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High School Physics Courses & Enrollments

Results from the 2012-13 Nationwide Survey of High School Physics Teachers

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Reports on High School Physics

High School Physics Availability (4/2014)

High School Physics Courses & Enrollments (6/2014)

Textbooks, Resources and Teacher Resourcefulness (forthcoming)

Who Teaches High School Physics (forthcoming)

The 2012-13 Nationwide Survey of High School Physics Teachers

During the 2012-13 academic year, we collected data from a representative national sample* of over 3,500 public and private high schools across the U.S. to inquire about physics availabilities and offerings. This and future reports describe our findings.

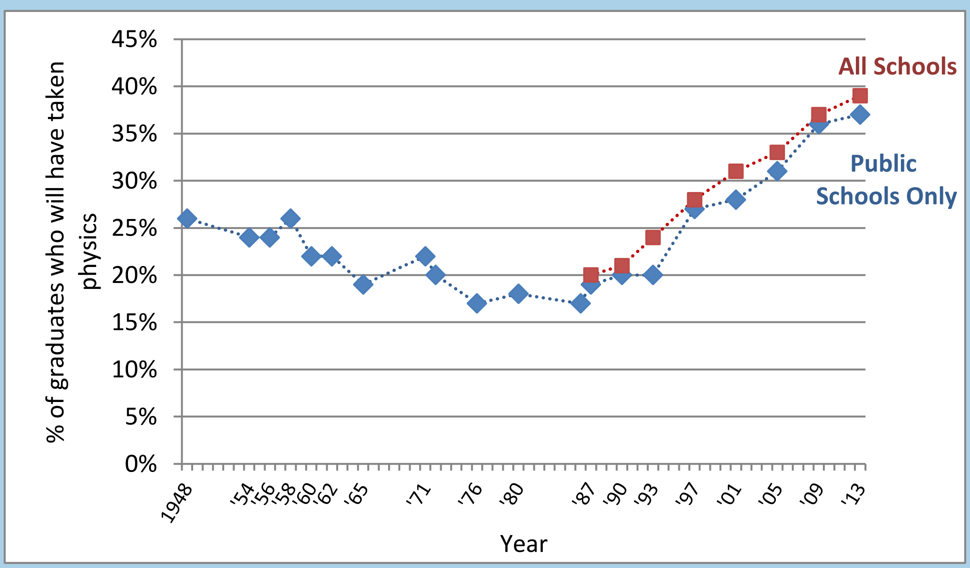
*Hawaii opted out.

Four Graduates in Ten Take High School Physics

The proportion of high school graduates who will have taken at least one physics course prior to graduation continues to grow. When we began this study in 1987, the "physics-taking rate" (the proportion of high school graduates who will have taken at least one high school physics course) was 20%. Based on data from our most recent survey (which includes both public and private high schools in the U.S.) during the 2012-2013 school year, we estimate that 39% of the class of 2013 took high school physics before graduating. Figure 1 provides a historical perspective.

Figure 1

Physics-Taking Rate in U.S. High Schools 1948 – 2013



* The physics-taking rate is the proportion of graduates who will have taken at least one high school physics course.

Data prior to 1987 compiled by AIP staff from U.S. Department of Education National Center for Education Statistics and its predecessors

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1.38 Million Students Enrolled in Physics Courses

While the physics-taking rate went from 37% in 2009 to 39% in 2013, the increase in the total number of students enrolled in physics courses was less pronounced. During the 2012-13 school year, 1.38 million students were enrolled in physics courses; this is up only slightly from the 1.35 million students enrolled in physics courses during the 2008-09 school year. However, while physics enrollments increased, the number of graduates from U.S. high schools fell from 3.35 million to 3.15 million. So, 30,000 more students took physics even though there were 200,000 fewer graduates. (We use the number of graduates as the denominator to calculate the physics-taking rate.)

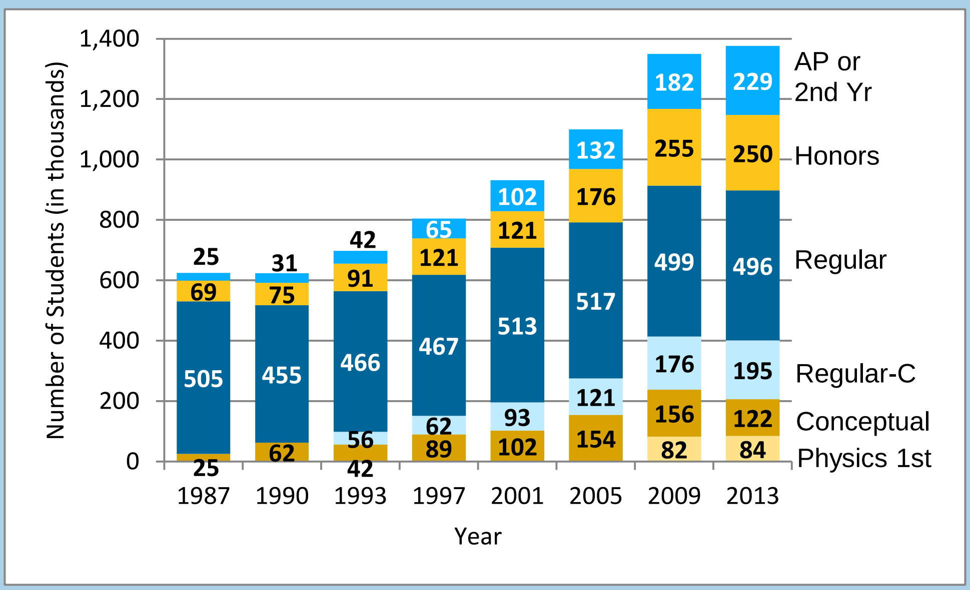
Variety in High School Physics Courses

The growth in enrollments continues to come from courses other than "regular" physics. In our 1986-87 study, we estimated that 119,000 students were enrolled in a physics course other than "regular" physics. For the 2012-13 school year, there were 685,000 students enrolled in some other physics course – an increase of over 560,000 students. A large part of the growth in physics enrollments can be traced to an increase in the variety of offerings. (See Figure 2.)

1.38 million students were enrolled in high school physics classes during the 2012-13 school year.

Figure 2

Physics Enrollments in U.S. High Schools by Type of Course 1987 – 2013



Regular-C is "regular" physics taught using a conceptual text.
Physics 1st was first included in the survey in 2009.

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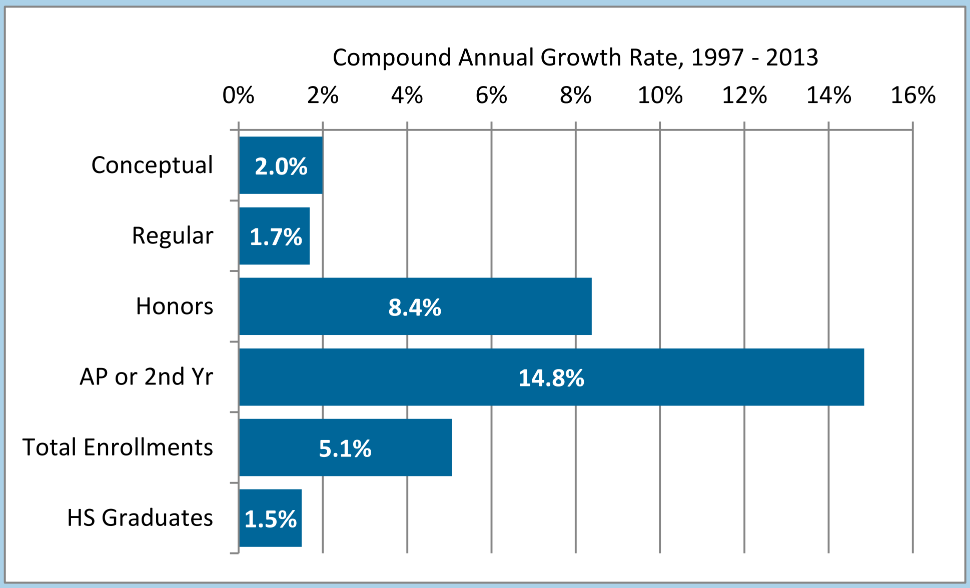
As seen in Figure 2 (previous page), the growth has not been even by type of course. Overall, the number of students enrolled in a physics course grew at a compound annual growth rate of 5.1% between 1997 and 2013.[1] If we look at enrollments by type of course, we see that enrollments in AP or 2nd-Year physics courses grew much more quickly than those in "regular" physics courses over this period. Figure 3 depicts the compound annual growth rates in enrollments for each type of course between 1997 and 2013. For comparison, we have included the compound annual growth rate in the number of graduates from U.S. high schools. We see that enrollments in "regular" physics courses have grown slightly faster than the growth in the number of graduates from U.S. high schools.

Figure 3

Compound Annual Growth in Enrollments in High School Physics Courses by Type of Course, 1997 – 2013



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The growth in physics enrollments in U.S. high schools varies greatly by type of class.

In calculating the physics-taking rate, we estimate the number of students taking their first physics course. Enrollments in AP or 2nd-year courses have grown the fastest over the last sixteen years, so it might seem that these increases would not affect the physics-taking rate. However, while almost every student in a 2nd-year physics course other

[1] The compound annual growth rate is used to measure growth over multiple periods. For example, enrollments in conceptual physics are up 37.1% over the 16-year period. The compound annual growth rate is (1.371)^(1/16), or 2% per year. We use the compound annual growth rate here because our data are annual enrollments.

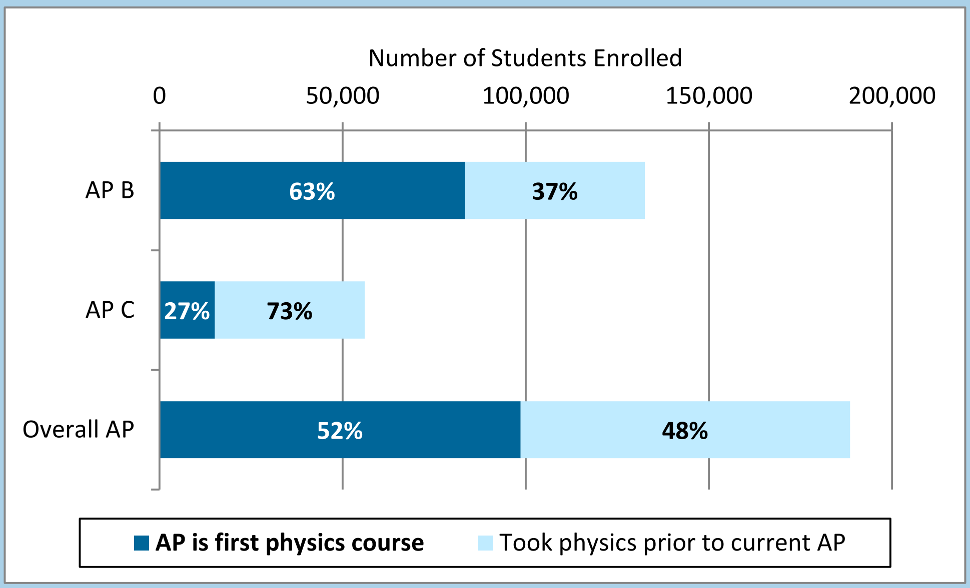
than AP physics is likely taking their second high school physics course, not every student in AP physics is in their second physics course. Thus, the growth in AP and 2nd-year courses does add to the physics taking rate.

Beginning in the Fall of 2014, AP physics offerings will change. AP Physics B will no longer be offered; it is replaced by two courses – AP Physics 1 & 2. The College Board recommended students complete a physics course prior to taking AP Physics B; a prior physics course is not recommended for students taking AP Physics 1. Given this change – and the anticipation that the number of students taking a first physics course will increase correspondingly, some might believe that the physics-taking rate will increase. However, this is not necessarily true.

AP physics is the first physics class for over half of the students enrolled.

Figure 4

Students Enrolled in AP Physics Classes as First Physics Course
by AP Class, 2012-13 School Year



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We asked teachers teaching AP physics courses what proportion of their students were in their first physics course. The results are shown in Figure 4. Overall, more than half of the almost 190,000 students enrolled in an AP physics course were taking the AP course as their first physics course. Since half of the students in AP physics courses are taking physics for the first time, it is possible that the change in the AP curriculum for the 2014-15 school year will not increase the physics-taking rate at all. On the other hand, it is also possible that students who currently opt for an AP course in biology or chemistry as a third science course might choose to take the new AP physics 1. It will be interesting to see how the change affects enrollments.

Enrollment Composition

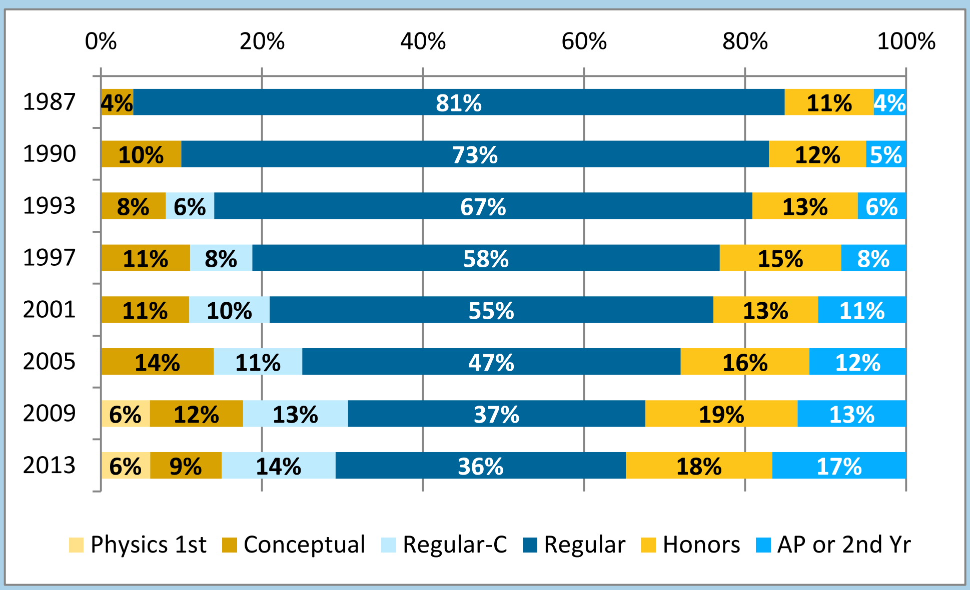
When we began our study, over 80% of the students taking physics in U.S. high schools were taking a “regular” physics course. Over time, the proportion of students taking “regular” physics has steadily dropped; however, it appears to have stabilized somewhat in the last two rounds of the survey. If we consider all students enrolled in “regular” physics courses – both those taught using a conceptual text and those taught using a more traditional text – we see that half of the students enrolled in physics courses were in one of these versions of “regular” physics. The details are provided in Figure 5.

As noted previously, the proportion of students enrolled in AP or second-year physics courses continues to grow. We have already mentioned potential impacts of changes in the AP physics curriculum. Since AP Physics 1 is designed to be a first-year course, we may see the proportion of students enrolled in AP and second-year courses grow even faster.

The proportion of students taking AP or second year physics has continued to grow.

Figure 5

Enrollment Composition in High School Physics Courses
All U.S. High Schools, 1987 - 2013



Regular-C is “regular” physics taught using a conceptual text.
Physics 1st was first included in the survey in 2009.

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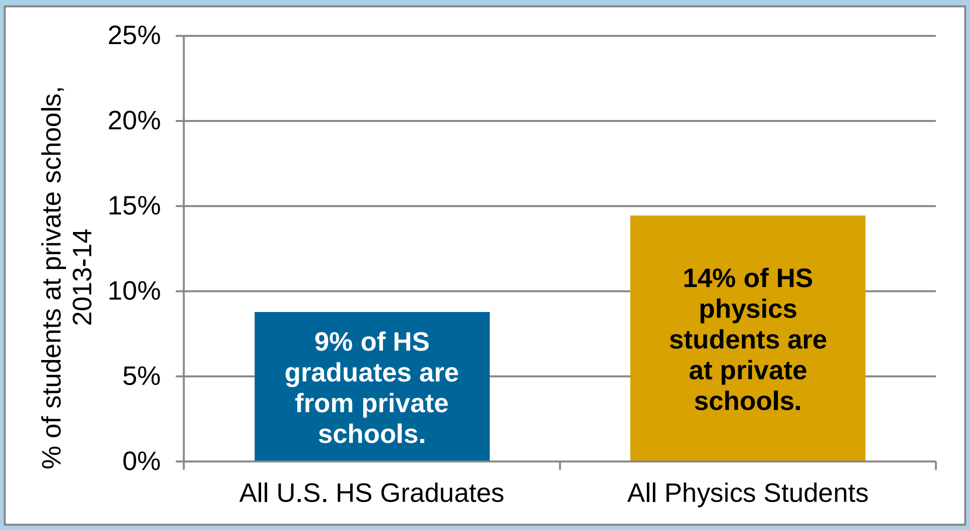
Physics Enrollments at Public & Private Schools

During the 2012-13 academic year, about 9% of all graduates from U.S. schools came from private schools. Given that 9% of high school graduates come from private schools, one might expect that about 9% of all physics students come from private schools. However, we estimate that about 14% of students enrolled in physics courses were in private schools. So, students attending private schools were more likely to take physics than students attending public schools. See Figure 6A.

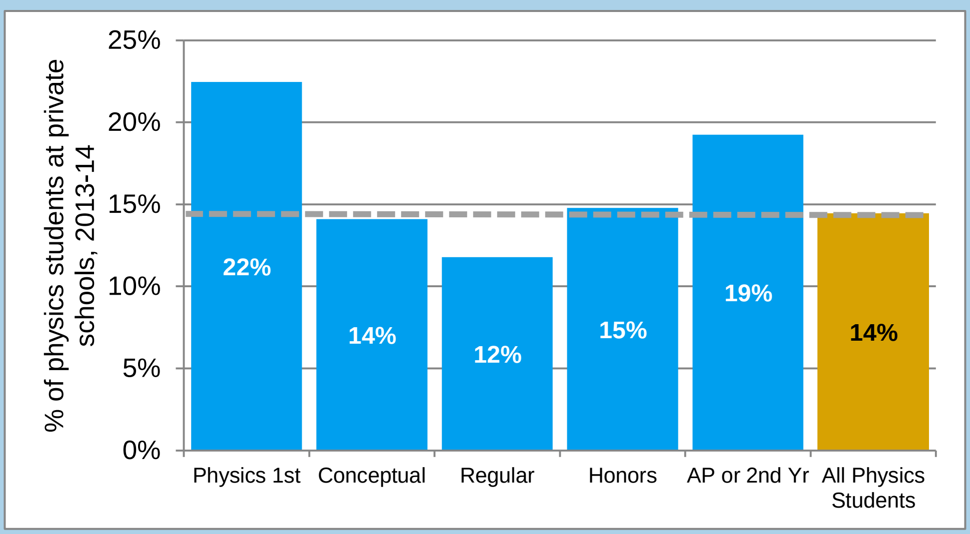
Figure 6

HS Graduates from & Physics Students at Private Schools
2012 – 2013 Academic Year

6A: Proportion of All Graduates & All Physics Students at Private Schools



6B: Proportion of Physics Students at Private Schools by Type of Course



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Students in private schools are more likely to take Physics First and AP or 2nd-year physics than students in public schools.

Figure 6B (previous page) displays the proportion of physics students at private schools by type of physics course. If students at private schools were equally like to take the same type of physics course as students in public schools, then we would expect that about 14% of the enrollment in each different type of physics course would be at private schools. While that is true for conceptual physics (and to some extent for regular and honors physics), we see that a much higher proportion of students in Physics First and in AP and 2nd-year courses are at private schools.

A Note on Calculating the Physics-Taking Rate

While looking at total enrollments in physics courses does provide some insight into physics taking in U.S. high schools, the enrollments do not tell the whole story. If we want to know how many students are exposed to physics in high school, we cannot look solely at enrollments because some of these students are enrolled in their second (or even third) physics course. Furthermore, simply looking at the number of students taking physics does not account for variations in the total number of students enrolled in U.S. high schools.

Physics-taking rate =

$$\frac{\#\ of\ students\ in\ 1st\ physics\ course}{\#\ of\ high\ school\ graduates}$$

This, in essence, normalizes the data.

We account for both of these potentially confounding factors when we calculate our physics-taking rate. First, we consider only students enrolled in their first physics class. As noted previously (see Figure 4), about half of the students in AP physics are taking their first physics course. (We assume all students in conceptual, honors, and regular physics are in their first physics course.) To determine the physics-taking rate, we take the number of students enrolled in their first physics course and divide by the number of graduates.[2] This, in essence, normalizes the number of students taking physics by accounting for both changes, in the number of high school students and in the number of students enrolled in their first physics course, simultaneously.

That is why we discuss the physics-taking rate before we look at the number of students taking physics courses. We believe the physics-taking rate is the best statistic to use for longitudinal comparisons.

More on 2013-14 High School Physics Enrollments

For more on student enrollments in high school physics courses, please see “Nearly 1.4 Million High School Physics Students” by Susan White and Casey Langer Tesfaye in the May 2014 issue of *The Physics Teacher* at http://dx.doi.org/10.1119/1.4872405. *The Physics Teacher* is an AAPT publication. The American Association of Physics Teachers (AAPT) is an AIP member society.

[2] We use the number of graduates because schools vary in configuration with some being K-12 and others housing only grades 11 & 12. There are, of course, many other grade combinations in between those two extremes.

Physics in Hawaiian High Schools

For the first time in the history of our study, the Superintendent of Schools for the State of Hawaii refused to allow us to contact schools in Hawaii. Thus, the data in this report covers all high schools – both public and private – in every state in the U.S. except Hawaii. Hawaii public schools account for less than one-half of one percent (<0.5%) of graduates from U.S. public schools; likewise, schools in Hawaii account for less than one percent (<1%) of graduates from private schools. The exclusion of these schools should not significantly affect the national results.

Survey Methodology

This study is based on a sample of one sixth of the public and private high schools in the U.S. Data collection for this round began in the fall of 2012. Although in past years we began the study by surveying all of the schools in our sample, we changed our methodology this round in order to lower the burden on high schools in our sample, many of which are already heavily surveyed. We began with web searches for each of the 3,858 schools in our sample. If we could identify a physics teacher at the school, we collected the contact information for that teacher. If not, we collected contact information for the principal or science chair. We then contacted each of the schools where we had not identified a physics teacher by phone and e-mail to determine whether or not physics was offered at the school and, if so, who taught it. We collected data on whether or not physics was offered from 3,553 of our 3,858 sampled schools (92%). We compared demographics for the non-responding schools with those of the responding schools and found no evidence to suggest that the two groups differ significantly. Thus, we believe we have a representative sample of schools.

During the spring of 2013, we contacted each of the 3,702 teachers we had identified in the fall to learn more about physics in each of the high schools. We heard back from 56% of the teachers.

Without the help of the principals, teachers, and staff at our sampled schools, we could not provide this information. We offer a sincere thanks to each of you.

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