science supervisor and teachers; the supervisor and the principal; and the science supervisor and other subject supervisors. The student was the best

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Fariel considered the science supervisor's most important responsibility to be improvement of instruction. In public relations the science supervisor informed the public regarding the present program and plans for its improvement. A good public relations program was based on the confidence the public, students, science teachers, and administration had in the science supervisor.\footnote{Fariel, pp. 143-146.}

Science supervisors needed to systematically provide the information regarding expenditures for schools. Fariel's article gave several suggestions for implementing, altering, or improving a public relations program. He believed that a good public relations program was the development of a cooperative relationship between the science supervisor and all the persons with whom he came in contact during the school year.\footnote{Fariel, pp. 143-146.}

"A Performance Model," by Jon R. Hendrix, described a model concerning the competencies needed by science supervisors. A science supervisor was accountable for upgrading science instruction through involvement of the teacher, administration, community, and all professional channels. Since a science supervisor's role in public schools was constantly changing, the model was not intended to be a static role description. Unique needs of each school system demanded modification, addition, or deletion of specific tasks in the model.\footnote{Jon R. Hendrix, "A Performance Model," in Second Sourcebook for Science Supervisors, ed. Mary Blatt Harbeck (Washington, D. C.: National Science Supervisors Association, 1976), pp. 43-50.}
Hendrix suggested that supervisors utilize the model to identify a role description suitable for the needs of the school system and the individual's skills. He recommended that the agreed-upon role description be used as an evaluation device for the supervisor's performance. In the model suggested by Hendrix, the responsibilities of the science supervisor comprised the following basic divisions: (1) curriculum and instruction; (2) staff personnel; (3) assignment, transfer, and work load; (4) orientation of the school employees in science; (5) staff management; (6) school buildings and equipment; (7) school/community relations; and (8) professional growth. According to Hendrix, removing the ambiguity of role expectations facilitated harmonious productive science supervision.144

"Getting Materials into Teachers' Hands," by Gary Huffman was a report of a science supervisor and two assistants on implementing new science projects. From February, 1971, to August, 1974, in the Indianapolis Public Schools, the science supervisor was responsible for getting many science materials into the hands of teachers. Original kits were sent to remain in the building. Teachers were provided with forms by which they could order kit replacements at the beginning of the fall and spring semesters. The staff filled these orders during the summer and at the beginning of the spring semester. The remainder of the school year was utilized to provide ongoing, in-service training, and trouble shooting activities.145

144Hendrix, pp. 43-50.

Gene P. Kingham offered his opinion of science fairs. He argued that a supervisor should test local sentiment regarding science fairs prior to making plans. If the community decided to have a fair, the science supervisor assisted students in choosing a topic for the project.  

According to Franklin D. Kizer, one of the most important responsibilities of the science supervisor was safety. He showed how a science supervisor could establish an awareness for safety among his teachers.

J. David Lockard emphasized that a major task of many science supervisors was being aware of the ongoing developments in science and mathematics curricula. This was necessary for making proper suggestions and for being aware of developing trends. Lockard reviewed numerous research studies he and his colleagues found helpful.

Edward P. Ortleb, in "Utilizing Community Resources for Teacher Education," stated that a major function of science supervision was to provide meaningful experiences which led to staff improvements. His article consisted of examples of methods of utilizing a variety of community resources to provide information to groups of teachers.

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These included amateur and hobby, health, professional, and cultural organizations. Use of community resources allowed many opportunities for a wide range of in-service activities for the professional growth of teachers.\textsuperscript{149}

Charlotte Purnell stated that the main concern of a science supervisor was to secure funds to carry out programs that would result in better teaching. Purnell suggested that science supervisors investigate the departments of natural resources, environmental control, consumer affairs, social services, Indian affairs, agriculture, and archaeology for possible financial support. He stressed that the science supervisor needed available sources for additional funds.\textsuperscript{150}

An outline of the process of curriculum reform was given by Donald Del Seni in "Developing Local Curriculum Reform." He considered the improvement of the instructional program the main function of the science supervisor. The process of curriculum reform which Seni implemented in his department was outlined in the following categories: (1) identifying the problem; (2) deciding on the best approach for organizing and effecting change; (3) organizing, delegating, and completing a project of curriculum innovation; (4) directing the program by becoming part of the working team; (5) maintaining the cohesiveness of the project; (6) seeking ways of funding the project;


and (7) evaluating the project.  

"A Model for Initiating Accountability," by Robert J. Starr, described the development of an initial accountability model based upon theory and research. He argued that accountability in science resulted from a series of teacher, science supervisor, and administrative actions, contributing to the attainment of an adequate education for all students. His model gave the concerned supervisor a starting point from which to develop the data base needed to initiate accountability.  

SUMMARY

Chapter 2 has presented, in chronological order, a review of the 106 studies located on the role of the public school science supervisor. The methodology and presentation of data in Chapter 3 describe the manner in which the studies will be analyzed.

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Chapter 3

METHOD AND PRESENTATION OF DATA

INTRODUCTION

This chapter explains the method employed to obtain and examine the results of prior studies, the next step in solving the problem of analyzing the role of the public school science supervisor. Utilizing the descriptive approach, large amounts of data could be presented and easily comprehended. This method involved discovering and describing interrelationships among the collected research studies. Data were placed under general headings characterizing the public school science supervisor. In this chapter the following divisions of the methodology are presented: (1) procedures for collecting data; (2) design of the criteria for analysis of research studies; and (3) schema for data.

PROCEDURES FOR COLLECTING DATA

A survey of published research identified several studies focusing on the role of the public school science supervisor. An ERIC and DATRIX computer search was also made. Various indexes which contained references to literature pertaining to science or supervision were examined. Studies related specifically to the role of the public school science supervisor were isolated; these references formed the bibliography by which this study was initiated. The bibliographies of all articles were checked for additional sources. The publications
analyzed in this study were selected from more than one thousand articles or books examined. The basic criterion used for selecting a given article was that it referred to the role of the public school science supervisor.

DESIGN OF THE CRITERIA FOR ANALYSIS OF RESEARCH STUDIES

No single study which would accomplish the objectives of this study was located; therefore, by incorporating a portion of several studies, the method used in this research was finalized.

Paul DeHart Hurd, in Biological Education in American Secondary School, 1890-1960, followed a format similar to the one chosen for this research. Hurd summarized relevant research concerning biological teaching in America.¹ The foundations of his study were publications from curriculum committees and investigations relating to curriculum and learning problems in biology. The accounts used in his study ranged from a few pages to 600 pages. Some treated a single problem or issue, while others covered the entire spectrum of biological education. The articles were grouped chronologically by ten-year periods.

Marian A. Kittle, in "Trends in the Use of Statistical Tools in Educational Research Articles," analyzed trends. The format for his article was closest to the one used for this research. Kittle's problem was to select statistical methods most valuable to students

of education. The data for his study were taken from *Journal of Educational Research* from 1920 to 1940. Each published article was carefully scanned and statistical methods recorded. The frequency of one particular method was determined by the number of different studies in which it was utilized. Kittle suspected trends would be fairly well pronounced; however, his study did not confirm this assumption: frequencies remained fairly constant throughout the period.²

A study which synthesized research studies was written by Beatrice Davis Carmen in 1970. Her survey of related research isolated 135 studies pertaining to supervision. After excluding studies in subject matter fields, church schools, and in special service areas, ninety-nine usable studies formed the basis for her study. These studies were grouped into the following categories: (1) activities and responsibilities; (2) supervisory behavior; (3) attitudes toward supervision; (4) supervisory relationships; and (5) organization and structure. The studies were reexamined and the findings synthesized and classified into one or more of the twenty-three subcategories of the problem areas.³

Most studies similar in format to this study had usable studies grouped according to similarity of subject matter. The specific categories were usually derived by the author after each study had been


reviewed. Their classification schemes facilitated dealing with the data.

Any role or concept must pass through five levels of development or concern before it is accepted. The levels are awareness, development, simulation, implementation, and evaluation. A vertical analysis stratified each of the articles according to these five levels, while horizontal analysis showed the advent, emphasis, and duration of events within various levels. Although this method of categorizing the data was somewhat arbitrary, it seemed to be the best way to incorporate beginnings, developments, trends, and projections. This system facilitated handling of the data by arranging studies according to similarity of subject matter.

SCHEMA OF DATA

The five levels of awareness, development, simulation, implementation, and evaluation were used to stratify or determine the concepts in each article. The articles which met the criteria for each level helped form the description of the science supervisor's role. The characteristics under the five levels of concern were applied to each of the articles as accurately as possible. These levels of development and characteristics associated with them were discussed by Malcolm Provus and Mary Blatt Harbeck. Each level was further

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subdivided into characteristics which appeared within that particular level, thus insuring that each article received fair treatment. The number of articles dealing with a particular topic and the recurrence of each theme was recorded. The rise and decline of a particular idea was discussed.

A table containing the five levels and the characteristics corresponding to each of these levels made it easier to classify the articles. The presence of a particular characteristic within an article was shown by placing an X in the appropriate space in the table. A brief explanation of each characteristic was necessary for consistency in evaluating the articles.

Awareness Level

The awareness level had two subdivisions of characteristics: identifying and assessing.

Identifying. Identifying referred to the recognition of a problem. An article also met this criterion when a need was established for a science supervisor to help with the entire science curriculum or with a particular area or field.

Assessing. Assessing was appraising schools to determine the amount of science supervision needed. Some authors accomplished this by local, state, or national surveys.

Development Level

The development level involved choosing, selecting, and enabling.
Choosing. Choosing concerned investigating possible alternatives available for science supervisory approaches. Discussing possibilities other than a science supervisor to improve the science curriculum fell within this category.

Selecting. After a school considered possible choices, the best approach was judged. Articles which met this criterion, selecting, presented methods of selecting the science supervisor.

Enabling. The final characteristic under the development level was enabling, which referred to money or individuals being made available.

Simulation Level

Each of the characteristics occurring within the simulation level referred to the examination of models relating to the role of the science supervisor.

Curriculum. Curriculum referred to an article which described a model of a science supervisor as he worked in developing curriculum.

Recruiting. Recruiting related to models in which the science supervisor was recruiting or selecting staff.

Growth/Development. Growth/development represented models of the science supervisor in orienting, educating, assigning, and managing the science staff, and also pertained to the supervisor's role in his professional growth.

Facilities. Facilities characterized models of the science supervisor in working with school buildings and equipment.
Community. Community relations were models describing the role of a science supervisor as he worked with activities within the community.

Implementation Level

The three basic characteristics of the implementation level were shaping/designing, modifying, and conceptualizing.

Shaping/designing. Shaping/designing denoted molding or fashioning the role of the science supervisor.

Modifying. Modifying referred to appropriate changes or alterations when the supervisor was first becoming established in a system.

Conceptualizing. Conceptualizing concerned adopting concepts of science supervision: formulating a thought or opinion on what the science supervisor's role should be.

Evaluation Level

The evaluation level was divided into assessing/measuring, judging/reporting, and adjusting. This level was the step after the science supervisor had become established in a school or system.

Assessing/measuring. Assessing/measuring dealt with determining if the science supervisor met the objectives he set out to accomplish.

Judging/reporting. Judging/reporting was the area in which authors gave their opinions or statistics from surveys. This category concerned a description of the role of a science supervisor. The many activities of a supervisor were recounted in this area.
Adjusting. Adjusting was making adjustments of the objectives, activities, and measuring process of the science supervisor in order to alter behavior.

The five levels of concern: awareness, development, simulation, implementation, and evaluation were arrayed in tabular form in Table 1.

SUMMARY

Chapter 3 applied a vertical and horizontal analysis to each of the articles on the role of the science supervisor. A vertical analysis classified each of the articles according to five levels of concern or development. These levels were awareness, development, simulation, implementation, and evaluation. The horizontal analysis recorded the advent, emphasis, and duration of events within the various levels. The analysis of the data is given in Chapter 4.
### Table 1

An Analysis of the Role of the Science Supervisor as Revealed in Literature

<table>
<thead>
<tr>
<th>Date</th>
<th>Article</th>
<th>Awareness</th>
<th>Development</th>
<th>Simulation</th>
<th>Implementation</th>
<th>Evaluation</th>
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<tbody>
<tr>
<td>1895</td>
<td>&quot;What Can Be Done to Increase the Efficiency of Teachers in Actual Service?&quot; (Balliet)</td>
<td>X</td>
<td>X</td>
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<tr>
<td>1904</td>
<td>&quot;The Supervisorship&quot; (Chancellor)</td>
<td>X</td>
<td>X</td>
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<tr>
<td>1906</td>
<td>The School and Its Life (Gilbert)</td>
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<tr>
<td>1908</td>
<td>Our Schools: Their Administration and Supervision (Chancellor)</td>
<td>X</td>
<td>X</td>
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<tr>
<td>1916</td>
<td>School Organization and Administration (Cubberly)</td>
<td>X</td>
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</tbody>
</table>

*A description of the levels of development used in analyzing the role of the public school science supervisor may be found in chapter 3.*
Table 1 (continued)

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<thead>
<tr>
<th>Date</th>
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<tr>
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<td>Shaping/Designing</td>
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<td>Assessing/Measuring</td>
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<tr>
<td>1917</td>
<td>The Public School System of San Francisco, California (Claxton)</td>
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<td>1917</td>
<td>A Textbook in the Principles of Science Teaching (Twiss)</td>
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<td>1923</td>
<td>The Principal and His School (Cubberly)</td>
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<td>1927</td>
<td>&quot;A Study in Special Supervision&quot; (Tiegs)</td>
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<td>1928</td>
<td>Organization of Supervision (Ayer and Barr)</td>
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<td>1929</td>
<td>&quot;The Supervision of Nature Study&quot; (Downing)</td>
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<td>1930</td>
<td>&quot;Teachers' Evaluation of Types and Sources of Supervisory Aid&quot;</td>
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<td></td>
<td>(Bamesberger)</td>
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<tr>
<td>1930</td>
<td>How to Supervise (Kyte)</td>
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<td>1931</td>
<td>&quot;The Functions of Special Supervision in the Minneapolis Public Schools&quot;</td>
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<td></td>
<td>(Nystrom)</td>
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<tr>
<td>1932</td>
<td>Instruction in Science (Beauchamp)</td>
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<td>1939</td>
<td>&quot;A Science Supervisor in a Large School District (Rawlins)</td>
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<td>1939</td>
<td>&quot;A Science Supervisor in a Metropolitan Area&quot; (Wildman)</td>
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<th>Implementation</th>
<th>Evaluation</th>
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<tr>
<td>1939</td>
<td>&quot;A Coordinator of Science Instruction in Experimental Schools&quot; (Zechiel)</td>
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<td>1941</td>
<td>The Origins and Development of Elementary School Science (Underhill)</td>
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<td>1942</td>
<td>&quot;What of Supervision?&quot; (Teeters)</td>
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<td>1942</td>
<td>&quot;The Relative Value of Supervisory Agencies in Secondary-School Science Teaching&quot; (Mathewson)</td>
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<td>1946</td>
<td>&quot;An Investigation of the Director or Supervisor of Science in the Public Schools&quot; (Carleton)</td>
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<td>&quot;Helping the Elementary Science Teacher&quot; (Maddux)</td>
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<td>1953</td>
<td>&quot;Supervision of Guidance Toward Science&quot; (MacLean)</td>
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<td>&quot;A Study on the Use of Science Counselors&quot; (Mayor)</td>
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<td>1957</td>
<td>&quot;Needed: Elementary School Science Consultants&quot; (Atkin)</td>
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<td>1958</td>
<td>&quot;What Kind and Amount of Help Do Our Beginning Science Teachers Need?&quot; (Victor)</td>
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<td>1958</td>
<td>&quot;The Evaluation of Supervision of Secondary-School Science Instruction&quot; (Lee)</td>
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<td>1960</td>
<td>&quot;New Developments in the Teaching of Science&quot; (Johnson)</td>
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<td>1960</td>
<td>&quot;Supervision of Elementary School Science: In-Service Courses&quot; (Tannenbaum)</td>
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<td>&quot;The Supervision of the Science Program&quot; (Stotler)</td>
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<td>Elementary School Administration and Organization (Dean)</td>
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<td>1961</td>
<td>The Teaching of Science in the Elementary School (Lewis and Potter)</td>
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<td>1961</td>
<td>&quot;Supervision of Science and Mathematics&quot; (Battle)</td>
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<td>1961</td>
<td>&quot;Supervision of Science and Mathematics&quot; (Busch)</td>
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<td>&quot;Survey of the Science Supervisor&quot; (Ploutz)</td>
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<td>&quot;A Proposal for Improving High School Science Teaching&quot; (Fowler)</td>
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<td>&quot;The First Problem: Helping the Teacher&quot; (Woodburn)</td>
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<td>1962</td>
<td>&quot;Resources for Improving Instruction in Biology&quot; (Klinge)</td>
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<td>1963</td>
<td>&quot;The Specialist: Threat or Challenge?&quot; (Hansen)</td>
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<td>1963</td>
<td>Elementary School Science Teaching (Vessel)</td>
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<td>New Developments in Elementary School Science (Zafforoni and Selberg)</td>
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<td>1964</td>
<td>&quot;Science Supervision in Texas Public Schools, 1960-61&quot; (Cannon)</td>
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<td>Elementary School Organization and Administration (Otto and Sanders)</td>
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<tr>
<td>1965</td>
<td>&quot;The Supervisor and Curriculum Director at Work&quot; (Heffernan and Bishop)</td>
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<td>1965</td>
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<td>&quot;The Need for Science Consultants&quot; (Reinisch)</td>
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<tr>
<td>1967</td>
<td>&quot;What a Science Teacher Expects from a Supervisor&quot; (Bongarzone)</td>
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<th>Evaluation</th>
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<tr>
<td>1967</td>
<td>&quot;The Role of the Science Supervisor&quot; (Brewer)</td>
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<td>1967</td>
<td>&quot;Identifying Trends and Their Implications&quot; (Eiss)</td>
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<tr>
<td>1967</td>
<td>&quot;Tactics for Curriculum Change&quot; (Eiss)</td>
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<td>1967</td>
<td>&quot;Working with Teachers&quot; (Harbeck)</td>
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<td>1967</td>
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<th>Choosing</th>
<th>Selecting</th>
<th>Enabling</th>
<th>Curriculum Recruiting</th>
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<tr>
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<td>1967</td>
<td>The Supervision of School Science Programs (Stotler, Richardson,</td>
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<td>1967</td>
<td>&quot;Interaction Analysis: A Useful Technique for Research and Science</td>
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<td></td>
<td>Supervision&quot; (Cunningham)</td>
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<tr>
<td>1967</td>
<td>&quot;Dialogue in Supervision&quot; (Saltman and Champagne)</td>
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Table 1 (continued)

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<th>Date</th>
<th>Article</th>
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<tbody>
<tr>
<td>1967</td>
<td>&quot;Prerequisites of an Effective Elementary Science Program&quot; (Victor)</td>
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<tr>
<td>1967</td>
<td>&quot;Evaluation in Elementary Science Classroom Teachers and Their Supervisors&quot; (Tannenbaum, Stillman, and Piltz)</td>
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<tr>
<td>1967</td>
<td>&quot;In-Service Science Activities for the Elementary School&quot; (Lerner)</td>
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<td>1967</td>
<td>Readings in Science Education for the Elementary School (Victor and Lerner)</td>
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<td>1968</td>
<td>&quot;The Development of an Instrument to Evaluate Certain Practices in Science Supervision&quot; (Goode)</td>
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<thead>
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<th>Date</th>
<th>Article</th>
<th>*Level of Development</th>
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</thead>
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<tr>
<td>1968</td>
<td>&quot;A Survey of State Supervisors of Science&quot; (O'Hearn and Doran)</td>
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<tr>
<td>1968</td>
<td>New Directions in Elementary Science Teaching (Hurd and Gallagher)</td>
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<td>1968</td>
<td>The Use of Educational Technology in Providing Knowledge of Educational Technology and Suggestions for Its Application to Science Supervisors (Eiss)</td>
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<tr>
<td>1969</td>
<td>&quot;Supervising the Science Program--The Role of the Science Supervisor&quot; (Simendinger)</td>
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<td>1970</td>
<td>&quot;The Role of the Science Supervisor in the Teacher Education Process&quot; (Monteau)</td>
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<th>Date</th>
<th>Article</th>
<th>*Level of Development</th>
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<tr>
<td>1971</td>
<td>&quot;The Role of the Science Supervisor as Perceived by Elementary and Secondary Science Teachers&quot; (Graika)</td>
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<tr>
<td></td>
<td></td>
<td>Identifying Assessing</td>
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<td>Choosing Selecting</td>
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<td>Enabling</td>
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<td>Curriculum Recruiting</td>
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<td>Growth/Development</td>
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<td>Facilities</td>
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<td>Community</td>
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<td>Shaping/Designing</td>
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<td></td>
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<td>Modifying/Conceptualizing</td>
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<td></td>
<td></td>
<td>Assessing/Measuring/Reporting/Adjusting</td>
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<td>1971</td>
<td>&quot;Science Teaching: Role of Supervisor&quot; (Harbeck)</td>
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<tr>
<td>1971</td>
<td>&quot;A Systems Model for Science-Teacher Supervision&quot; (Koran)</td>
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<td></td>
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<td>X</td>
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<tr>
<td>1971</td>
<td>The Supervisor as a Catalyst for Change: A Comparative Study on the Role of the Foreign Language and Science Supervisors (Papalia and Doran)</td>
<td></td>
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<td>1971</td>
<td>&quot;Review of an Encounter with Educational Technology&quot; (Smith)</td>
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<th>Date</th>
<th>Article</th>
<th>Level of Development</th>
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<tr>
<td>1972</td>
<td>&quot;How Do We Evaluate What Is Going On?&quot; (Reiher)</td>
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<td>1972</td>
<td>&quot;A Cooperative School and University Teacher Education Program in Science --One Model&quot; (Eastman and Goldberg)</td>
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<td>1972</td>
<td>&quot;The Supervisor as a Facilitator of Self-Evaluation&quot; (Andersen)</td>
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<tr>
<td>1972</td>
<td>New Dimensions in Supervision (Williams)</td>
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<tr>
<td>1973</td>
<td>&quot;A Study of Science Supervision in the Public High Schools of Louisiana&quot; (Hutchinson)</td>
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*A description of the levels of development used in analyzing the role of the public school science supervisor may be found in Chapter 3.*
Table 1 (continued)

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<td>1973</td>
<td><em>A Survey of Science Teaching in Public Schools of the United States</em></td>
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<tr>
<td></td>
<td>(Schlessinger and others)</td>
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<td>1973</td>
<td><em>Teaching Science by Inquiry in the Secondary Schools</em></td>
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<td></td>
<td>(Sund and Trowbridge)</td>
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<td>(Richmond)</td>
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<tr>
<td>1975</td>
<td><em>Supervisory Behavior in Education</em></td>
<td>X</td>
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<tr>
<td></td>
<td>(Harris)</td>
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<tr>
<td>1976</td>
<td>&quot;A Profile of Science Supervision in New York State&quot;</td>
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<td></td>
<td>(Ritz and Felsen)</td>
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Table 1 (continued)

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<thead>
<tr>
<th>Date</th>
<th>Article</th>
<th>Awareness</th>
<th>Development</th>
<th>Simulation</th>
<th>Implementation</th>
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<td>1976</td>
<td>&quot;Educational Funding: Planning for Involvement&quot; (Awkerman)</td>
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<td>&quot;The Supervisor and Teachers in Liability&quot; (Bozardt and Righter)</td>
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<td>1976</td>
<td>&quot;The Graduate Education of a Science Supervisor&quot; (Butts and May)</td>
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<td>1976</td>
<td>&quot;Providing the Learning Environment&quot; (Bybee)</td>
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<th>Implementation</th>
<th>Evaluation</th>
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<tbody>
<tr>
<td>1976</td>
<td>&quot;Preparing for and Implementing Change&quot; (Eiss)</td>
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<td>1976</td>
<td>&quot;Working in Public Relations&quot; (Fariel)</td>
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<td>1976</td>
<td>&quot;A Performance Model&quot; (Hendrix)</td>
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<td>&quot;Science Fairs One Teacher's Opinion&quot; (Kingham)</td>
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<td>&quot;Science Education Research&quot; (Lockard)</td>
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<tr>
<td>1976</td>
<td>&quot;Utilizing Community Resources for Teacher Education&quot; (Ortleb)</td>
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<td>1976</td>
<td>&quot;Utilizing Community Resources&quot; (Purnell)</td>
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<td>1976</td>
<td>&quot;Developing Local Curriculum Reform&quot; (Seni)</td>
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<tr>
<td>1976</td>
<td>&quot;A Model for Initiating Accountability&quot; (Starr)</td>
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*Level of Development

- Identifying
- Assessing
- Choosing
- Selecting
- Enabling
- Curriculum
- Recruiting
- Growth
- Development
- Facilities
- Shaping
- Designing
- Modifying
- Conceptualizing
- Assessing
- Measuring
- Judging
- Reporting
- Adjusting

*A description of the levels of development used in analyzing the role of the public school science supervisor may be found in Chapter 3.
Chapter 4

ANALYSIS AND RESULTS

INTRODUCTION

Analysis of all the data was required to establish a description of the role of the public school science supervisor. The analysis given in Chapter 4 reveals beginnings, developments, trends, and projections of the role of the public school science supervisor.

Within the limits of this study, 106 articles were located which related to the role of the public school science supervisor. Each article was examined closely to determine the level of concern for which it met the criteria. When an article presented various aspects of science supervision, each aspect was recorded in appropriate awareness, development, simulation, implementation, or evaluation levels. Items classified under the awareness level were discussed as beginnings; those under development and implementation were presented as developments; those under simulation were grouped to determine projections; and those aspects classified under evaluation were used to determine trends pertaining to the role of the public school science supervisor. A chronological classification was also essential to specify the period of time during which the phases of science supervision occurred.
BEGINNINGS OF SCIENCE SUPERVISION

Thirty-four articles, or 32 percent, of the total articles examined, discussed the awareness level. Many contained only one or two sentences with characteristics within the awareness level. Many of the articles discussed both identifying and assessing and since authors made almost identical statements, identifying and assessing are summarized in a brief narrative in this chapter.

Superintendents did not have sufficient time for supervision and could not contribute detailed supervision in all areas; therefore, certain cities employed a science supervisor as early as 1895. At first the position of science supervisor was not very widespread.\(^1\)

Several authors stated that initial or additional science supervisors were needed to assist teachers with modifications resulting from the introduction of new courses or alterations occurring in present courses. Inadequately trained teachers were not utilizing the potentialities of science.\(^2\)

Mathewson recommended in 1942 that more city science supervisors be available although department heads in public schools, principals,


city science supervisors, and state science supervisors were possible persons for assuming science supervision duties. Four years later Carleton reported that some systems were not convinced of the desirability of having a science supervisor. Forty-nine years after Balliet's writing, the trend of providing a system-wide supervisor for science was still not very widespread and did not seem to be accelerating. Science supervision was usually a duty assigned to an assistant superintendent or research director. Stotler reported that educational leaders disagreed on the importance of having science supervisors in comparison to general supervisors.

Science supervisors dealt with problems facing everyone associated with science education, and several authors recommended that school systems employ a science supervisor. Fowler reported that an increase in the number of openings for science supervisors indicated that supervision was advantageous.

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DEVELOPMENTS IN SCIENCE SUPERVISION

Developments were drawn from the articles listed under the development and implementation levels. Fourteen articles, or 13 percent of the total, referred to these levels; a brief summary of articles within these levels is given.

Much friction resulted between supervisors and regular teachers because the authority of science supervisors was not clearly defined. Although science supervisors were representatives of the superintendent, they were not properly coordinated with the system. Many science supervisors regarded the principal as a subordinate, and were often antagonistic toward principals. In many instances the teachers chose to follow the principal instead of the supervisor.

According to Gilbert in 1906, Kyte in 1930, and Teeters in 1942, principals and supervisors were attempting to determine their responsibilities and authority, indicating that science supervisors encountered the same difficulties for several years.

Nystrom in 1931, and Zechiel in 1939 stressed that the duties of a science supervisor were broadening. Nystrom reported that

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supervisors, directors of science departments, and superintendents agreed that science supervision had the main purpose of improving instruction. Zechiel emphasized that the science supervisor was responsible for perceiving his special field in relation to other fields and to student needs.¹¹

Mathewson reported that in 1942 science education was changing to make a contribution to the war effort. Science supervisors were needed more than ever to assist teachers in modifying courses, to teach new units, and to acquire up-to-date supplemental materials.¹²

In the late 1950's, science instruction changed rapidly from being traditional, content-oriented, and teacher-centered to a process-oriented and student-centered approach. Studies indicated that competent supervisors provided valuable assistance to teachers.¹³ Although more supervisors of science were being employed than previously, the need for competent people in the field was widespread because of a demand for stepped-up programs in science, an increase which included elementary science and in-service education. As recently as 1968, the


services of a science supervisor were not available to the vast majority of classroom teachers.\textsuperscript{14}

The exponential growth in scientific knowledge, increased emphasis on science, and the proliferation of science curricular projects from 1959 until 1969 brought about a new leadership role for the science supervisor. The responsibilities of the science supervisor ranged beyond teaching or clerical experiences to inspiration as well as guidance.\textsuperscript{15}

Older programs received renewed emphasis, additional programs were developed, and innovations in the use of media increased because of the National Defense Education Act and the National Science Foundation. More specialized personnel were employed as a result of increased enrollments, subject matter specialization, and public realization of the need for specialists to seek improvement of curriculum and instruction.\textsuperscript{16}


Harbeck suggested that the role of the science supervisor was constantly changing as patterns of school organization changed.\(^\text{17}\) Sund and Trowbridge, in 1973, concluded that the role of the science supervisor was increasing and had assumed an increased leadership position in recent years.\(^\text{18}\)

**PROJECTIONS FOR SCIENCE SUPERVISION**

The simulation level included models which could be used by science supervisors. These models were examples of directions authorities perceived science supervision would pursue. All of the articles listed under simulation except one were written after 1970; the concepts presented were current at the time of the writing of this study. Only six articles, or 6 percent of the total, dealt with simulation models or models concerning the role of the science supervisor. The only model incorporating all of the divisions under simulation was the model presented by Hendrix, directed at removing the ambiguity of role expectations to facilitate science supervision.\(^\text{19}\)

Models on growth or development were discussed by Cunningham, Eastman, Goldberg, and Andersen. Cunningham and Andersen proposed the


systems model, the prime purpose of which was evaluation of teachers. Eastman and Goldberg designed a model to strengthen science education offered by colleges.20

TRENDS IN SCIENCE SUPERVISION

A majority of the articles included a listing of the duties of a science supervisor; these articles were grouped into eight time periods in Figure 1. Until the 1927-1936 period, very few articles appeared on the role of the science supervisor. The same number of articles, or seven, were published in the next two periods: 1937-1946 and 1947-1956. From 1957 to 1966, the period in which Sputnik appeared, the number of articles increased greatly and continued to increase in the 1967-1976 period. Literature of this period revealed a greater emphasis being placed on publishing articles on science supervision.

Several activities listed under the evaluation level contributed to the role of the public school science supervisor. Most of the articles which listed the duties of the science supervisor failed to discuss ways in which the supervisor was involved in the process.

Science supervisory activities within each period appear in Table 2, page 111. Entries in this list were arranged in descending order of

Figure 1. Distribution and Quantity of Articles Written from 1895 through 1976
Table 2
Frequency of Science-Related Instructional Activities Occurring from 1895 through 1976 in Literature Examined

<table>
<thead>
<tr>
<th>Science-Related Instructional Activities</th>
<th>Dates of Publication</th>
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<tbody>
<tr>
<td>Curriculum Development</td>
<td>0</td>
</tr>
<tr>
<td>Providing Supplies</td>
<td>0</td>
</tr>
<tr>
<td>Classroom Teaching</td>
<td>1</td>
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<tr>
<td>Encouraging Teaching</td>
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<tr>
<td>In-Service Education</td>
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</tr>
<tr>
<td>Curriculum Evaluation</td>
<td>1</td>
</tr>
<tr>
<td>Conducting Meetings</td>
<td>1</td>
</tr>
<tr>
<td>Classroom Visitation</td>
<td>1</td>
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<tr>
<td>Conferences</td>
<td>1</td>
</tr>
<tr>
<td>Preparing Visual Aids</td>
<td>0</td>
</tr>
<tr>
<td>Public Relations</td>
<td>0</td>
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<tr>
<td>Teacher Evaluation</td>
<td>0</td>
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<tr>
<td>Consulting Children</td>
<td>1</td>
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<tr>
<td>Teacher Assignment</td>
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<tr>
<td>Coordinating Efforts</td>
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<tr>
<td>Budget</td>
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<td>Teacher Orientation</td>
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<td>Planning Facilities</td>
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<td>----------------------------------------</td>
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<tr>
<td>Arranging Field Trips</td>
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<td>Developing Philosophy</td>
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<td>Fund Allocation</td>
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<td>Interschool Visitation</td>
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<td>Office Work</td>
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<td>Research</td>
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<td>Professional Development</td>
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<td>Hiring Aides</td>
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<td>Use of Computer</td>
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<td>Liability Awareness</td>
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<tr>
<td>Television and Radio Production</td>
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</table>
frequency. Activities mentioned in 15 percent of the articles are shown in Figure 2.

Figure 3, page 115, shows that curriculum development was mentioned in fifty-three, or 50 percent, of the 106 articles. The first article that mentioned curriculum development as a duty of the science supervisor appeared in 1917. From 1927 to 1936, six articles appeared on this duty. The number fell to one in both the 1937-1946 and the 1947-1956 periods, but increased in subsequent years. The aspect of curriculum development which received most emphasis was designing courses.

The activity given the second greatest emphasis was providing supplies: locating, selecting, and distributing supplies to teachers. The first article on this activity appeared in 1929. As shown in Figure 4, page 116, only three articles appeared during the period 1937-1946, none between 1947 and 1956, thirteen between 1957 and 1966, and fifteen between 1967 and 1976. Providing supplies has been one of the main functions of a science supervisor since 1957, as indicated by the articles reviewed for this study.

The next two categories in the list of activities a science supervisor performed were classroom teaching and encouraging teachers. Figure 5, page 117, and Figure 6, page 118, show the temporal distribution of articles in these categories. A total of twenty-six articles, or 25 percent, mentioned these aspects of the role of the science supervisor. The purpose of classroom teaching was often to assist teachers in the use of new courses and methods or materials and equipment. As early as 1904, classroom teaching was mentioned in the literature;
Figure 2. A Summary of the Frequencies of Science-Related Instructional Activities Occurring Most Often in the Literature Examined from 1895 through 1976
Figure 3. Frequency of Curriculum Development Occurring from 1895 through 1976 in Literature Examined.
Figure 4. Frequency of Providing Supplies Occurring from 1895 through 1976 in Literature Examined
Figure 5. Frequency of Classroom Teaching Occurring from 1895 through 1976 in Literature Examined.
Figure 6. Frequency of Encouraging Teachers Occurring from 1895 through 1976 in Literature Examined
however, only six articles mentioned it between 1904 and 1957. The period from 1957 to 1966 produced six articles and the number increased in the 1967-1976 period to fourteen.

Encouraging teachers consisted of giving inspiration as well as guidance, accomplished by creating a supportive climate familiarizing teachers with possible ways to increase their competency in science. Supervisors also kept teachers informed of new developments, institutes and conferences, university courses, and information concerning professional societies. No articles appeared until 1931 and only four articles mentioned encouraging teachers prior to 1957. From 1957 to 1966, six articles and from 1967-1976, sixteen articles were written concerning encouraging teachers.

In-service education was a relatively new concept, as shown in Figure 7. Although twenty-one articles, or 19 percent of the total, mentioned in-service education, the first article on this subject did not appear until 1958. In-service education was one activity of the science supervisor in which there was a definite increase in emphasis. The number of articles increased from six in 1957-1966 to fifteen in 1967-1976.

Curriculum evaluation consisted of testing and evaluating programs. Very little was written on this activity until 1960, as shown in Figure 8, page 121. Only three articles, one in 1904, one in 1932, and another in 1939, were written before 1960. The number increased from five to ten in the last two periods.

Designing or conducting in-service education, orienting new teachers, planning facilities, arranging field trips, interschool
Figure 7. Frequency of In-Service Education Occurring from 1895 through 1976 in Literature Examined
Figure 8. Frequency of Curriculum Evaluation Occurring from 1895 through 1976 in Literature Examined
visitation, fund allocation, and public relations were not mentioned as possible activities of the science supervisor until 1957. The appearance of each of these activities, except for orienting new teachers, increased greatly since the launching of Sputnik, indicating there was a trend toward a greater emphasis on these activities.

Office work, budget preparation, professional development, conducting or guiding research, developing a philosophy, coordinating the efforts of teachers and administrators, consulting with children, preparing visual aids, recruiting and assigning teachers, evaluating teachers, and holding individual conferences with teachers were areas mentioned only three times or less between 1895 and 1957. Classroom visitation was mentioned only four times and conducting meetings with teachers occurred only six times in this same period.

In only two cases did the activity listed in Table 2, page 111, not appear in the 1966-1976 period. The two instances were producing radio and television programs and showing the potential use of computers to teachers. Employing teacher aides and keeping teachers informed concerning liability and safety were activities not mentioned until the 1967-1976 period. Since each of these activities was only mentioned one time, a trend was not represented.

SUMMARY

Chapter 4 has presented an analysis of literature relating to the role of the public school science supervisor. The beginnings, developments, trends, and projections of a science supervisor's role, which were abstracted from the literature, were presented. A table
and various figures made this analysis more comprehensible. Chapter 5 presents a summary with findings, conclusions, and recommendations.
Chapter 5

SUMMARY

INTRODUCTION

In this study the problem was to analyze the role of the public school science supervisor, as perceived by recognized authorities, through the identification and description of beginnings, developments, trends, and projections found in scientific and educational literature. The literature survey, as limited, isolated 106 articles related to the role of the public school science supervisor. Each was examined to discover the level or levels of science supervision with which it dealt.

A descriptive analysis research design was followed to identify relevant factors which described the role of the public school science supervisor. According to the parameters of this study, it was felt that any concept or role must pass through five levels of concern or development before it is accepted. The levels determined were awareness, development, simulation, implementation, and evaluation. A vertical analysis stratified each of the articles according to these five levels, while a horizontal analysis determined the advent, emphasis, and duration of events within which various levels were recorded.

FINDINGS

The following emerged as significant findings:
1. The majority of articles concerning science supervision were limited to one author's opinion and consisted primarily of a listing of the duties of the science supervisor.

2. Science supervisors were employed initially to assist superintendents in matters of curriculum development and implementation. Although the presence of a science supervisor was reported as early as 1895, there was disagreement of opinion concerning the desirability of having a system-wide supervisor. Some school administrators preferred department heads, assistant superintendents, or principals to supervise science.

3. Lack of a clear role definition seemed to limit the effectiveness of the first science supervisors in working with teachers and administrators.

4. As the United States prepared for World War II, the duties of the science supervisor were modified. Teachers modified their courses to respond to conditions.

5. After Russia launched Sputnik in 1957, the science program was suddenly flooded with federal money to be used for the improvement of the science program.

6. Few authors have published articles proposing models or any type of study concerning projections for the role of the science supervisor.

7. Developing curriculum was the activity of science supervisors mentioned most frequently. This activity was mentioned in 65 percent of all articles.

8. As recently as 1968, the services of a science supervisor were not available to the vast majority of teachers.
9. Money from the National Defense Education Act and the National Science Foundation after 1957 made new programs available and gave renewed emphasis to older programs.

10. Articles written on the role of the science supervisor have steadily increased in number since 1957.

11. In-service education, orienting new teachers, planning facilities, arranging field trips, interschool visitation, utilizing funds, and public relations were first mentioned as activities of the science supervisor in the period 1957 to 1966.

CONCLUSIONS

Based on the findings of this study, the following conclusions were drawn:

1. Although the number of articles on science supervision has increased greatly since 1957, most of the content was based on the author's personal experience rather than systematic research.

2. The science supervisor was first introduced because the superintendent did not have sufficient time to supervise all subjects. This was particularly true because new courses were being added and others were being modified.

3. Science supervision was not readily accepted by many teachers and administrators for years because of the lack of a clear role definition for the science supervisor and other personnel assigned supervisory responsibilities.

4. From 1957 to 1976, more money was available for science-related activities. New programs were made available and older
programs received greater emphasis; therefore, the duties of a science supervisor increased greatly.

5. Most articles published on science supervision related actual duties of the science supervisor, rather than projecting the direction science supervision could be expected to pursue.

RECOMMENDATIONS

Based on the conclusions of this study, the following recommendations were made:

1. More research is needed on models designed to define the role of the science supervisor.

2. There is a need for in-depth studies in science supervision on a national basis, beyond the range of a single researcher.

3. As it appeared that a science supervisor would be a valuable asset to any school system, those school systems which do not employ one should consider adding the position.

4. It was recommended that science supervisors use this research as a basis for defining their role, dealing more effectively with contemporary problems, and as a foundation for future endeavors.

The purpose of this study was to analyze the role of the public school science supervisor by identifying beginnings, developments, trends, and projections. It is the contention of the writer that this study has presented those factors necessary for defining the role of the public school science supervisor.
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