

High School Physics in Iowa

A summary of key findings from the
2009 Iowa High School Physics Teachers Survey



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About the survey

In October of 2005, former Iowa Governor Tom Vilsack was quoted saying, "In about five years, we're not going to have anybody to teach physics." Though the statement was somewhat tongue-in-cheek, it served to draw attention to the documented shortage of high school physics teachers in Iowa and elsewhere. We were interested to see what the situation was four years later, but to also go beyond the mere number of teachers to inquire about their background, how, what, and who they taught in their courses, what resources they had at their disposal, and their interest in furthering their physics pedagogical skills through professional development. This document contains a brief summary of some of the findings; complete survey results and analysis are available in a full report at the University of Northern Iowa Physics Department website.

Who took the survey?

- We sent email invitations to the 371 known public high school physics teachers in the state; 151 (41%) completed the entire online survey.
- Responding teachers were distributed across the state, mirroring the population density. When compared with the percentages of large schools vs. small schools in the state, a higher percentage of respondents taught at large schools, though this might be expected as large schools may have multiple physics instructors.

Who's teaching physics?

- On average, respondents have completed 5 undergraduate physics courses; assuming an average of 3 semester hours of credit per course, this is equivalent to the minimum of 15 semester hours of physics required by Iowa for a physics teaching endorsement.
- Approximately 1/5 of physics teachers hold a physics degree, 1/5 hold a biology degree, 1/5 hold a chemistry degree, and the remaining 2/5 hold some other degree.
- Nearly half of earned undergraduate degrees are education related (*i.e.* "physics teaching.")
- 94% of respondents indicated that they are currently endorsed to teach physics.
- While many teachers with biology degrees are teaching physics, few teachers with physics degrees teach biology.
- On average, respondents have taught for 17 years, while they have taught *physics* for 11 years.
- One-third of current teachers expect to retire within the next 10 years, but this is not unexpected assuming a teaching career of 30 years. One-third of respondents indicated that they intend to teach for another 20 or more years.
- 70% of respondents indicate that they are likely to remain in secondary education, while only 3% indicated definite plans to leave the field.

What are they teaching?

- 91% of respondents currently teach a traditional high school physics course, while 38% teach physical science. Small numbers of respondents teach AP Physics, College Physics, or some other physics course.
- Nearly 2/3 of physics teachers also teach chemistry.
- Half of respondents teach a single physics course, while half teach two or more sections. On average, a high school physics course enrolls 17 students.
- Kinematics and Newton's Laws each receive about 1/6 of instructional time, on average. The remaining 2/3 of class time is divided among several other topics.
- 63% of teachers don't address relativity, 34% do not teach thermodynamics, 25% do not include electricity and magnetism, and 18% don't teach optics.

How are they teaching physics?

- 87% of respondents utilize a textbook for their course(s). The leading use is for out-of-class problem solving of textbook problems. Only 2/3 of instructors require out-of-class reading.
- 57% of respondents have tried or currently use a "nontraditional" approach to teaching physics that emphasizes cooperative group work and student discovery, while deemphasizing lecture. Of this group, 60% use (or have used) PRISMS, while 40% use (or have used) the modeling method.
- Only 28% of respondents participate in regional or statewide Physics Olympics competitions with their students. Those that do are most likely to have a biology background; few with physics degrees participate.
- 23% of respondents use some type of nationally-normed conceptual assessment in their physics courses. The most popular instrument is the Force Concept Inventory.
- We asked respondents to judge the importance of various elements of physics teaching. More than 80% agreed or strongly agreed on the importance of group work, requiring students to answer conceptual questions, and conducting demonstrations for students.

What resources are available to physics teachers?

- More than half of physics teachers have less than \$500 a year available for purchasing equipment, while 90% have less than \$1000. 6% have no financial resources.

What are students in physics courses like?

- Nearly 90% of teachers report that their students have at least adequate preparation in algebra when entering their physics courses. Only half report at least adequate preparation in measurement and uncertainty.
- Collectively, surveyed teachers rank the ability to work in a cooperative group to solve a problem or conduct an investigation as the most important to future physics work.

What professional development programs do physics teachers participate in?

- Only 29% of respondents participate in professional development opportunity at least once a year.
- Teachers with less than 10 years of teaching experience are the least likely to participate in professional development.
- Respondents are most interested in professional development opportunities linked to acquiring and utilizing technology in the classroom, followed by the general use of inquiry-based approaches to teaching physics.