

BACKGROUND OF HIGH SCHOOL PHYSICS TEACHERS
IN A GROUP OF CATHOLIC SCHOOLS

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by

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CHAPTER I

INTRODUCTION

In past years the undergraduate preparation of high school physics teachers has been a topic of discussion and research.¹ A few experimental programs have been developed.²

This study intends to examine the undergraduate and graduate background of high school teachers of physics and compare this to current recommendations of background preparation of high school teachers. This study will also examine the preparation of teachers in high school physics curriculum projects.

Background of the Group

The study was limited to a group of Catholic schools located across the United States. The group of schools chosen is administered and staffed to varying degrees by members of the same religious order. The primary goal of the religious order is the Christian education of youth.

There are many religious orders in the United States having similar goals in education. Each order administers and staffs a group of schools. Each group of schools has a basic philosophy of education reflecting the philosophical background of the religious order.

The study has singled out one such group of schools. The particular group of schools has not been studied with respect to the background training of the physics teachers. Not all of the teachers of

the group are members of the religious order administering the group of schools.

The group of schools selected is administered and staffed by a religious order of which the author was a member for a time. During that time, and since leaving, the author has been interested in the preparation and background of physics teachers in this group of schools. The study of this group of schools should reflect similar characteristics of the physics teachers in schools administered by other religious orders.

The main objective of the study is to compare the background training of the physics teachers in the schools administered by this religious order to the current recommendations of background training for physics teachers.

The author has not named the religious order or the schools of the survey at the request of the teachers surveyed.

The study was undertaken to determine the background training of physics teachers in these schools administered by the religious order. The results will be given to the schools to aid in the ongoing education of the teachers. The results will also be a guideline for similar schools administered by a religious order. All the schools surveyed are in the United States.

There are twenty-nine schools. Of these schools ten are in the Northeast; all are located in metropolitan areas. Another ten are in the Midwest with three in metropolitan areas. Three are in the South, two being in metropolitan areas. The remaining six are located in metropolitan areas of California.

Background and Significance of the Study

In past years there has been a steady decline in enrollment in high school physics.³ It has been noted that the reasons for a decrease in enrollment is due to physics teacher shortage, a stress on difficulty of the subject, and the lack of teacher preparation.⁴ The concern of the physics community concerning the steady decline of enrollment in high school physics is brought to light in the Commission on College Physics report pertaining to the need to improve the preparation of high school physics teachers.⁵ Many recent physics curriculum projects have had as one of their goals increased interest and enrollment in high school physics.⁶

Many physicists and committees of physicists and educators have stated the importance that everyone should take high school physics, and that physics should be made adaptable to meet the needs of all.⁷

The Commission on College Physics showing concern for preparation of high school physics teachers recommended seven guidelines to be followed in high school physics teacher preparation programs.⁸ These are stated in context in Chapter II on page 11. Sawyer also stated the need for a change in the preparation of high school physics teachers.⁹ Burnett, in quoting Barifield's study of In-Service Education for Beginning Science Teachers in Virginia High Schools, notes the lack of adequate preparation of teachers.¹⁰

Teacher training of physics teachers has not been the only area of concern. In the past sixteen years, there has been an increased tempo of study and development of physics curriculum projects for the high school level. Methodology and techniques of instruction have been

under study at length. In this study only teacher training will be addressed.

One concern in the proper education of physics teachers is the class load. Many high school physics teachers only teach one or two physics classes while the rest of their teaching load are other areas of science or mathematics.¹¹ Physics teaching is not their primary duty. Related to this problem is that many of these teachers did not prepare to be physics teachers, but teach physics as a second field.¹² In many instances, the teachers fail to have the necessary background.

The background of physics many high school teachers have is in the r-curriculum courses, which are physics courses that are designed for the undergraduate training of physics students that are preparing to go into research physics.¹³ See Definition of Terms on page 7. During the undergraduate physics programs, the prospective teachers have little chance to set up equipment and become familiar with its use. This is evidenced by DiLavor's students' success in equipment use as compared to the students in the conventional advanced courses.¹⁴ The laboratory work that the prospective teacher experiences is of little value in laboratory preparation and equipment use. Read also refers to the need of preparation of teachers in laboratory management, and use and building of equipment.¹⁵ This laboratory training is almost non-existent in the present programs.

Much of the training of present physics teachers in laboratory techniques, equipment use and management is received either through In-Service Programs, Summer Institutes, such as the Illinois State Physics Project, or through on-the-job experimentation, or through professional

magazines such as in the "Apparatus for Teaching Physics" in The Physics Teacher.¹⁶ This training is usually obtained either through graduate programs or National Science Foundation sponsored programs. It is also through these same programs that a physics teacher becomes familiar with the philosophy of many physics curriculum projects that have been developed.

Many of these projects are being taught in schools where the teacher has not had an opportunity to go through a training session with respect to a particular project. Elliott reports in his findings that 80% of the teachers surveyed used PSSC to varying degrees and only 7% had any training in the PSSC project prior to teaching it.¹⁷

Another study suggested that teaching methods should be included in college courses.¹⁸ Presently there is a lack of adequate training in techniques and methods. The Commission on College Physics recommendations includes the establishment of physics courses specifically designed for the non-specialist that are geared for the teacher and non-scientist.¹⁹

Read describes a new program at East Carolina University designed to meet the needs of prospective and new high school physics teachers. Much of the program is developed around the specific curriculum projects, multi-media materials, purchasing, repairing, building, managing and using equipment. In the traditional programs, the only equipment contact was in the laboratory.²⁰

DiLavore also established and conducted an experimental course for preparation of high school physics teachers. One of the objectives he set out was that the student be able to verbalize his understanding of physical concepts; another objective sought was the student has a

skill in handling and building equipment. He mentioned that many were able to handle equipment better than advanced students of the more conventional courses.²¹

Haber-Schaim states:

In the past it has generally been assumed that once the competence in a discipline has been attained, good teaching habits can be acquired from lectures about teaching methods. Even today, the dichotomy between subject matter and method is the rule rather than the exception.... Today the future physics teacher is likely to start taking the same physics course as the student who plans to go on to graduate school, or into industry as a professional physicist, chemist or engineer.²²

In light of class loads, the insufficient courses in physics, the techniques of equipment, and the curriculum projects, it is quite important to determine, as this study is setting out to do, if the present high school physics teacher is adequately prepared.

Purpose of the Study

The purpose of the study was limited to the physics teachers in the schools administered by the religious order. The purpose of the study is:

1. Examine the undergraduate preparation of the physics teacher.
2. Examine the additional training including graduate study since completing the undergraduate program.
3. Compare the background of the physics teachers to the current recommendations as spelled out by the Commission on College Physics for a program of preparation of high school physics teachers.
4. Examine the training of high school physics teachers in the philosophy and use of materials of physics curriculum projects.

Hypotheses

The basic hypotheses of the study are:

1. In this group of schools, the present high school physics teacher's undergraduate background does not meet the current recommendations of high school physics teacher preparation.
2. Additional training since completion of undergraduate degree programs will compensate for any deficiencies of the teachers.
3. The training in various physics curriculum projects, including philosophy and use of materials, is received after completing the undergraduate program of studies.
4. Many teachers use physics curriculum projects in varying degrees without any apparent training in the physics curriculum project.

Definition of Terms

Background of physics teachers. The background of physics teachers is taken to include those courses of physics that develop the content of physics, the techniques of use of laboratory equipment, the techniques and instructional methods that aid the high school physics teacher.

Physics Curriculum Projects. Physics curriculum projects refer to those specific curricula that have been developed with a specific philosophy and include texts, equipment and multi-media materials to meet the objectives of the project. Project Physics, Physical Science Study Committee or PSSC, and The Illinois State Physics Projects are examples of curriculum projects.

The R-Curriculum. The r-curriculum is the undergraduate courses that are specifically designed for physics students that are intending

to go on in graduate research physics. The definition was formulated by the Second Ann Arbor Conference.²³

Class Load. The number of classes the teacher is meeting. The classes include the number of sections of a particular subject as well as the other subjects. It is defined as such to examine what part of the total class load is physics.

Procedures for Collecting Data

The schools selected range across the United States. The teachers were contacted through a mailed questionnaire with a cover letter explaining the survey.

The data were tabulated and compiled in averages and percents. The categories surveyed included the general background, the undergraduate background, and the graduate background of the physics teachers.

CHAPTER II

REVIEW OF LITERATURE

One of the concerns of the present high school physics teacher is his class load. Many times the high school physics teacher is teaching at most one or two physics classes and the remainder of his teaching load is in other areas of the curriculum. Ralph A. Sawyer quoting a study by the American Association for the Advancement of Science states that, "...of all teachers of high school physics, 81% teach one or two classes, while 15% teach three or four classes, making a total of 96% part-time teachers of physics."²⁴ Welch and Welberg also refer to the high school teacher of physics as one usually teaching other classes as well as physics. Elliott in his study of high school physics teachers in the California public schools found that only 55% of all physics teachers taught five or more hours per week.²⁵ Again a sizeable proportion of the teachers taught related courses. In the Illinois State Physics Project Miller reported in his findings the 567 teachers that were surveyed taught a total of 2616 classes of which 1026 were physics classes.²⁶ The Commission on College Physics stated that high school physics teachers should be prepared to teach one other field besides physics.²⁷

Related to the problem of teacher load is teacher preparation. Many of the teachers of high school physics either have not received their degrees in physics or lack the necessary minimum hours and training.

Boercher states:

Although most universities consider about twenty-four semester hours in physics as the minimum desirable training for a physics teacher, a survey of those people teaching physics in secondary schools found that 23% of them had taken less than nine semester hours of college physics, 43% had taken nine to seventeen semester hours, and only 14% had thirty or more semester hours. Most teachers specialize in some other subject and then take the minimum number of courses which will allow them to teach physics.²⁸

Noting that many lack the necessary background to teach physics, and also those teachers have chosen physics as a minor field to teach, it is found that few teachers have a background in physics consistent with the current recommendations.

In the Illinois State Physics Project, the 567 teachers surveyed, 1% had 1-5 semester hours, 6.5% had 6-10 semester hours, 17.3 had 11-18 semester hours, 34.7% had 19-35 semester hours, and 39.2% had 36 or more semester hours of physics. The same teachers in the study 23.1% had 1-18 semester hours, and 73.7% had more than 18 semester hours of education courses.²⁹

Hunter reported in his study that the average preparation of physics teachers in Louisiana was 10.2 semester hours of physics.³⁰

Many of the studies on teacher preparation report that the physics teacher is inadequately prepared. Welch and Welberg summarized their findings stating, "In general, teachers feel a need for more physics subject matter training, rather than more education courses. One noticeable exception is the expressed need for more training in the methods of teaching physics."³¹ Of the teachers polled by Welch and Wellberg, 78% agreed that college physics courses should also stress teaching methods that are of value to the high school teacher.³²

The Commission on College Physics in its opening remarks states:

A strong commitment to teacher training may not be reasonable for every institution. It requires that significant resources-- money and faculty time (which every institution cannot afford)-- be set aside for the benefit of a small number of students. The small physics department in all likelihood cannot support both an r-curriculum in physics and a teacher preparation program without holding common classes, which is not recommended.³³

The Commission then goes on to recommend the following points to be considered for establishing a program to prepare high school physics teachers:

1. The program should prepare a teacher in at least one other field.
2. In the opinion of the PPPT, it is not desirable to have teacher candidates simply take the courses of the research-oriented bachelor's degree program.
3. The sequence of physics courses will affect recruitment and must accommodate the likely sources of students.
4. The content of the physics courses should reflect the needs of the high school teacher.
5. The style of the courses should reflect the fact that the high school teacher needs a greater ability than does the research student to explain physics in words as well as mathematics.
6. A course in the history and philosophy of physics is particularly important for the teacher.
7. The program should enable teachers already in service to get further training in physics.³⁴

Burnett quotes Barfield's study of In-Service Education for Beginning Science Teachers in Virginia High Schools:

...the majority of science teachers expressed the need for 'considerable help' in techniques of teaching and organizing units of work, in evaluation, and in improvising science equipment.... The majority claimed that they had received no in-service help in these and other problems that they encountered in science teaching.³⁵

Oenes reports the recommendations of the International Commission of Physics Education, "A physics teacher should have a minimum of 500 hours (about four semester courses) of physics designed for teachers beyond the level they are going to teach, along with the appropriate courses in mathematics." The group goes on to recommend, "The undergraduate education of physics teachers should include courses that stress the relevance of science to the problems of society."³⁶

Many of the individuals that have researched the area of high school physics teacher preparation as well as the commissions established to study the area of physics teacher preparation have definitely stated a need for change in the status quo. The undergraduate preparation of the high school physics teacher is going to require a different emphasis in physics content than the person enrolled in the r-curriculum. The prospective teacher must also be trained in laboratory management, equipment operation, repair and building, as well as equipment evaluation. He must become familiar with the various curriculum developments and projects for high school physics.

DiLavore and Walker report on the progress of an introductory physics course designed for teacher education at the University of Maryland. The course was designed in accordance with the recommendations of the Commission on College Physics. In their report they discuss the implementation and analysis of the course as it was taught for two years. They felt the students were able to verbalize physical concepts better than those who were in a conventional course; the students were able to handle and build equipment better than many advanced physics majors. DiLavore did admit that in their experimental course over the two years they lacked a true objective, reliable evaluation of the course.³⁷

Another program designed in accordance to the Commission on College Physics recommendations is reported by Floyd Read. Two programs have been designed; one in a pre-service summer training program that has operated for two summers. The participants are college juniors and seniors that have expressed an interest in teaching. Read states:

There are three major thrusts of the program: (a) management of the high school physics laboratory, (b) curriculum, and (c) lecture demonstrations and analysis of laboratory equipment.

The participants are exposed to curriculum reforms and the common physics curriculum projects. They have an opportunity to become familiar with much of the equipment designed for those curriculum projects such as PSSC and Project Physics.³⁸

The second program described by Read was a Fifth-Year Program. Five students that were recent graduates that intended to teach high school physics were each given a grant to support their year of training. The program called for the placement of each student in an area high school for a teaching internship. They taught one physics class under a supervisory teacher and spent the remaining time in on-campus programs designed specifically for additional support in the teaching area.³⁹

Besides providing the high school physics teacher with the necessary undergraduate or pre-service training, it is thought that there must be continual, ongoing training as well. Oenes reports that the International Commission of Physics Education recommends, "Teachers should attend on the average at least one week of in-service training a year." Also referring back to the recommendations of the Commission on College Physics their seventh recommendation states, "The program should enable teachers already in service to get further training in physics."⁴⁰

Sawyer points out the Master's degree in science teaching that was established to broaden the science training of many of the present teachers in the area of new curriculum projects. The Illinois State Physics Project is but one of many in-service projects for developing the background of many present high school physics teachers.⁴¹

Fletcher G. Watson states that the effective teacher's learning is an ongoing process. His education and training should not cease at the end of the undergraduate level, but should continue throughout the period of his service in the classroom.⁴²

CHAPTER III

METHODS AND PROCEDURES

Subjects

The teachers surveyed were chosen from a group of private schools administered and staffed to varying degrees by the religious order. The schools have a common educational philosophy based on the educational philosophy of the order. The schools are primarily college preparatory in nature.

All of the schools administered by the religious order that are in the United States were surveyed. They numbered twenty-nine. Most of the schools are located in the major metropolitan areas of the United States. A few of the schools are located in population centers of one hundred thousand, and some in areas of fifty thousand or less. The schools are located and serve people in socio-economic range from upper-middle class through inner city, low income families.

The enrollment of the schools varies from less than three hundred up to almost sixteen hundred. The student populations vary from all boys, through coinstitutional and coeducational.

The class scheduling include single section per grade, homogeneous grouping, modified and totally modular schedules.

A modular schedule is defined as the school day being broken into short time segments called modules. In a modified modular schedule, each class is assigned a certain number of modules per day. The number

of modules varies according to the type of class. Classes are of different lengths. The schedule is inflexible beyond this point.

In a totally modular schedule the assignment of modules for each class varies as well as the number of modules for a particular class from day to day. The schedule is more flexible to meet the needs of a class.

Development of the Questionnaire

The questionnaire was developed over a period of six months. Three categories of the background of the teachers were identified to be surveyed: the general background; the undergraduate background; and the graduate background.

Once the general categories were identified, the significant areas were determined for each category.

The author taught for seven years in the schools administered and staffed by the religious order. Using this experience and knowledge gained, the questionnaire was developed in a gradual stepwise fashion. A stepwise process was used to avoid any mind sets or assumptions. In the final form the questionnaire retrieved the necessary information.

The Categories and Significant Areas of the Questionnaire

The significant areas of each category are:

1. The general background.
 - a. The teaching experience, particularly in physics.
 - b. The teaching load and what part of the load was physics.
 - c. The certification of each person, particularly in physics.

- d. The future plan in education. If he is to remain in education, and if so does he plan to continue to teach physics.
2. The undergraduate background.
- a. The purpose of his undergraduate education. If the program of studies was designed for teaching, engineering, industry, research, or other.
 - b. Of the physics content courses, what part was r-curriculum, and what part was designed for high school physics teaching.
 - c. The amount of training in laboratory management and safety; in the use, repair, building, and adapting of equipment; and the evaluation and purchasing of equipment.
 - d. The training in the philosophy and use of materials of physics curriculum projects designed for high schools.
3. The graduate background.
- a. The amount of training beyond the undergraduate degree. Has a graduate degree been earned? If so, was it in education and in particular in physics education?
 - b. The amount of additional training in physics content courses, particularly courses developed primarily for high school physics teachers.
 - c. The additional training received in laboratory management and safety; the use, building, repair, and adapting of equipment; and the evaluation and purchasing of equipment.
 - d. The amount of training in curriculum projects.

The Collection and Treatment of Data

The teachers were surveyed using a mailed questionnaire. A cover letter introducing and explaining the survey and its goals was included with a return envelope. A copy of the letter and questionnaire is located in the appendix.

The data were tabulated according to the significant areas of the categories of the questionnaire. Any comments of the teachers were also tabulated.

The tabulated results were computed into percents and averages. From the computations general trends of the background of the teachers from undergraduate through graduate training was analyzed with respect to the recommendations of the Commission on College Physics. Any significant changes in the group trends from the undergraduate training through the graduate training were noted.

CHAPTER IV

RESULTS AND ANALYSIS OF DATA

Response to the Survey

Twenty-nine schools made up the group surveyed. Teachers of nineteen schools responded by returning the completed questionnaire. One person returned the questionnaire refusing to take part. The nineteen responses gave a 66% return.

The school populations of the responses were 16% of three hundred or less; 52% with student populations between five hundred and one thousand; and 32% with student populations between one thousand and sixteen hundred students.

The General Background of the Group

The teaching experience of the group varied from a first year teacher through one with thirty-three years experience. The average years of experience was twelve years. Those teaching twelve years or less made up 63% of the group; the other 37% of the group had been teaching twenty or more years. The range of years of teaching physics was from one to twenty-eight, the average being seven years. Those that taught physics every year of their teaching experience made up 32% of the group. See Table 1.

The class load of the teachers varied from one class of physics through a full load of physics. No one taught a second year physics course. Two persons had administrative duties; one was a principal while the other was a vice principal.

TABLE 1
GENERAL BACKGROUND OF PHYSICS TEACHERS

Teacher Group	Number	Percent	Average
Teaching Experience			
Total	19		12
Less than twelve	12	63	
12 - 20	0	0	
Greater than 20	7	37	
Teaching Experience in Physics			
Total	19		7
Every year	6	32	
Certification			
High school	17	89	
Physics	15	79	
Future in Teaching			
Continue	17	89	
Continue in physics	16	84	
Class Load			
All physics	1	5	
50% or more physics	6	32	
Less than 50% physics	12	63	
Second year physics	0	0	

Only one person taught an entire load of physics. Of the group, 32% had a teaching load of 50% or more physics. Of this group each taught at least one non-physics class. One teacher's non-physics class was electronics. The class load consisting of less than 50% physics included 63% of the group. Of these, one had a load that was primarily electronics.

These results of teacher loads are consistent with the studies of class loads of high school physics teachers.⁴⁴ The Commission on College Physics recommendations for a program of preparation of high school physics teachers states that high school physics teachers should be prepared to teach one other field.⁴⁵ Of the teachers responding, 84% taught at least one other course besides physics. If electronics is considered a separate field, then 95% of the group taught at least one other course besides physics.

Of the group, 89% were certified to teach, and 79% were certified to teach physics. Those planning to continue to teach comprised 89% of the group, and 84% were planning on continuing to teach physics. The two members of the group with administrative duties plan to teach physics.

Undergraduate Preparation

Of the group, 58% went through a teacher education program at the undergraduate level. The other 42% completed undergraduate studies in engineering or research.

At the completion of the undergraduate level, the members of the group had an average of twenty-seven semester hours of physics. Only 11% had less than six hours; 11% had from six to twelve hours; and the remaining 78% had twenty-four or more hours of physics.

Of the members of the group, only one had any semester hours of physics courses designed for high school teachers. Of the twenty-five semester hours he had, fourteen were in courses designed for high school physics teachers. See Table 2.

The second, fourth, fifth and sixth recommendations of the Commission on College Physics state that the courses must be specifically designed to meet the needs of high school physics teachers. The courses they take must be separate from the r-curriculum courses designed for the students in research physics.⁴⁶

Only one member of the group had any training in the curriculum projects for high school physics at the undergraduate level.

Graduate Background

All but one had additional course work since completing the undergraduate program. The one exception was a first year teacher. Those with completed graduate degrees made up 63% of the group; 11% had completed doctoral degree programs.

Of the master's degrees completed, 32% were in education fields, while 21% were in physics education, 5% in math education, and 5% in science education. Master's in physics comprised 11% of the group, and 5% had gone on to complete doctorates in physics. Of the remaining graduate degrees 5% had master's in math, 11% in engineering; 5% of those in engineering had completed doctoral programs in engineering.

Of the teachers surveyed, those that had additional hours in physics made up 79% of the group. Of these, 58% had semester hours in physics courses designed for high school physics teachers. See Table 3.

TABLE 2
UNDERGRADUATE BACKGROUND OF PHYSICS TEACHERS

Teacher Group	Number	Percent	Average
Purpose of Education			
Teaching	11	58	
Engineering/Research	8	42	
Business/Industry	0	0	
Physics Background (semester hours)			
Total			27
Less than 6	2	10.5	
6 - 12	2	10.5	
12 - 24	0	0	
Greater than 24	15	79	
Designed for teachers	1	5	
Physics Curriculum Project	1	5	

TABLE 3
GRADUATE BACKGROUND OF PHYSICS TEACHERS

Teacher Group	Number	Percent
Graduate Work		
Total	18	95
Master's degree	11	58
Doctoral degree	2	11
Master's Degree		
Total Education Related	5	45
Physics Education	3	27
Math Education	1	9
Science Teaching	1	9
Physics	3	27
Math	1	9
Engineering	2	18
Doctoral Degree		
Physics	1	5
Engineering	1	5
Physics Background (semester hours)		
Content Courses	15	79
Designed for Teachers	11	58

TABLE 3 (con't.)

Teacher Group	Number	Percent
Physics Curriculum Projects		
Taught Project	11	58
Trained in Project Taught	3	27
Trained in one or more Projects	8	42

The final recommendation of the Commission on College Physics states that a teacher preparation program should be designed as such to aid the present teachers.⁴⁷

As noted before, only one had any course work in physics designed for teachers, but this rose to 58% of the group having course work designed for teachers on the graduate level.

The Physics Curriculum Projects

Of the teachers responding, 58% teach physics curriculum projects. Only 27% had any training in the physics curriculum project they teach.

Of the group responding, 42% had training in one or more physics curriculum projects. Only one of the group received any training on the undergraduate level. All received the training since completing the undergraduate program at National Science Foundation sponsored programs.

CHAPTER V

SUMMARY AND CONCLUSION

The recommendations of the Commission on College Physics for a program of preparation of high school physics teachers was used as a guideline to compare the results to the hypotheses established for the study.

The Undergraduate Background of Present Physics Teachers

The first hypothesis stated that the present teachers of high school physics received a background training in r-curriculum courses, and this was deficient with the current recommendations of undergraduate training programs of physics teachers. Of the group, 95% received no training in physics courses designed specifically for teachers. Only one had any training in specific courses for physics teachers. In light of the recommendations of the Commission on College Physics that undergraduate programs for high school teacher preparation contain courses designed specifically for teachers, the first hypothesis is verified.

Graduate Training of Present Physics Teachers

Much of the training designed specifically for high school teachers is received after completing the undergraduate program of studies was the second hypothesis. Of the surveyed group, 79% had additional training in physics. Members that received additional training

in courses designed specifically for teachers comprised 58% of the group. This shows a substantial increase of training for the teaching of physics. The Commission on College Physics recommends that physics teacher preparation programs aid the present teachers as well. The second hypothesis is supported by this marked increase of participation of teachers in programs designed for high school teachers at the graduate level.

The Physics Curriculum Projects

The third hypothesis stated that most teachers received training in the physics curriculum project after completing the undergraduate program of studies. Of the group surveyed only one received any training in physics curriculum projects at the undergraduate level, while 37% of the group received training in one or more physics curriculum projects after completing the undergraduate program of studies. All of this group received the training in National Science Foundation sponsored programs.

Of the group surveyed, 58% were teaching physics curriculum project courses while 27% of them had any training in the physics curriculum project they were teaching. This supports the fourth hypothesis of the study, that most teachers do not have any training in the curriculum projects they are teaching.

Comments of the Group Surveyed

Responses from 42% of the group gave additional comments concerning teacher preparation.

The predominant need stated was for the training in laboratory management, and in the use, building, repair, and adapting of equipment. Others stated a need to prepare the teacher in techniques of laboratory demonstrations, and the use of audio-visual equipment.

Some objected to courses designed specifically for teachers. Of these the general view was the teacher should take the r-curriculum program. The skills of teaching can be added later with extra courses. The emphasis was that the teaching skills could be a latter addition.

This is in conflict with the proposals of many studies. Haber-Schaim's statement in Chapter I best sums up the conflict.

The author does not think of teaching as a coat or covering that can be placed over a body of knowledge. Teaching is an essential part of the knowledge. It is the part that is needed to aid in the direction of the knowledge that is sought.

The second question that is raised by the study concerns the additional training in courses designed for physics teachers. Many of the teachers that received training in these specific courses for teachers participated in National Science Foundation programs. It is hoped that these training courses for physics teachers do not decrease as the number of National Science Foundation programs diminish.

The author believes that training for the teacher must be an ongoing process. The programs must be available for the teacher. It is hoped that many schools that offered National Science Foundation sponsored programs continue to build programs for high school physics teachers.

FOOTNOTES

1. Commission on College Physics, "Preparing High School Physics Teachers," Science Education, LV, 2, April, 1971, 249; see also Ralph A. Sawyer, "Reflections on the High School Curriculum" School Science and Mathematics, LXV, 11, May, 1965, 389.
2. Philip DiLavore and Jearl Walker, "Physics for Teachers: An Experimental Course," The Physics Teacher, IX, 7, October, 1971, 370; see also Floyd Read, J. W. Byrd, and R. M. Helms, "Special Programs for Pre-Service Physics Teachers," The Physics Teacher, IX, 8, November, 1971, 447-448.
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APPENDIX

COVER LETTER AND QUESTIONNAIRE

Frederick Huestis
420 S. MacArthur Blvd.
Apt. 255
Irving, Texas 75060

Dear Colleague:

I teach physics in a private high school. During the past summers I've been working in a master's program in science education. I've chosen a project concerning the undergraduate preparation of physics teachers.

I would greatly appreciate it if you would take a few minutes now to complete the enclosed questionnaire and return it to me in the provided envelope.

The study is designed to determine the undergraduate background of physics teachers, and compare this to the recommended background teachers of high school physics should receive on the undergraduate level.

I am not asking for names of personnel, schools, or districts. The information collected by the questionnaire will be tabulated, and used in the tabulated form. I am interested in the trends of the group.

Thanking you for your time and cooperation, I remain

Frederick R. Huestis

BACKGROUND OF HIGH SCHOOL PHYSICS TEACHERS

Enrollment of School_____.

GENERAL TEACHING BACKGROUND

Number of years teaching_____; teaching physics_____.

Number of sections of physics you are teaching_____.

Other teaching assignments. Indicate by number classes and/or sections.

_____ Chemistry	_____ Phy. Sc.	_____ Other
_____ Biology	_____ Gen. Sc.	_____
_____ Math	_____ Earth Sc.	_____

Physics is required_____; an elective_____.

Curricula used:

_____ PSSC	_____ Project Physics (Harvard)
_____ Illinois Project	_____ "Traditional" type
_____	_____

Is a second year physics course offered? _____

If so, please describe. _____

Would you choose the present text and materials if given the opportunity? _____

GENERAL UNDERGRADUATE BACKGROUND

Degree _____ Major _____ Minor _____

Certified to teach: _____, _____, _____, _____, _____.

Teaching physics is my first choice_____ alternate choice_____.

I teach physics as I have some background in it and I'm assigned_____.

Primary purpose of your education:

_____ Teach	_____ Engineering
_____ Research	_____ Business/Industry

Do you plan to continue to teach? _____ Physics? _____.

Most programs for high school physics teachers are included in programs designed for physics majors and engineers. Few courses are designed specifically for physics teachers. In listing your background in physics, indicate each by semester hours; also place a check next to the course if it was designed for physics teachers.

_____ Mechanics	_____ Quantum Mechanics
_____ Light, Optics, & Acoustics	_____ Thermal Dynamics
_____ Atomic Physics	_____ Others
_____ Nuclear Physics	_____
_____ Electrical Circuits	_____
_____ Electronics	_____

Were any courses in your undergraduate preparation designed to meet the specific needs of:

☐ lab management ☐ building and repair of equip.
☐ purchasing of equip. ☐ comparing and adapting equip.
☐ lab safety

Were curriculum projects covered in depth in your undergraduate preparation?

☐ PSSC ☐ Illinois Project
☐ Project Physics ☐ _____
☐ _____ ☐ _____

Do you feel you were adequately prepared to teach physics? _____.
 If not please state any deficiencies of your undergraduate program.

EDUCATION SINCE COMPLETION OF UNDERGRADUATE DEGREE

Other Degrees: _____ Major _____ Minor _____

Courses in physics or teaching physics since completing undergraduate studies.

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Courses in physics curriculum projects since completion of undergraduate studies. Indicate if in-service, workshop, National Science Foundation Institute.

Course	Description
PSSC	_____
Project Physics	_____
Illinois Project	_____
_____	_____
_____	_____
_____	_____
_____	_____

Any comments you feel are pertinent to the educational preparation of high school physics teachers.

BACKGROUND OF HIGH SCHOOL PHYSICS TEACHERS
IN A GROUP OF CATHOLIC SCHOOLS

by

FREDERICK ROBERT HUESTIS

B. S., St. Edwards University, 1966

AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1974

The study set out to determine the background preparation of high school physics teachers in a group of Catholic schools in the United States. The background of the teachers was compared to the current recommendations for preparing high school physics teachers. The standard used for the current recommendations was that of the Commission on College Physics report for a program of preparation of high school physics teachers. The study determined the undergraduate and graduate background of the physics teachers. The group selected was a group of schools in the United States administered and staffed by a religious order. This group is typical of the many groups of schools administered by religious orders in the United States. The study was undertaken to determine the background of the physics teachers in order to aid the group of schools in the ongoing physics education and training of physics teachers. The results serve as a guideline for any group of schools administered and staffed by a religious order in the United States.

After studying the recommendations of researchers on physics teacher preparation programs, the guidelines of the Commission on College Physics was chosen. The group was surveyed with a mailed questionnaire. The questionnaire surveyed three categories. The first category was the general background which included teaching load, teaching experience, certification, and future in teaching. The second category was the undergraduate background. This segment determined purpose of education, amount of physics content courses, the amount of physics content courses designed for teachers, course work in laboratory management and safety, and the use, repair, adaption, evaluation and purchase

of equipment, and the training in physics curriculum projects. The final category dealt with the graduate background. It included any additional physics content course work, the amount of physics courses designed for teachers, and training in physics curriculum projects.

The study showed that most physics teachers are educated in programs designed for research physicists. A very small percent of the teachers are exposed to any of the curriculum projects. A few received any training in the use of the laboratory or equipment. A majority of the teachers participated in content courses for teachers at the graduate level. Training in the use of the laboratory and equipment was received at the graduate level. The teachers were exposed to physics curriculum projects at the graduate level. These were all National Science Foundation sponsored programs. Most teachers that teach physics curriculum projects have not had training in the physics curriculum project they have taught.

The teachers surveyed did not participate in programs with physics courses designed for the teacher as is recommended. The deficiencies were reduced by participating in graduate programs as is recommended by the Commission on College Physics. The increase in training in physics curriculum projects at the graduate level is still insufficient.