A STUDY OF THE ACADEMIC AND PROFESSIONAL PREPARATION OF THE FIRST YEAR SECONDARY SCHOOL PHYSICS TEACHERS IN KANSAS

by

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TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

The concern for more and better preparation of teachers in the field of science and mathematics has grown considerably in the past decade. A study made by James B. Conant in 1961 reveales that 23 per cent of high school physics classes are taught by teachers who have studied the subject in college for less than 9 semester hours or about 7 per cent of the time of their training in four years.[1] This study was made to investigate the academic and professional preparation of first year physics teachers in Kansas.

Statement of the Problem

It was the purpose of this study to determine (1) the number of college credits in physics of the first year physics teachers in Kansas as well as the number of credit hours they possess in the science and mathematics field; and (2) the number of college credits they have in professional education courses; and (3) the relationship between academic and professional preparation of teachers of physics and the size of the school in which they teach. From this study the researcher attempts to provide further information in regard to the controversy concerning the preparation of first year secondary school physics teachers in the field of science.

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[1]James Bryant Conant, The Education of American Teachers (New York: Mc Graw-Hill Book Company, Inc., 1963), pp. 52-53.

Significance of the Problem

Educating qualified teachers of science has recently been stressed as one of the most important aims of education.

> During the past few years, Americans have developed a new understanding of the extent to which the nation's strength and security depend upon its manpower resources, that is, upon the skills, capacities, and creativeness of its people. The greatest stress currently is on scientific and technological accomplishment. [2]

Comparative studies of the college preparation, teaching combinations, and salaries of Kansas high schools were made by Ridgway[3] (1931), Irwin[4] (1938), and Lockhard[5] (1946). These investigators found that a large number of science teachers were insufficiently prepared for the science they were teaching, especially in the small secondary schools. The lack of academic preparation in physics is most striking; Gardner and Richardson (1960) analyzed the principals' reports of the Ohio State Department of Education for 1957-58, collecting data on 2222 teachers.

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[2]Marjorie Gardner and John S. Richardson. "The Teachers of Science in Ohio's Senior High Schools." Educational Research Bulletin, 39:65, March, 1960.

[3]C. W. Ridgway, "A Comparative Study of the Training and Teaching Combinations of Kansas High School Teachers." Kansas State Teachers College Studies in Education, 5:1-31.

[4]Frank L. Irwin, "A Comparative Study of the College Preparation, Teaching Combinations, and Salaries of Kansas High School Teachers, (1938)." Kansas State Teachers College Bulletin of Information, 18:1-38.

[5]Gene K. Lockhard, "A Comparative Study of the College Preparation, Teaching Combinations, and Salaries of Kansas High School Administrators and Teachers, (1946)." Kansas State Teachers College Bulletin of Information, 16:1-38.

Their findings, similar to the NEA Study, showed that 9.58 per cent of the physics teachers of that state had no credit in that subject. Fewer than half of the physics teachers had as many as fifteen credit hours in physics.[6] The importance of a high school science program is not questioned, however the shortage of well-trained teachers of science is serious.

There have been a variety of intensive programs designed to upgrade American science education. Representative of such programs were those of the National Science Foundation (institutes for science and mathematics teachers), Ford Foundation (filmed courses in high school physics and chemistry), and the American Association for the Advancement of Science (Science Teaching Improvement Program). James B. Conant has made a more recent impact by his recommendations on the preparation of science teachers in the mid-west. It appears that the "USSR versus United States" space race has stimulated American education, particularly in the science area.

Assumptions and Limitations

In obtaining the necessary information for tabulating the number of credit hours in physics and related subjects, and the number of professional education credit hours, the researcher assumed the correctness of the 1965-66 High School Principals' Organizational Reports on file in the accreditation section and the North Central Association Reports on file in the

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[6]Gardner and Richardson, op. cit., p. 67.

certification section of the Kansas State Department of Public Instruction. These reports included both public and non-public high schools. The research for this study was limited to the first year physics teachers in Kansas for the 1965-66 school year.

Definitions of Terms

First Year High School Physics Teacher. This person will have acquired a bachelor's degree or a master's degree between the years 1963-65 from an accredited institution of higher learning; the current employment for the 1965-66 school year in one of the Kansas high schools is the first teaching position held by the individual. This position includes the teaching of at least one class of high school physics.

Part Time Science Teacher. This person is employed to teach classes of physics, along with chemistry, earth science, general science, physical science, or biology for a fraction of the school day.

Full Time Science Teacher. This person is employed to teach classes of physics, along with chemistry, earth science, general science, physical science, or biology for the entire school day.

Teaching Area or Science Field. The total number of all college credits earned in physics, chemistry, biology, and earth science. Credit hours in mathematics will be included as a related field of preparation.

Professional Education. Professional education includes all courses that lar labeled by institutions as education courses. Included in professional education will be at least six semester hours directed toward the understanding of the individual in the area of pupil development and learning; these courses are in the psychology field.

Credits. The number of semester hours earned during college preparation.

Qualification to Teach. Each teacher must meet the requirements of the Kansas State Board of Education as stated in the Certification Handbook of January 1, 1966. For minimum certification a physics teacher needs 18 semester hours in science and 10 credit hours in physics.[7]

DESIGN OF THE STUDY

This study was based on the data concerning the first year secondary school teachers of physics in Kansas. Schools in Kansas that belong to the North Central Association of Colleges and Secondary Schools are required to fill out annual reports which include the number of hours of preparation in the teaching areas of all new personnel in each school system. Data concerning the first year physics teachers was taken from one of the copies of the 1965-66 reports. For secondary schools not belonging to the North Central Association the 1965-66 High

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[7]Kansas State Board of Education, Certification Handbook, (Topeka: State Board of Education, 1966), p. 66.

School Principals' Organizational Reports were screened to find the remaining first year physics teachers in Kansas along with their teaching load. The writer accepted the accuracy of the principals' judgment in recording the semester hours of credit for the teachers in the proper place on the respective reports. All first year physics teachers' transcripts were studied to obtain their science and mathematics backgrounds. In some cases it was necessary to make corrections from the college transcripts because of the discrepency between the number of credit hours in science subjects listed on the transcripts and those listed on the organizational reports. Certified Teachers' college transcripts were on file in the certification office at the State Department of Public Instruction.

The items recorded about each teacher were: name of the teacher, name of the teacher's graduating college or university, name and size of the school in which the teacher is employed, number of credits in physics, total number of credits in teaching area or science field, number of credits in professional education, number of credits in chemistry, biology, the physical sciences, and mathematics; and whether the teacher is a full time science teacher, part time science teacher, or full time physics teacher. The number of teachers and the organization of each school were also recorded.

REVIEW OF THE LITERATURE

The increased concern about the quality of science

education has drawn the attention of many organizations and well known individuals. This is evident from the strides that have been made by improving the educational materials in the field of science such as textbooks, films, and laboratory guides. The governmental support given to high schools under the National Defense Education Act of 1958 has improved the facilities and equipment found in science laboratories across the nation.

It must not be overlooked that the most important feature of any high school physics program is the quality of the teacher in the classroom. Teacher competency is difficult to determine; however, the study of the academic and professional preparation of each teacher is probably the most tangible means of making an evaluation. The question may be asked as to why it is so important to have an effective physics teacher on the high school level. The high school teacher is being recognized as the key to any successful effort to increase the supply of raw material from which future science teachers, engineers, and scientists are made. It is only through pursuing a subject well beyond the introductory level that a future teacher can gain a coherent picture of the subject, get a glimpse of the vast reaches of knowledge, feel the cutting edge of disciplined training, and discover the satisfactions of rigorous study well done (so that when he becomes a teacher, he can communicate something of this spirit to others).[8]

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[8]Conant, op. cit., p. 106.

Much has been written about the subject-matter preparation of high school science teachers. Unfortunately, down through the years certification requirements have determined the nature of educational programs of preparation.[9] Changes in state certification laws will take place, yet the demands on teachers cannot wait on legislative of bureaucratic permission. More studies concerning the preparation of physics teachers would be helpful in evaluating the current educational programs for the preparation of physics teachers.

Literature on the Preparation of Physics Teachers

A survey of the academic backgrounds of science teachers in the State of Ohio was made by Koelsche in 1957. Data was obtained from the 1957-58 principals' reports on file at the Ohio State Department of Public Instruction, Columbus. Of the 84 physics teachers studied, the median number of credits earned in the combined science areas was forty-seven. Approximately 99 per cent of these teachers had some science credits in their collegiate backgrounds.

Eighty-two per cent of the physics instructors had 33 or more credit hours in science; however, the nature and depth of the preparation varied considerably in the different areas. Physics was included in the academic backgrounds of 91.7 per cent of the instructors teaching the subject. The median number of credits for the group was thirteen. Of these teachers 40.5

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[9]Lucien B. Kinney, Certification in Education, (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1964), p. 122.

per cent had 10 credits or less and 13.1 per cent had 31 or more. Chemistry was also included in the academic backgrounds of physics teachers, their respective percentages were fifteen and nine. The seven full time teachers of physics on the whole were better prepared than the part time teachers. The areas of preparation arranged according to their decreasing strengths were: biology, chemistry, physics, geology, and astronomy.

Except for 32 teachers out of 476 studied, the professional education backgrounds of the science instructors consisted of 16 or more semester hours of credit in education courses.[10]

In 1957 Baker and Brooks made a study of the academic preparation of science teachers in the State of Kansas from the 1955-56 High School Principals' Organizational Reports on file at the Kansas State Department of Public Instruction. Of the 1144 science teachers studied it was found that 37.6 per cent of them had a science major and 50 per cent of them had college credit in physics I. There were less than 10 full time physics teachers out of the 251 who taught physics. The survey showed that physics teachers had about the same number of hours in first year physics and first year chemistry- 84 per cent had physics I and 66 per cent had physics II (preparation in biological science was below average for the whole group). Only a few

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[10]Charles L. Koelsche, "The Academic and Teaching Backgrounds of Secondary Science Teachers in the State of Ohio," Science Education, 43:134-39, March, 1959.

physics teachers had advanced training in physics.[11]

Pella (1958) analyzed data on the academic training of 258 physics instructors in Wisconsin. Of this number 163 taught physics and some non science subject (in most cases mathematics). The remaining 95 taught physics and other science subjects (full time science teachers). Seven per cent of the physics teachers had no academic preparation in physics, but the collegiate preparation of 75.5 per cent of the teachers of physics included 10 or more credits in physics. There was a range of 3 to 48 credits for those teachers having some academic preparation in physics; the average number was 13.5 credits. Ninety-three per cent of the physics teachers had some preparation in chemistry, 75.4 per cent had academic preparation in biology, and 60 per cent of the physics teachers had credit in earth science.

The situation with reference to mathematics is what one would expect since physics is a quantitative subject. Mathematics was included in the preparation of 93 per cent of the 258 physics teachers. The average of 16.6 credits was earned in this area.[12]

Mallinson (1949) made an investigation of the subject

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[11]Weldon N. Baker, and Merle E. Brooks, "Background and Academic Preparation of the Teachers of Science in High Schools of Kansas, (1956-57), "The Emporia State Research Studies, 6:1-40, December, 1957.

[12]Milton O. Pella, "The Nature of the Academic Preparation in Science of Wisconsin High School Teachers of Physics, Chemistry, Biology, and General Science," Science Education, 42:107-114, March, 1958.

matter backgrounds of student teachers in science. Future science teachers from five selected institutions were given the Regents Examinations of the University of New York to determine the extent of their academic preparation in this area. These tests were given in the fields of biology, earth science, chemistry, and physics. Adjustments were made on the examinations until there was a reliable consistance in the differential index with regard to the difficulty between fields. By scores obtained on the tests given during April and May of 1948 the academic preparation of first year physics teachers was poor, only future chemistry teachers scored lower.[13]

A large scale study of science and mathematics teaching facilities, made by the National Education Association Research Division (1959), revealed that among 5200 science teachers questioned, about half were employed as full time teachers of science, and 0.3 per cent have no training in the science field at all. Between 21 and 22 per cent have fewer than 20 hours in science fields.[14]

Literature on College Programs for the Preparation of Physics Teachers

By questionnaire, Novak and Brooks (1959) recorded the

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[13]George G. Mallinson, "An Investigation of the Subject Matter Backgrounds of Student Teachers in Science," School Science and Mathematics, 49:265-272, April, 1949.

[14]Herbert A. Smith and Guy B. Homman, "The Academic and Professional Preparation of Teachers of Science," Review of Educational Research, 31:291, June, 1961.

judgment of 196 high school teachers of science as to the preparation necessary to teach high school science. The reporting Kansas high school science teachers, as a group, were modest in their recommendations for college preparation, yet even these modest recommendations exceed the certification requirements for science teachers in some states. By the responses it is evident that too many science teachers are satisfied with little college preparatory work in the science subjects taught in the high school.[15]

Science teachers are currently feeling the demand to have training which considers conditions that influence scientific discovery, the nature of the creative process and the tools employed. To convey scientific attitudes conducive to the growth of investigative processes in science the teacher should definitely be trained beyond the introductory level.

In 1960 the American Association for the Advancement of Science (AAAS) Cooperative Committee on the Teaching of Science and Mathematics recommended training well beyond introductory courses physics I and physics II. The prospective high school physics teacher should have one-semester courses in each of the following subjects: physical mechanics, heat and thermodynamics, optics, modern physics, and electricity and magnetism. "Emphasis should be on thorough quantitative

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[15]Joseph D. Novak and Merle E. Brooks, "College Preparation of Teachers of Science," Science Teacher, 26:473, November, 1959.

treatment of a limited number of important topics in these areas of classical physics."[16] Advanced laboratory work should be associated with these courses. Supporting chemistry courses should include general chemistry, organic chemistry, and physical chemistry. Of course, a background in mathematics including differential and integral calculus would be prerequisites for some of the courses in a curriculum of this nature.

According to the American Association for the Advancement of Science, in a 4-year program the first year physics teacher should have 28 credits in physics; 8 credits in chemistry, 8 hours in biology, related science, 3 hours; and mathematics 12 hours. Even though many physics teachers are also required to teach classes of mathematics the best teaching combination would be one of teaching chemistry along with physics. Academic preparation to teach such a program would be: physics 18 credits, chemistry 18 credits, biology 6 credits, related science 12 credits, and mathematics 12 credits.[17]

After making a wide range study in 1963 Conant recommends that a combined field of chemistry and physics would be most attractive to the well trained first year teacher. A proposed program would be something like the following: 60 hours of general education, including 6 hours of mathematics,

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[16]"Preparation of High School Science Teachers," Science, 131:1024-29, April, 1960.

[17]Ibid., 1024-29.

6 hours of physical science, and 3 hours of general psychology; additional mathematics or history or philosophy or sociology of education or educational psychology, 6 hours; chemistry 21 hours; physics 24 hours; and student teaching and special methods 9 hours. The total physical science courses including 6 hours of mathematics would be 57 hours.[18]

Concerning professional education Conant recommends a sequence that would vary from a minimum of 12 credit hours to a maximum of 18 credit hours. Of these hours, 9 semester hours would be the credit for the time spent on special methods and student teaching. Included in the catagory of "essential" would be a course dealing with some knowledge of tests and measurements.[19]

PRESENTATION AND ANALYSIS OF DATA

Table I shows the teaching combinations of the first year physics teachers according to the school size. Seventeen or 50 per cent of the 34 first year physics teachers taught in schools with less than one hundred students or 70.6 per cent of the first year physics teachers taught in schools with less than two hundred students. Only one, or about 3 per cent of the first year physics teachers taught physics full time. A teaching combination of mathematics and physics was most common among the first year teachers of physics. The teaching of

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[18]Conant, op. cit., pp. 174-76.

[19]Ibid., p. 171.

TABLE I

TEACHING COMBINATIONS OF FIRST YEAR PHYSICS TEACHERS ACCORDING TO SCHOOL SIZE

School Size	Number of Teachers						
	Physics	Physics and Mathematics	Physics and Chemistry	Physics Chemistry Biology	Physics Chemistry Mathematics	Physics Other	Totals
--- 100	-	9	1	5	-	2	17=50%
100-200	-	2	-	2	2	1	7=20.6%
201-300	-	1	1	1	-	-	3=8.8%
301-500	-	1	1	-	1	-	3=8.8%
501-850	-	1	1	-	-	1	3=8.8%
850 ---	1	-	-	-	-	-	1=3.0%
Totals	1=3%	14=41.2%	4=11.8%	8=23.4%	3=8.8%	4=11.8%	34

physics and mathematics involved fourteen or 41.2 per cent of this group. Other combinations were: physics and chemistry, four or 11.8 per cent; physics, chemistry and biology, eight or 23.4 per cent; and physics, chemistry and mathematics, three or 8.8 per cent. Almost 12 per cent of the first year physics teachers taught physics and at least one other course outside the science and mathematics field.

Full time science teachers were better prepared in the science field than the part time science teachers as indicated by Table II. Fourteen full time science teachers comprised 42.4 per cent of the group of thirty-four teachers of physics and had 53 semester hours in science on the average while the nineteen part time science teachers had an average of 32 credits in science. Two or 6.1 per cent of the first year physics teachers had twenty credits or less in science. The majority or 63.8 per cent of this same group of teachers ranged from (21-45) credits in the related science area; and ten or 30.1 per cent had over forty-five credits in the science field. Due to the small sample of first year physics teachers there is no significant data showing that physics teachers starting their teaching careers in systems of two hundred or more are better prepared in the field of science. One full time physics teacher had 47 hours in related science; the range in semester hours for the group was from fifteen to one hundred one.

Academic preparation in physics. Table III shows that every teacher of physics had some college preparation in physics

TABLE II

COMPARISON OF THE ACADEMIC PREPARATION IN RELATED SCIENCE OF FULL TIME AND PART TIME SCIENCE TEACHERS ACCORDING TO SCHOOL SIZE

School Size	Semester Hours											
	1-20 credits		21-30 credits		31-45 credits		46-57 credits		58 or more credits		Totals	
	PST	FST	PST	FST	PST	FST	PST	FST	PST	FST	PST	FST
--- 100	1	-	5	1	4	2	-	-	1	3	11	6
100-200	1	-	2	-	-	1	1	1	-	1	4	3
201-300	-	-	-	-	1	-	-	1	-	1	1	2
301-500	-	-	2	-	-	-	-	1	-	-	2	1
500 ---	-	-	-	-	1	2	-	-	-	-	1	2
Totals	2	-	9	1	6	5	1	3	1	5	19	14
	2=6.1%		10=30.4%		11=33.4%		4=12.1%		6=18%		33	
Range in Semester Hours (15-101)									Averages -		32	53

One full time physics teacher had 47 hours in related science - School Size 2501

PST -- Part Time Science Teacher

FST -- Full Time Science Teacher

TABLE III

COMPARISON OF THE ACADEMIC PREPARATION IN PHYSICS OF FULL TIME AND PART TIME SCIENCE TEACHERS ACCORDING TO SCHOOL SIZE

School Size	Semester Hours											
	0 credits		1-9 credits		10-20 credits		21-27 credits		28 or more credits		Totals	
	PST	FST	PST	FST	PST	FST	PST	FST	PST	FST	PST	FST
--- 100	-	-	2	1	7	5	2	-	-	-	11	6
100-200	-	-	-	1	4	2	-	-	-	-	4	3
201-300	-	-	-	-	1	1	-	1	-	-	1	2
301-500	-	-	-	-	2	1	-	-	-	-	2	1
500 ---	-	-	-	-	-	2	1	-	-	-	1	2
Totals	-	-	2	2	14	11	3	1	-	-	19	14
	0%		4=12.1%		25=75.9%		4=12.1%		0%		33	
Range in Semester Hours (3-30)									Averages - 15		12.3	

One full time physics teacher had 30 hours in physics - School Size 2501

PST -- Part Time Science Teacher

FST -- Full Time Science Teacher

but, four or 12.1 per cent of the thirty-four first year physics teachers do not have enough credit hours in physics to meet the minimum standards for certification to teach physics in Kansas high schools. This minimum is 10 credit hours.

Twenty-five or 75.8 per cent of the full time and part time science teachers had from (10-20) credits in physics and four or 12.1 per cent had from (21-27) hours in physics. One teacher in a small high school had 3 credits in physics; this ranged up to 30 credits in physics for a full time physics teacher in a large school. Full time science teachers had an average of 12.3 credits in physics and the part time science teachers had an average of 15 credits in physics. This indicates that full time science teachers are getting most of their science training outside the field of physics.

Eleven or 84.5 per cent of the thirteen full time and part time science teachers with less than twelve credits in physics were teaching in school systems of less than two hundred students.

Academic preparation in chemistry. (Table IV) Thirty-two or 94 per cent of the thirty-four first year physics teachers had some credit in chemistry. Nine or 26.5 per cent of the teachers studied had less than eight credit hours in chemistry. Eight or 24.2 per cent of the full time and part time science teachers had from (8-12) credits in chemistry, nine or 27.2 per cent had from (13-18) credits in chemistry, and seven or 21.2 per cent had nineteen or more credits in chemistry.

TABLE IV

COMPARISON OF THE ACADEMIC PREPARATION IN CHEMISTRY OF FULL TIME AND PART TIME SCIENCE TEACHERS ACCORDING TO SCHOOL SIZE

School Size	Semester Hours											
	0 credits		1-7 credits		8-12 credits		13-18 credits		19 or more credits		Totals	
	PST	FST	PST	FST	PST	FST	PST	FST	PST	FST	PST	FST
--- 100	1	-	5	-	3	2	2	2	-	2	11	6
100-200	1	-	1	-	-	-	1	2	1	1	4	3
201-300	-	-	-	-	1	-	-	1	-	1	1	2
301-500	-	-	1	-	1	-	-	-	-	1	2	1
500 ---	-	-	-	-	1	-	-	1	-	1	1	2
Totals	2	-	7	-	6	2	3	6	1	6	19	14
	2=6.1%		7=21.2%		8=24.3%		9=27.2%		7=21.2%		33	
Range in Semester Hours (0-30)									Averages -		8.3	19

One full time physics teacher had 15 hours in chemistry - School Size 2501

PST -- Part Time Science Teacher

FST -- Full Time Science Teacher

Comparing the full time science teachers preparation in physics and chemistry it is evident that first year physics teachers are better prepared in chemistry than in physics. The table shows that full time science teachers had an average of 19 semester hours in chemistry compared to the 12.3 credit average for physics preparation shown on Table III. Part time science teachers had an average of 8.3 semester hours in chemistry. The range in preparation of chemistry for the first year physics teachers is (0-30) credits; one full time physics teacher had 15 credit hours in chemistry.

Eight or 89 per cent of the nine full time and part time science teachers with less than 8 credits in chemistry were teaching in school systems with fewer than two hundred students.

Academic preparation in biology. Table V shows that biology was included in the academic preparation of thirty-two or 94 per cent of the thirty-four first year physics teachers. Their training ranged from (0-64) credits. Nineteen or 56 per cent of the teachers had less than a minimum of eight hours credit proposed by Conant. Fourteen or 41.2 per cent of the full time and part time physics teachers had eight credits or more in biology. The part time science teachers had earned an average of 6.4 credits, and the full time science teachers had earned an average of 21 credits in biology. One full time physics teacher had 2 credits in biology.

Twelve or 63.2 per cent of the full time and part time science teachers with less than eight credits in biology were

TABLE V

COMPARISON OF THE ACADEMIC PREPARATION IN BIOLOGY OF FULL TIME AND PART TIME SCIENCE TEACHERS ACCORDING TO SCHOOL SIZE

School Size	Semester Hours											
	0 credits		1-7 credits		8-12 credits		13-18 credits		19 or more credits		Totals	
	PST	FST	PST	FST	PST	FST	PST	FST	PST	FST	PST	FST
--- 100	1	-	7	-	1	3	-	-	2	3	11	6
100-200	-	-	4	-	-	-	-	1	-	2	4	3
201-300	-	-	1	-	-	-	-	-	-	2	1	2
301-500	1	-	1	1	-	-	-	-	-	-	2	1
500 ---	-	-	1	2	-	-	-	-	-	-	1	2
Totals	2	-	14	3	1	3	-	1	2	7	19	14
	2=6.1%		17=51.5%		4=12.1%		1=3%		9=27.3%		33	
Range in Semester Hours (0-64)									Averages - 6.4		21	

One full time physics teacher had 2 hours in biology - School Size 2501

PST -- Part Time Science Teacher

FST -- Full Time Science Teacher

teaching in school systems with an enrollment less than two hundred.

Academic preparation in mathematics. (Table VI) Thirty-two or 94 per cent of the first year physics teachers had some academic preparation in mathematics. Twenty-one or 62 per cent of the thirty-four physics teachers studied had more preparation in mathematics than the recommended minimum of twelve proposed by Conant. Twelve or 35.3 per cent of these physics teachers had twenty-four or more credits in mathematics which is equivalent to a college major in that subject.

The average number of credits in mathematics for the full time science teachers was 8.3 and the larger sample of part time science teachers had an average of 31 semester hours in mathematics. This indicates that many of the first year teachers of physics are also teaching mathematics as shown in Table I. The range in mathematics credit hours of the science teachers studied was (0-86).

Nine or 75 per cent of the twelve full time and part time science teachers with less than 12 credits in mathematics were teaching in school systems with fewer than two hundred students.

Professional education preparation. First year physics teachers received an average of 20.6 credits in this area as shown by Table VII. All but four of the first year physics teachers met the minimum of twenty credits in professional education required for certification. This is well over the minimum suggested by Conant.

TABLE VI

COMPARISON OF THE ACADEMIC PREPARATION IN MATHEMATICS OF FULL TIME AND PART TIME SCIENCE TEACHERS ACCORDING TO SCHOOL SIZE

School Size	Semester Hours											
	0 credits		1-6 credits		7-11 credits		12-23 credits		24 or more credits		Totals	
	PST	FST	PST	FST	PST	FST	PST	FST	PST	FST	PST	FST
--- 100	-	1	1	4	-	-	4	1	6	-	11	6
100-200	-	-	-	2	-	1	2	-	2	-	4	3
201-300	-	1	-	-	-	1	1	-	-	-	1	2
301-500	-	-	-	1	-	-	-	-	2	-	2	1
500 ---	-	-	-	-	-	-	-	1	1	1	1	2
Totals	-	2	1	7	-	2	7	2	11	1	19	14
	2=6.1%		8=24.2%		2=6.1%		9=27.2%		12=36.4%		33	
Range in Semester Hours (0-86)									Averages - 31		8.3	

One full time physics teacher had 22 hours in mathematics - School Size 2501

PST -- Part Time Science Teacher

FST -- Full Time Science Teacher

TABLE VII

AVERAGE NUMBER OF CREDITS EARNED IN PROFESSIONAL EDUCATION BY FIRST YEAR PHYSICS TEACHERS IN KANSAS

Area	Part Time Science Teacher	Full Time Science Teacher	Average
Professional Education	20.0	21.2	20.6

One full time physics teacher had 24 hours in professional education. All but four teachers met the minimum requirement of twenty semester hours for certification.

SUMMARY AND CONCLUSIONS

The purpose of this study was to determine the number of college credits in physics of the first year physics teachers in Kansas as well as the number of credit hours they had in the science and mathematics field; and the number of college credits they had in professional education courses; and the relationship of academic and professional preparation of teachers of physics and the size of the school in which they taught. Data for this study was obtained from the 1965-66 North Central Association Reports on file at the State Department of Public Instruction, Topeka. This study involved 34 first year physics teachers in Kansas.

Using the AAAS's recommendations for the college preparation of physics teachers, the data on the first year physics teachers supports the following conclusions:

(1) Seventeen or 50 per cent of the first year physics teachers taught in schools with less than one hundred students or 70.6 per cent taught in schools with less than two hundred students.

(2) A teaching combination of physics and mathematics involved 41.2 per cent of the first year physics teachers.

(3) Seventeen or 89.5 per cent of the nineteen part time science teachers were teaching mathematics as well as physics for part of the school day.

(4) Full time science teachers were better prepared in the science field than part time science teachers.

(5) First year physics teachers had an average of 42 credit hours in the science field.

(6) Four or 12.1 per cent of the thirty-four first year physics teachers do not have enough credit hours in physics to meet the minimum requirement for certification.

(7) The range in academic preparation in physics of the first year physics teacher is from (3-30) credits with an average of fourteen semester hours in physics.

(8) One hundred per cent of the four first year physics teachers with less than 10 credit hours in physics were teaching in school systems with fewer than two hundred students.

(9) The full time science teachers studied were better prepared in chemistry than in physics.

(10) Seventy-three per cent of the 34 first year physics teachers had eight credits or more in chemistry.

(11) Eighty-nine per cent of the nine teachers of physics with less than eight credits in chemistry were teaching in schools smaller than two hundred.

(12) Fourteen or 41.2 per cent of the first year physics teachers had eight or more credits in biology.

(13) Twenty-one or 62 per cent of the thirty-four physics teachers had over twelve semester hours in mathematics; thirty-five per cent had mathematics training equivalent to a college major in that subject.

(14) Seventy-five per cent of the twelve science teachers with less than 12 credits in mathematics were teaching in school

systems with an enrollment less than two hundred.

(15) First year physics teachers earned an average of 20.6 credits in professional education.

The average first year physics instructor had 14 semester hours of preparation in physics and 42 semester hours in the science field. Only the one full time physics instructor met the AAAS's minimum recommendation of 28 credits in physics. Less than 24 per cent of the first year physics teachers had enough credits in physics to meet Conant's suggested 18 hour minimum for a teaching combination of physics and chemistry.

Seventeen or 89.5 per cent of the 19 part time science teachers were teaching at least one class of mathematics. The part time science teachers had an average of 19 semester hours in mathematics. Fourteen of these teachers taught mathematics as their principle subject and physics as the only course in the field of science.

There was found to be no significant relationship in the academic and professional preparation of the first year physics teachers and the size of the school in which they teach.

The largest number, ten or 29.4 per cent of the first year physics teachers were being trained by The Kansas State Teachers College of Emporia; two of these students had earned a masters degree. There were six of the teachers studied that were trained in colleges and universities other than in Kansas; Oklahoma was the largest contributor.

This study suggests that there are few teachers being

trained to teach physics as their principle subject in Kansas high schools. On the average first year physics teachers have scarcely met the minimum requirements for certification to teach physics. Certainly there needs to be an improvement in the academic training for future physics teachers. Science workshops and in-service institutes sponsored by the National Science Foundation, improvements in college curriculums in teacher preparation, upgrading of certification requirements, consolidation of small schools, and other projects are working toward the improvement of education and the preparation of better physics teachers.

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ABSTRACT

A STUDY OF THE ACADEMIC AND PROFESSIONAL PREPARATION OF THE FIRST YEAR SECONDARY SCHOOL PHYSICS TEACHERS IN KANSAS

by

TIMOTHY AMOS RUNDUS

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AN ABSTRACT OF A REPORT

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The purpose of this study was to determine the extent of the academic preparation in physics of the first year physics teachers in Kansas as well as the number of credit hours that are included in their preparation in the science and mathematics field; the number of college credits they have in professional education courses; and the relationship between academic and professional preparation of teachers of physics and the size of the school in which they teach.

Data concerning the first year physics teachers was obtained from the 1965-66 North Central Association Reports and the 1965-66 High School Principals' Organizational Reports on file at the State Department of Public Instruction, Topeka. Thirty-four first year high school physics teachers were studied.

The American Association for the Advancement of Science's (AAAS) minimum recommendations were used to determine the adequacy of preparation along with the certification requirements for first year high school physics teachers in the State of Kansas.

Seventeen or 50 per cent of the first year physics teachers taught in schools with less than one hundred students or 70.6 per cent taught in schools with less than two hundred students. Fourteen or 41.2 per cent of the first year physics teachers, which included a large percentage of part time science teachers had a teaching combination of physics and mathematics.

The average first year physics instructor had fourteen semester hours of preparation in physics and forty-two semester

hours in the science field. Only the one full time physics instructor met the AAAS's minimum recommendation of 28 credits in physics. Full time science teachers were better prepared in the science field than part time science teachers.

Analysis of the first year physics teachers' training in the science and mathematics field revealed that full time science teachers were better prepared in chemistry than in physics. This indicated that full time science teachers are getting most of their science training outside the field of physics.

The first year physics teachers had an average of 14 credits in chemistry. Twenty-seven per cent of the teachers did not earn the AAAS's recommendation of eight credits in chemistry. The teachers averaged 13.2 credit hours in biology. Fifty-six per cent of the physics teachers did not earn eight credits in biology recommended by the AAAS. An average of 20.1 credits was earned in mathematics and thirty-eight per cent of the teachers did not earn the AAAS's recommendation of twelve credits. First year physics teachers earned an average of 20.6 credits in professional education; four teachers did not earn the minimum of twenty semester hours.

The study indicated that there was no significant relationship in the academic and professional preparation of the teachers studied and the size of the schools in which they taught.

The lack of adequate training in physics shows that there

definitely needs to be an improvement in the academic training of future teachers of this subject. There is a definite need to evaluate the certification requirements in Kansas in order to raise the level of preparation for future teachers of physics.