

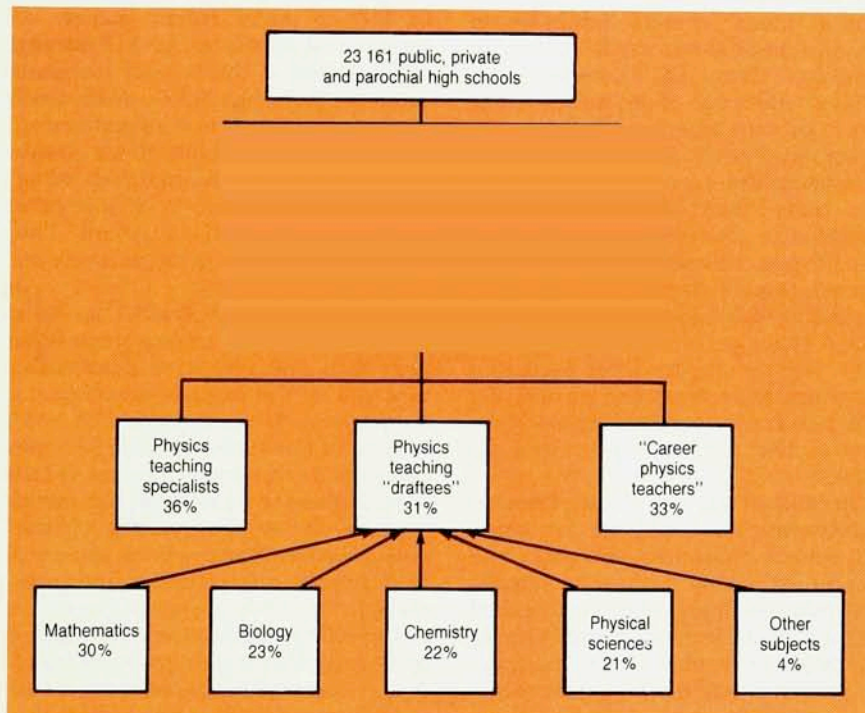
AIP RELEASES FIRST MAJOR SURVEY OF HIGH SCHOOL PHYSICS TEACHERS

The first national sample survey of physics teachers at public, private and parochial high schools—a project conceived and planned by the American Institute of Physics and the American Association of Physics Teachers—has just been completed and published by AIP. The survey has involved a major commitment of AIP's resources. It was planned, conducted and analyzed over a period of three years, and it breaks new ground in the systematic study of science education in the United States.

Government studies covering all aspects of public education have not usually devoted much space to comparatively low-enrollment fields such as physics. The AIP survey is the only one of the important recent studies to focus exclusively on physics teachers, and it is one of the few to sample the whole field of public, private and parochial schools. The report includes information on the high school physics curriculum, factors influencing the scope and quality of physics offerings, the education and experience of physics teachers, the rewards and frustrations associated with physics teaching, the availability and use of laboratory equipment and textbooks, and trends in the profession.

A comprehensive description and summary of the high school survey will appear as an article in *PHYSICS TODAY* early next year, but some of the more striking results of the survey warrant mentioning here.

The AIP findings indicate that 17 900 teachers taught a total of 35 200 physics classes with 623 600 students at 15 800 US high schools during the spring 1987 semester. About two-thirds of the high schools in the United States offer physics every year, and another 17% offer it in alternate years. Nine out of ten high schools with physics classes have only one physics teacher, and four out



The high school survey contacted 23 161 schools and located 15 800 where physics is taught. Questionnaires were sent to teachers at nearly 3000 schools, and about three-quarters of the teachers responded. About two-thirds of the teachers can be considered professional physics teachers by dint of training or experience, about one-third poorly trained draftes from other fields.

of five provide only a basic introductory course in physics. Still, 96% of all US high school students attend schools where physics is available.

As the numbers imply, most students attend relatively large schools with at least one physics teacher. "Interestingly," the report says, "the findings suggest that, in some respects, many schools with large minority enrollments seem relatively well-positioned to offer an extensive program in physics. Minimum graduation requirements in science at these schools are, on the average,

slightly higher than they are at mostly white schools. Teacher salaries are comparable, and slightly higher budgets are allotted per physics class for equipment and supplies. In addition, a somewhat greater choice of physics-related extracurricular activities are available to individual students and to classes.... Nevertheless, these same schools seem to show the effect of the economic and academic disadvantages suffered by their communities. Teachers report fewer students going on to college and are more likely to complain about inadequate

preparation in reading and especially mathematics among their physics students. More teachers also cite the lack of parental involvement and community support as a problem in their physics teaching. And, most importantly for our study, the proportion of students enrolling in physics is lower. . . . The percentage of students taking physics in schools with fewer than 5% minority enrollment is about 40% higher than in schools where more than half of the students belong to minority groups."

The survey found that small schools can maintain robust physics programs when administrative support is strong and science graduation requirements are demanding. Catholic schools and secular private academies put as much or more emphasis on physics instruction as large public schools. Generally, however, the quality and scope of physics offerings are highly sensitive to school size and geographic location, and to the socioeconomic and racial composition of the student body. Where such factors combine to produce low enrollments in physics courses, vicious circles come into play: Low salaries and the necessity of having physics teachers teach other subjects discourage college physics majors from becoming teachers, and schools end up drafting teachers from other fields to teach the one or two physics courses they do offer.

Because of varying certification requirements, the AIP team constructed special measures to gauge the degree of specialization in physics teaching. A "specialist" was defined as a teacher who had earned a degree in physics or started off teaching physics, and had taught physics regularly throughout his or her teaching career. Teachers who lacked the degree or initial specialization but who had taught physics regularly were defined as "career physics teachers." The remainder were teachers with little or no formal physics background who had been drafted to teach the subject on only an occasional basis.

As indicated in the figure (page 93), about one-third of the teachers turned out to be specialists, one-third career physics teachers and one-third draftees.

Even though roughly two-thirds of the respondents in the sample can be regarded as professional physics teachers by dint of training or experience, almost two-thirds of the teachers had to devote the bulk of their attention to other subjects. Only about 13% had taught physics exclusively in the previous year. In the largest schools, however, almost half

Availability of Report

Single copies of AIP's survey of high school physics teachers or of a summary version are available free of charge and multiple copies by special arrangement. For copies of the 76-page report, "Physics in the High Schools: Findings from the 1986-87 Nationwide Survey of Secondary School Teachers of Physics" (October 1988), write to the Education and Employment Statistics Division, American Institute of Physics, 335 East 45 Street, New York NY 10017.

the physics teachers taught nothing but physics, and another quarter taught primarily physics.

Origins and methodology

Of all the major recent surveys of high school teachers, the AIP survey attained one of the highest response rates—better than 75%. AIP staff members took the unusual extra step of contacting school principals directly to get a definitive, updated list of physics teachers and to help ensure the cooperation of the teachers. The response rate from principals was an astonishing 99.8%.

Much of the credit for the survey's high response rate goes to the school principals and education administrators and to the teacher-respondents themselves. Ultimately, in the estimation of the staff who planned and carried out the survey, its success has to be credited to the current climate of concern about the quality of the nation's educational system, especially in science, mathematics and technology.

The AIP statistics division, headed by Beverly Porter, first put the idea of doing a comprehensive sample survey of high school physics teachers to the division's advisory committee in 1984. The committee authorized the division to formulate a proposal, and the AIP governing board approved funding for the project in December 1985. After one year of planning, the division hired sociologist Michael Neuschatz to carry out the survey. Neuschatz earned his PhD in 1985 at the University of Colorado, Boulder, where he also had developed and directed a quantitative research program on student attrition. A second member of the statistics division staff, Maude Covalt, was assigned to the project. Neuschatz and Covalt worked full-time on the project for two years and are coauthors of the survey report.

In spring 1986 the division sent out a test questionnaire, prepared in consultation with AAPT staff, to 270 AAPT members. In reaction to com-

ments from more than 200 respondents, the questionnaire was modified to include additional questions delving into the teachers' sense of their influence on their working environments, their contacts with other teachers in the field and their sense of community versus isolation.

Meanwhile, a master list of 23 161 schools was obtained from Quality Education Data Inc, an educational data resource firm in Denver, Colorado, and the list was organized by school type and the average number of students in each grade and then disproportionately sampled to ensure adequate representation of Catholic schools and large public schools.

In fall 1986 letters were sent out to all members of the Council of Chief State School Officers and to all 50 state science supervisors informing them of the upcoming survey. A mailing to all 2100 superintendents of public school districts followed. Letters also were sent to private and parochial school organizations.

Upon receiving overwhelmingly encouraging responses from all quarters, a mailing was sent out in December 1986 to the principal of each sample school asking if physics was offered and, if so, asking for the names of all physics teachers at the school. Two follow-up mailings and a round of follow-up phone calls to stubborn nonrespondents yielded a final sample of 3301 physics teachers at 2846 schools (see figure).

The 12-page revised questionnaire was sent out to teachers in March 1987. Three mailings and one telephone follow-up yielded responses from 2485 teachers, just over 75% of the sample. The close-out date for responses was September 1987, and it took the final three months of that year to code and enter the data. Data editing and analysis, and the writing of the final report, took another nine months.

New three-year study

AIP's statistics division always planned to make the initial high school survey the foundation for an ongoing study of the physics teaching community. A follow-up three-year survey has been authorized.

In the new study, according to Neuschatz, some questions will be replicated to test the stability of the initial results; some comparisons will be made in a first look at changes over time; there will be a focus on new teachers; and there will be special reports on other target groups and issues, to be selected in light of reactions to the current survey.

—WILLIAM SWEET