

High School Physics Availability

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)

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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.

Physics in U.S. High Schools

Our analysis of the data from over 3,500 high schools in the U.S. begins with an examination of the availability of physics in U.S. high schools. The schools in our sample are a nationally-representative random sample of the almost 25,000 high schools in forty-nine of the fifty states. Table 1 shows the remarkable consistency in the availability of physics through the years. About 95% of seniors attend a school where physics is taught on a regular basis; this has been true since our first survey during the 1986-87 academic year.

Table 1

Physics Taking & Physics Availability
in U.S. High Schools: 1987 – 2013

School Year	Physics Taking Rate* (%)	Proportion of seniors attending schools where physics is offered ...	
		Every Year [◇] (%)	Rarely or Never [◇] (%)
1986-87	20	91	4
1996-97	28	94	4
2004-05	33	93	4
2008-09	37	92	4
2012-13	NA [‡]	91	6

* The physics taking rate is the proportion of seniors who will have taken at least one physics class prior to graduation.

‡ This number will be available in a future publication.

◇ None of these are statistically significantly different from the prior period.

Some schools offer physics in alternating years or through cooperative programs with other institutions. Seniors at these schools comprise the remaining proportion of seniors in U.S. high schools.

<http://www.aip.org/statistics>

Even though the availability of physics has been relatively constant, we have seen increases in the proportion of students taking at least one physics class in high school since the inception of our survey in 1986. These two results combined suggest that the availability measure may be somewhat misleading. In fact, it does not include an assessment of the capacity of physics teachers to teach additional classes if more students wanted to take them. We know from our prior studies that the average number of physics classes per teacher has grown.¹ We also know that the proportion of teachers who teach all or mostly physics has grown from 32% in 1993 to 53% in 2009.² At some point, high school administrators have to decide how to assign teachers to classes in order to accommodate the needs and requests of their students. It is not clear how many more physics students the current teachers could accept.

In future reports we will examine the number of students taking physics, the types of physics classes they are taking, the number of high school physics teachers, and much more about high school physics in the US. In this report, we consider the availability of physics in US high schools.

Factors Affecting Physics Availability

In a 2010 report,³ we examined two factors affecting physics availability: the size of the school (in terms of the number of seniors at the school) and the type of school (public or private). Larger schools are more likely to offer physics than smaller schools, and public schools are more likely to offer physics than private schools. Part of the reason that physics is more available in public schools is that they tend to have more students, on average, than private schools.

This year, as we examine the availability of physics at the state level, we look at educational attainment in each state and the average size of schools in the state as factors affecting physics availability. As we found earlier, physics is more likely to be offered in states with larger schools on average. We also find that high school physics is more likely to be offered in states with a higher proportion of adults (age 25 or older) who have graduated from high school.

The American Community Survey (conducted by the U.S. Census Bureau) measures educational attainment by state. The specific measure we have chosen to use is the proportion of the population age 25 and older who have graduated from high school (or earned a GED).

¹ See, for example, focus on Who Teaches High School Physics? (November 2010), <http://www.aip.org/sites/default/files/statistics/highschool/hs-whoteaches-09.pdf>

² See the report referenced in note 1.

³ See focus on High School Physics Availability (April 2010), <http://www.aip.org/statistics/reports/high-school-physics-availability>

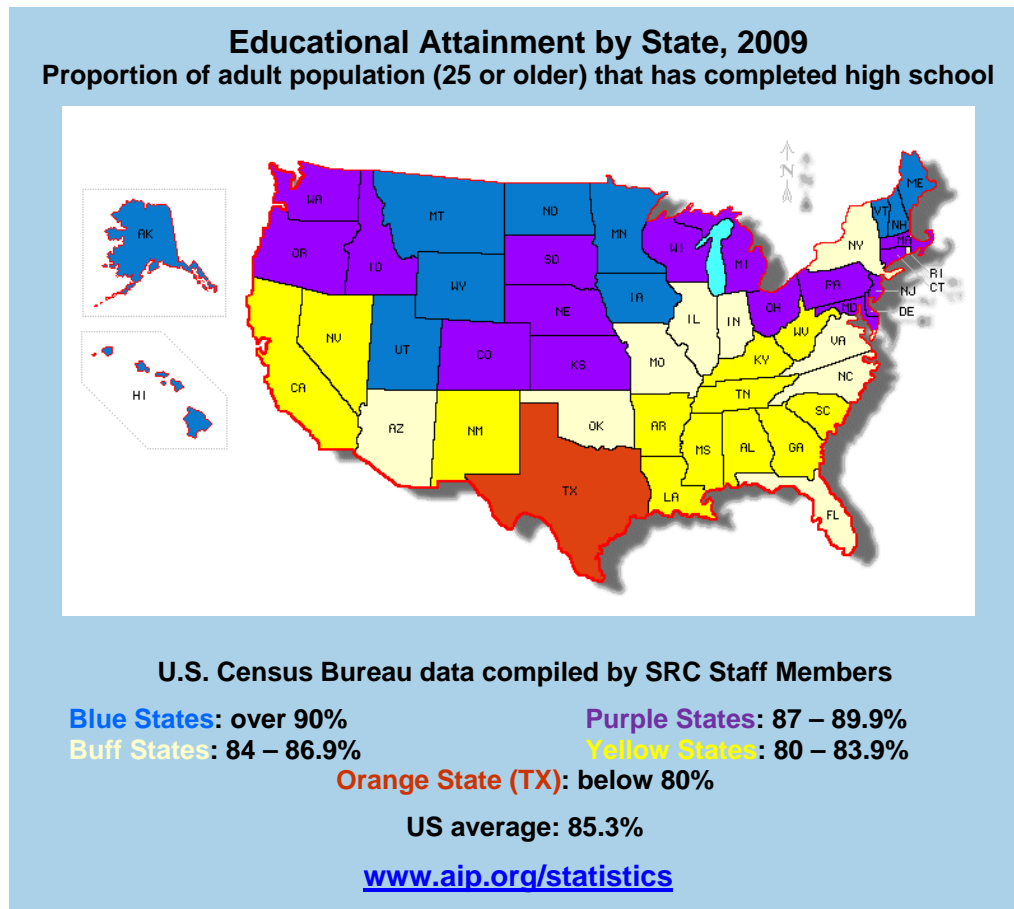
The educational attainment of adults in a state and the average size of schools in the state affect the availability of physics in a state.

Some of these residents have also earned a bachelor’s degree or an advanced degree. In 1990, about three-fourths of the U.S. population age 25 or older had graduated from high school. By 2000, this had risen to over 80%; it exceeded 85% in 2009 (which is the most recent year for which data are available).

The availability of physics in a high school does not necessarily affect the proportion of students taking physics. The data in Table 1 (on the front page) show an increasing proportion of students taking physics over time while the availability of physics classes has not changed significantly.

Even though availability is unchanged, the proportion of residents holding at least a high school diploma has increased over this period. It seems as though there is a “virtuous cycle”: as a higher proportion of the population earns a high school diploma, so too does a higher proportion of students take physics in high school. Thus, the physics-taking rate is more closely related to educational attainment than it is to availability. Figure 1 shows the educational attainment by state using 2009 data.

Figure 1



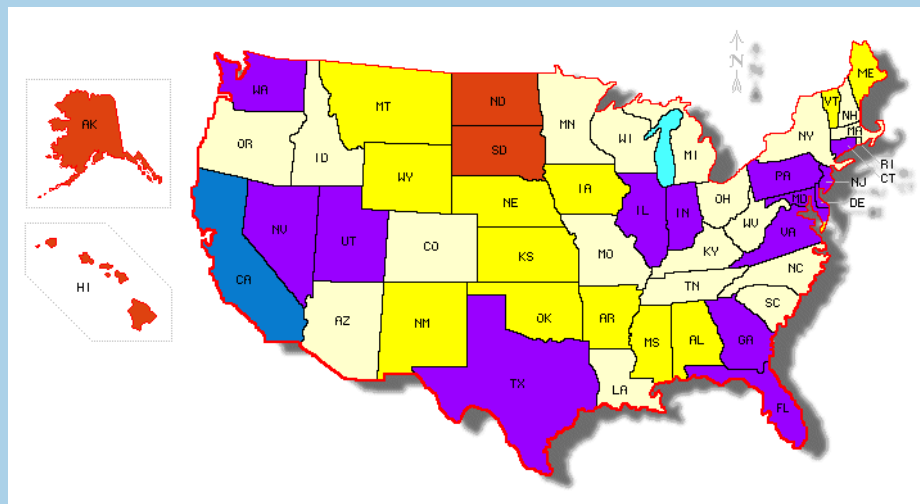
In 2009, 85.3% of the U.S. population age 25 or older had completed high school or earned a GED.

In 2009, 85.3% of the U.S. population age 25 or older had earned at least a high school diploma; the population of Florida mirrored that of the US. The blue and purple states on the map had a higher proportion of the population with a high school diploma; the yellow and orange states had a lower proportion.

In Figure 2, we examine the average number of seniors per high school in each state.

Figure 2

Average Number of Seniors per High School, 2010-11
Includes Public and Private High Schools with at least 3 seniors



US Department of Education data compiled by SRC Staff

Blue State (CA): over 200

Buff States: 100 – 149.9

Purple States: 150 – 199.9

Yellow States: 50 – 99.9

Orange States: fewer than 50

US average: 142.5

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California high schools average more than 200 seniors per school; they are the largest in the US.

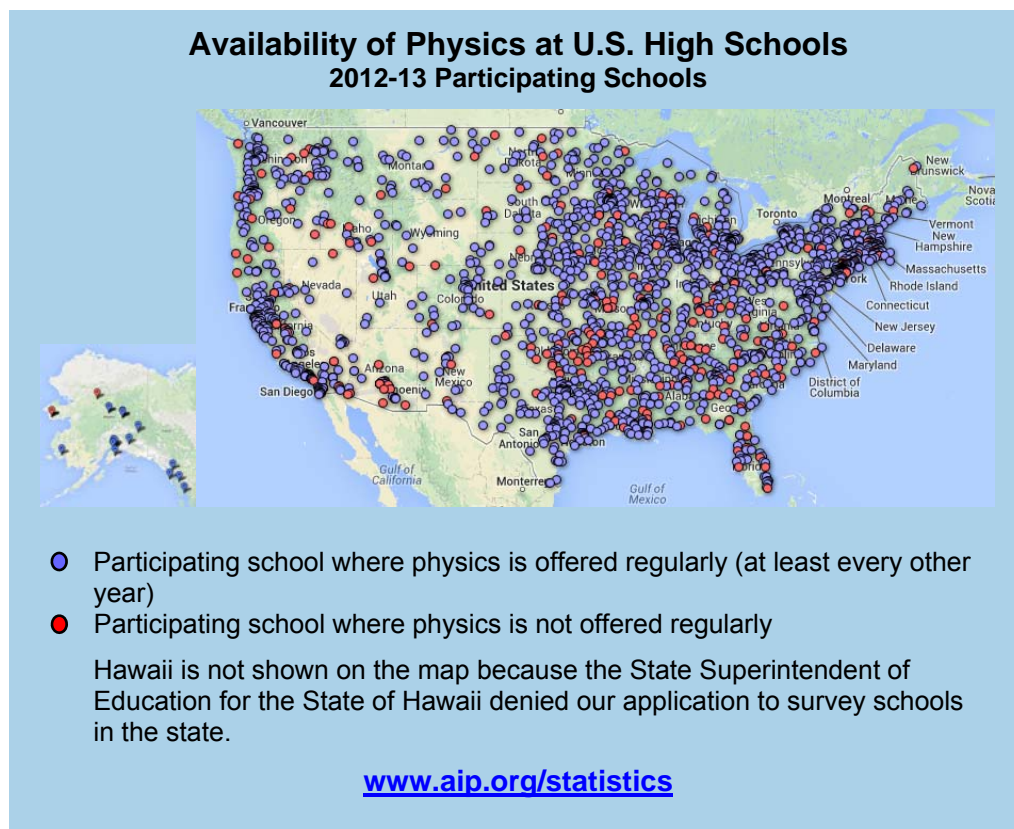
California high schools, on average, enroll more than 200 seniors per school. Alaska, Hawaii, North Dakota, and South Dakota have the smallest average numbers of students. Nine states account for over half of all seniors in US high schools: California, Florida, Illinois, New Jersey, New York, Michigan, Ohio, Pennsylvania, and Texas. Only three of these states (New York, Michigan, and Ohio) average less than 150 seniors per high school.

With these measures in mind, we will examine the availability of physics by state. Specifically, we will look at the proportion of seniors (a) attending schools where physics is available regularly (at least every other year) or (b) attending schools where physics is taught every year.

Physics Availability by State

Figure 3 depicts the availability of physics at schools in our study. The distribution of schools in our survey mirrors the distribution of high school seniors across the U.S. The blue dots represent schools where physics is available regularly (at least every other year), and the red dots indicate a school where physics is not offered regularly.

Figure 3



The blue dots indicate participating schools which offer physics regularly (at least every other year).

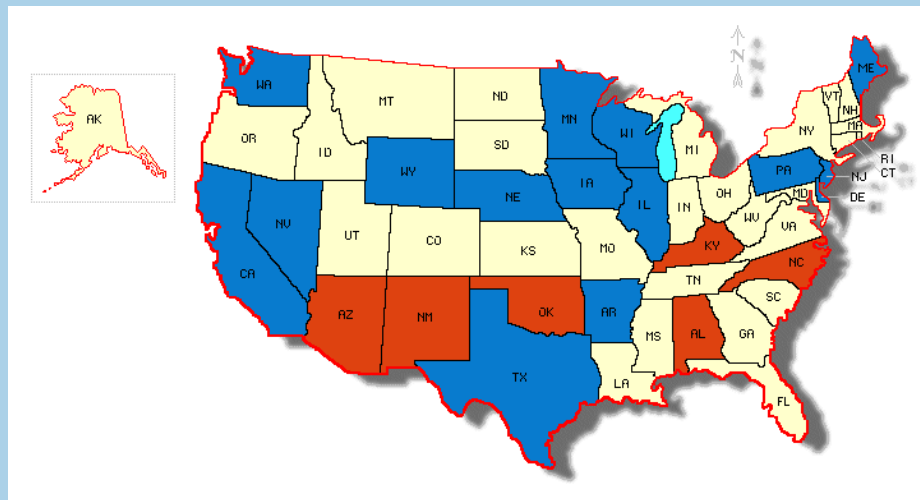
Although this map shows the parallels between the distribution of seniors and the distribution of physics availability, these parallels alone do not tell the whole story. While the dots do indicate whether or not physics is offered at a particular school, the map provides no indication as to the size of the school. Furthermore, the map does not distinguish between the schools that offer physics every year and those that offer it in alternate years.

Figures 4 and 5 (pages 6 and 7) provide these details. Figure 4 (page 6) displays whether or not physics is available regularly (at least every other year); Figure 5 (page 7) depicts whether or not physics is available every year at state high schools. In both cases, we compare the statewide proportion of seniors enrolled in schools where physics is

available at the national average. States in which physics is available to a significantly higher proportion of students are colored blue. Buff-colored states do not differ significantly from the national average, and the states colored orange have a significantly lower proportion of seniors attending schools where physics is offered.

Figure 4

**Regular Availability of High School Physics by State
(Physics is offered at least every other year)
2012-13 School Year**



The six states with lower-than-average physics availability account for about 9% of the seniors in US high schools.

In **blue states**, physics is available regularly (at least every other year) to a significantly **higher** proportion of seniors than the national average of 94%. (Availability is higher than average.)

In **buff states**, the proportion of seniors who attend schools where physics is available regularly (at least every other year) does not differ significantly from the national average of 94%.

In **orange states**, physics is available regularly (at least every other year) to a significantly **lower** proportion of seniors than the national average of 94%. (Availability is lower than average.)

Hawaii declined to participate in the 2012-13 survey.

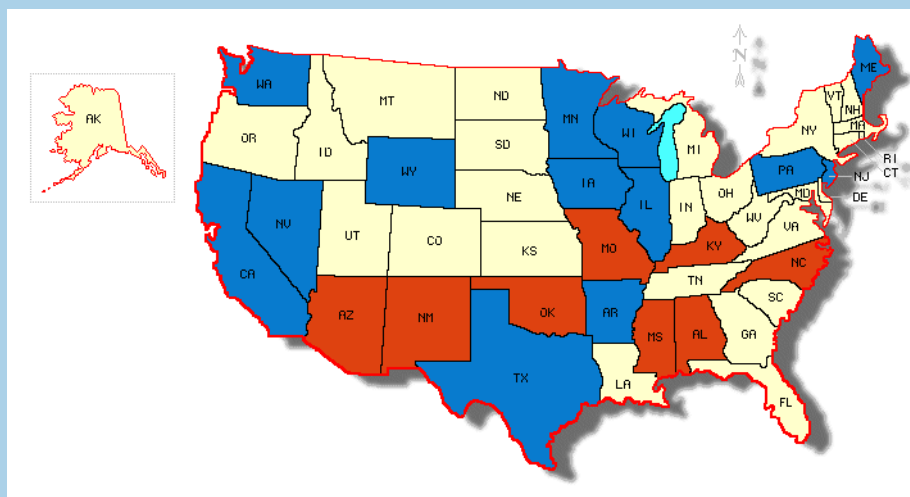
<http://www.aip.org/statistics>

Of the six states with lower-than-average physics availability, only Arizona is near the national average in both educational attainment and average number of seniors per school. Of the states with above-average availability, California, Nevada, and Texas have below-average educational attainment, but the average number of seniors per school is above the national average. Beginning with the 2012-13 school year, the Texas Education Agency also required that every school district offer students the opportunity to take physics, so it is not surprising that availability in Texas is above average.

At some schools physics is offered, but not every year. The differences between Figures 4 and 5 are due to schools where physics is offered in alternate years. In Figure 5, we consider whether or not physics is offered every year at a school, and the picture changes slightly. Seniors attending schools in Mississippi, Missouri, Nebraska and Delaware are less likely to find physics available every year in their high schools. Each of these four states drops a category when the analysis shifts from the availability of physics regularly (at least every other year; Figure 4) to the availability of physics every year (Figure 5).

Figure 5

Annual Availability of High School Physics by State (Physics is offered every year) 2012-13 School Year



In **blue states**, physics is available every year to a significantly **higher** proportion of seniors than the national average of 91%.
(Availability is higher than average.)

In **buff states**, the proportion of seniors who attend schools where physics is available every year does not differ significantly from the national average of 91%.

In **orange states**, physics is available every year to a significantly **lower** proportion of seniors than the national average of 91%.
(Availability is lower than average.)

Hawaii declined to participate in the 2012-13 survey.

<http://www.aip.org/statistics>

Schools in Delaware, Mississippi, Missouri, and Nebraska are more likely to offer physics in alternate years than schools in other states.

High school physics availability is higher than average in Arkansas which neighbors states with below-average availability. This is despite the fact that it has educational attainment and average high school senior class size that are both below the U.S. average. If physics educators better understood the factors that affect physics availability in Arkansas, they might be able to implement them in other states.

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 seniors enrolled in all U.S. public schools; likewise, schools in Hawaii account for less than one percent (<1%) of seniors enrolled in 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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