College of Science and Mathematics
Department of Biology and Physics

Recent Demographics of Physics Teachers From Schools and Staffing Survey (SASS)

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Abstract

This project is part of a multidisciplinary team to study secondary physics teaching using the School and Staffing Survey (SASS) spanning the years 1987 through 2011. We will investigate the following questions: How many physics teachers are there in the United States? What are trends in the population growth compared to other teacher groups in the past 20 years? What proportion of those that teach physics do so as their main assignment? What other subjects do physics teachers teach? To what extent have physics teachers earned a physics degree at any level? What other backgrounds do these teachers have? What has been the certification status of physics teachers over time? To what extent has the racial and gender profile of physics teachers changed over time? To what extent have the age and years' of experience distributions change over time? We will also analyze trends in early career physics teachers.

Research Questions

Who is teaching America's high school physics students?
How do physics teachers compare to teachers in other STEM and non-STEM disciplines?

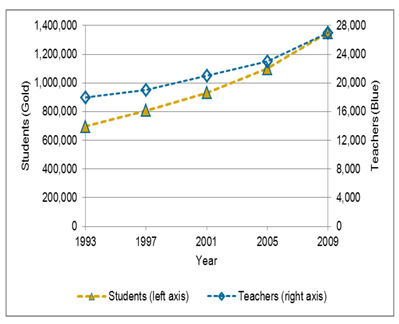
Introduction & Design

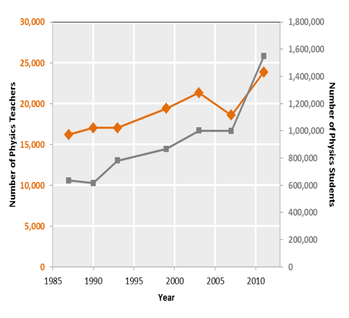
Several documents have raised concerns about the nature of the STEM workforce (Landers & Gates Jr, 2010; National Research Council, 2005, 2010). As a result of these documents, national initiatives such as the NSF Robert Noyce Teacher Scholarship Program have emerged to support the growth of K12 science and math teaching careers. To ensure that large-scale initiatives are employing the right fixes for the right problem, it is critical to understand the landscape that those programs are trying to reshape. We used data from the National Center for Education Statistics' Schools and Staffing Survey (SASS) between 1987 and 2011. We will compare these results with those from the American Institute of Physics and their Focus On series when applicable.

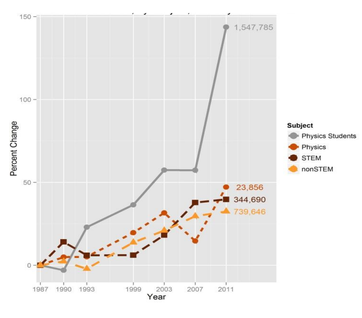
We consider a discipline-level disaggregation of the national data on STEM teachers in this longitudinal examination using SAS 9.3. A **physics teacher** is defined as a teacher with at least one class period of physics taught during the sampled academic year or has a physics main assignment. A **STEM teacher** is defined in a similar manner but excludes physics teachers. A **non-STEM teacher** is any remaining teacher excluding physics and STEM teachers.

References are available upon request

Number of Physics Teachers

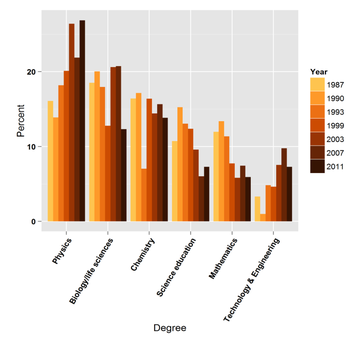


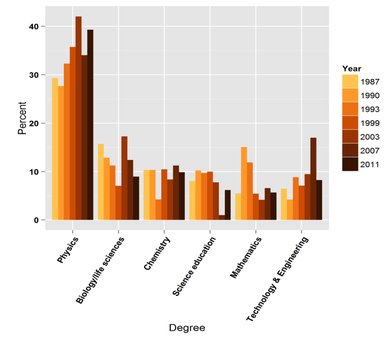


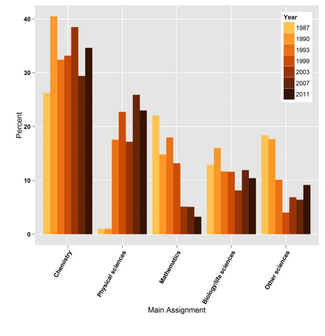


The leftmost diagram was taken from the AIP Report *Who Teaches High School Physics* (retrieved from: httl://www.aip.org/statistics). Some similarities and some differences exist between this and our SASS data (figure in center). In the years spanning 1990 to 2003, consistent growth is exhibited for both teachers and students. In both cases, the ratios changed at relatively the same rate. However, the weighted values from the SASS reflect lower numbers than the AIP data. The graph on the right compares the percent change in the number physics students and teachers as well as STEM and Non-STEM teachers relative to 1987. Physics students show the greatest change nearly every year yet the number of new physics teachers do not meet the increase.

Degrees of Physics Teachers

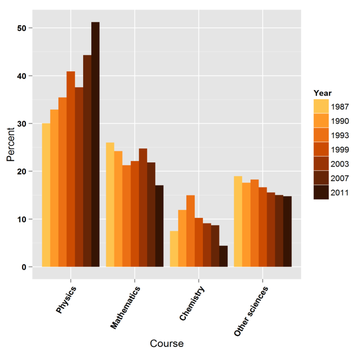


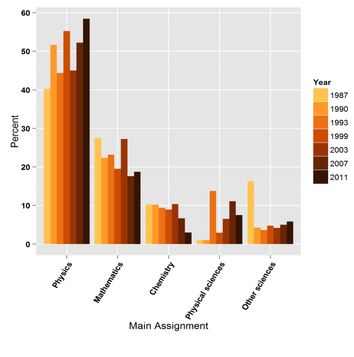




The diagram on the left shows the percentage of degree holders for teachers of physics. While there is an increasing trend, only about 25% of physics teachers have a physics degree. More encouraging, however, is that physics degree holders represent almost 40% of teachers with a physics main assignment (figure in center). All other disciplines are around 10%. The rightmost figure shows the degrees of teachers with a physics main assignment if it is not a physics degree.

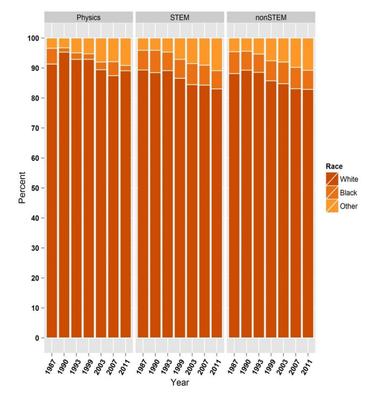
Physics Degree Holders

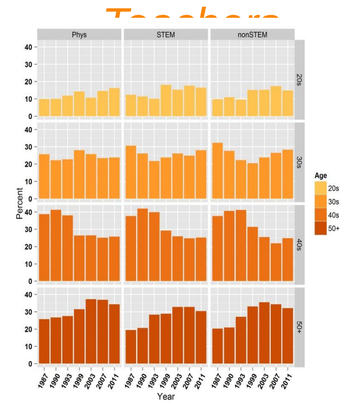


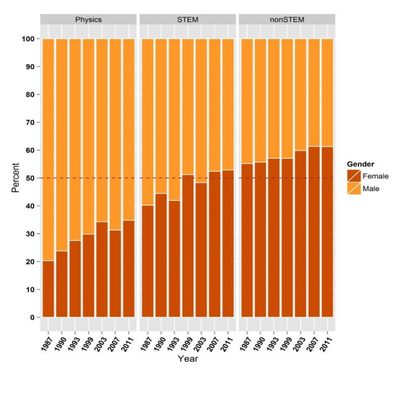


The diagram on the left shows that approximately fifty percent of courses taught by physics degree holders are physics courses. Mathematics is the next largest percentage. The percentage drops sharply for other disciplines. We also find that almost 60% of physics degree holders are assigned Physics (figure on right) followed by math. Together these account for nearly 80% of the main assignments.

Race/Ethnicity, Age and Gender of Physics / STEM Teachers

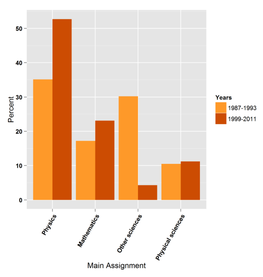


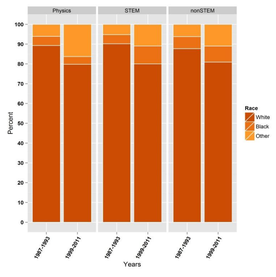


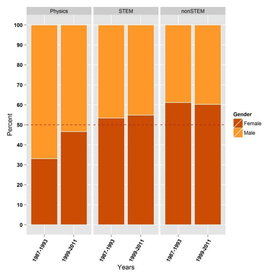


These diagrams compare physics, STEM and non-STEM teachers. The leftmost diagram demonstrates that the teaching population is predominantly white. The center diagram shows that the population of teachers is getting slightly younger. Finally, although there is growth in the number of female physics teachers, the bulk of physics teachers are male.

*Early Career Teachers (*statistical work in progress due to sample size issues)*







Early career teachers are those who have 0 through 2 years in the classroom. Due to the small sample size each year, we aggregated the years into two groups – 1987-1993 and 1999-2011. Very large error rates in these groups have thus far prevented us from carrying out some of the analyses done on the entire dataset. However, we have been able to discover trends in some categories. The first diagram indicates that the main teaching assignment of beginning physics teachers is shifting more towards physics and math (slightly) and away from other disciplines. The center graph shows a slight change in ethnicity towards other races, but still, predominantly 80% white. Finally, it is also positive to see a shift towards a more balanced ratio of male/female teachers.

Conclusions

Collectively, our results indicate that the US physics teacher population is not well represented by aggregated STEM data. The make-up (gender and ethnicity) does not match the population of students they are teaching. Furthermore, though there are positive trends in terms of more degree holders teaching physics, it is still common to have a physics course being taught by someone without a background in physics. Therefore, initiatives judging success on aggregate data may not be able to identify specific areas for reform efforts. In this light, our results hint at a diffusion of responsibility within the STEM community regarding which groups should initiate reform efforts. Programs like KSU's I-IMPACT project is recruiting physics professionals into the teaching career to address this problem. The Noyce Undergraduate Initiative also focuses on recruiting minorities into teaching physics.