

High School Physics Availability

Results from the 2008-09 Nationwide Survey of High School Physics Teachers

Susan White & Casey Langer Tesfaye

Physics in U.S. High Schools

AIP started tracking physics in U.S. high schools in 1987. We have seen the proportion of seniors taking at least one physics class prior to graduation (physics taking) in U.S. high schools increase from 20% in 1987 to 33% in 2005. According to preliminary analyses of the data we collected during the 2008-09 academic year, we expect this number to continue to increase. We will examine recent trends in physics taking in our next publication in this series.

First, however, we will address the underlying issue of access to physics in high school. One measure of access is the proportion of schools teaching physics; however, this number understates the availability of physics to individual students because smaller schools are less likely to offer physics. Instead, we will consider the proportion of seniors attending schools where physics is taught. We see very little change in this figure over time. Table 1 outlines the data for selected survey years; data in other years mirrors what is shown.

Table 1

**Physics Taking & Physics Availability
in U.S. High Schools: 1987 – 2009**

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	NA [‡]	92	4

* 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 July of 2010.

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

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REPORTS ON HIGH SCHOOL PHYSICS

High School Physics Availability (4/2010)

High School Physics
Courses & Enrollments
(7/2010)

Who Teaches High School
Physics (10/2010)

Under-Represented
Minorities in High School
Physics (1/2011)

Females in High School
Physics (4/2011)

THE 2008-09 NATIONWIDE SURVEY OF HIGH SCHOOL PHYSICS TEACHERS

During the 2008-09 academic year, we contacted a representative national sample of about 3,600 public and private high schools across the U.S. to inquire about physics availability and offerings. These reports describe our findings.

The proportion of seniors attending a high school where at least one physics class is taught has remained remarkably consistent over the last twenty years. This signifies that the increases in physics taking are real and not simply due to changes in the presence of a physics class; however, this crude availability measure masks changes in the number of physics classes taught in U.S. high schools. As noted previously, the next publication in this series, *focus on High School Physics Courses & Enrollments*, will examine recent trends in physics taking and the number and types of physics classes offered.

Since most students attend local high schools, it is important to consider local availability of physics in U.S. high schools. The presence of a physics class in a particular school does not ensure that every senior has access to physics. However, it is a good place to start to compare high school physics at the state level. Tables 2 and 3 detail physics availability by size of school and by type of school.

Table 2

**Physics Availability in U.S. High Schools
by Size of School, 2008-09**

Size of School (Number of Seniors)	Proportion of ...		Proportion of Seniors in Schools Offering Physics ...	
	U.S. High Schools (%)	Seniors Enrolled (%)	Every Year (%)	Rarely or Never (%)
1 – 49	44	6	61	20
50 – 199	32	26	85	8
200 – 299	9	17	92	4
300 – 499	11	31	99	1
500 +	4	20	99	0

*These figures have
shown little change in
the last twenty years.*

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

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Table 3

**Physics Availability in U.S. High Schools
by Type of School, 2008-09**

Type of School (Public or Private)	Proportion of ...		Proportion of Seniors in Schools Offering Physics ...	
	U.S. High Schools (%)	Seniors Enrolled (%)	Every Year (%)	Rarely or Never (%)
All Schools	100	100	92	4
Public Schools	67	92	92	4
Private Schools	33	8	87	6

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

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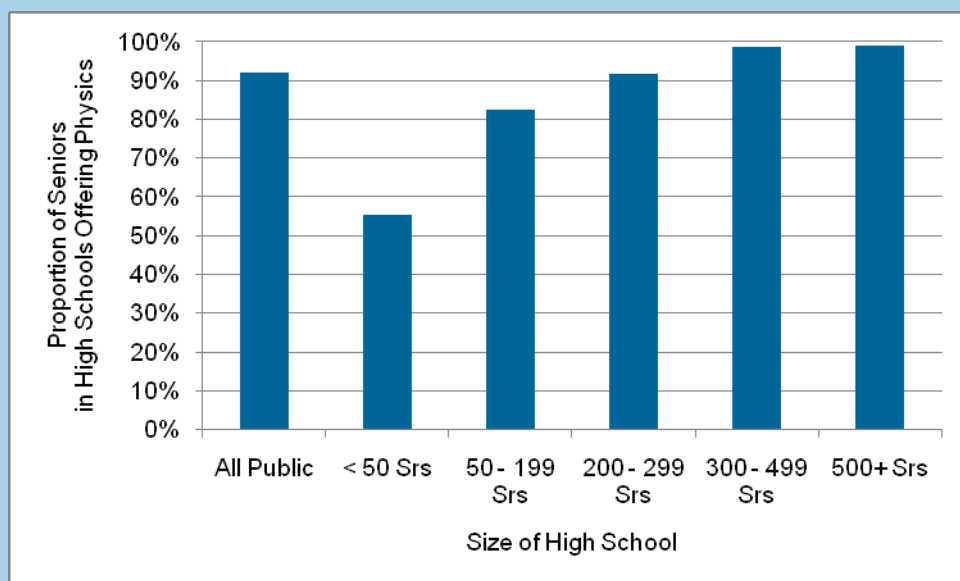
A private high school typically has fewer seniors than a public high school; thus, it is not surprising that physics is available more regularly in public high schools.

Not surprisingly, physics is offered more regularly in larger schools than in smaller ones. It is important to note that, even though a very small proportion (~5%) of U.S. high schools have 500 or more seniors, these high schools enroll about one-fifth of the seniors. Physics is also more widely available in public high schools than private high schools.

Figures 1 and 2 combine the data from Tables 2 and 3 and show the availability of physics for students in public schools by the size of the school (Figure 1) and in private schools by the size of the school (Figure 2). Small public and private high schools are less likely to offer physics every year than larger ones. We see a similar pattern emerge when looking at schools where physics is offered rarely or never. A higher proportion of seniors in smaller high schools attend schools rarely (or never) offer physics.

Figure 1

Proportion of Seniors Attending U.S. Public High Schools where Physics is Offered Every Year, 2008-09

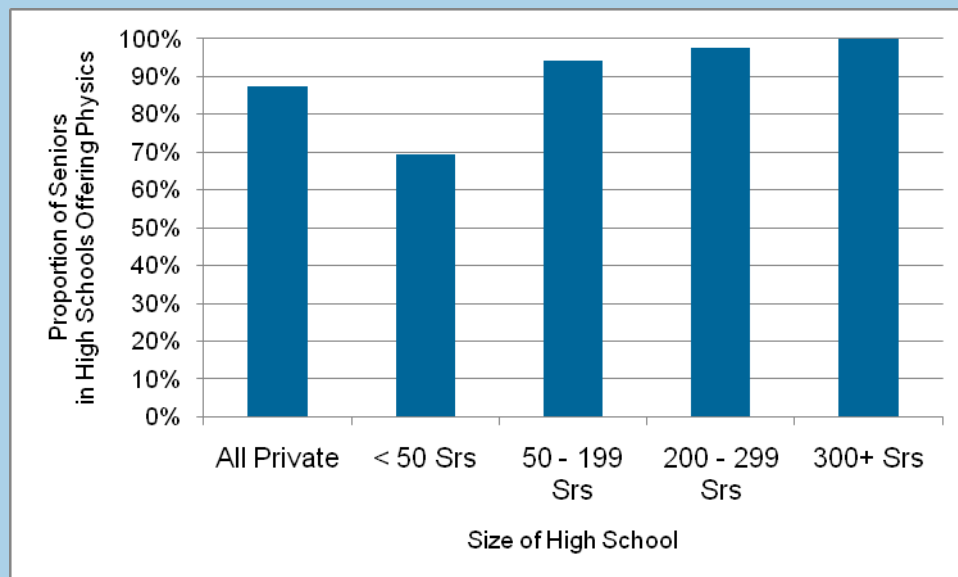


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Seniors attending small public high schools are less likely to find physics offered every year than those in larger public high schools.

Figure 2

Proportion of Seniors Attending U.S. Private High Schools where Physics is Offered Every Year, 2008-09



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As with the public high schools, seniors attending small private high schools are less likely to find physics offered every year than those in larger private high schools.

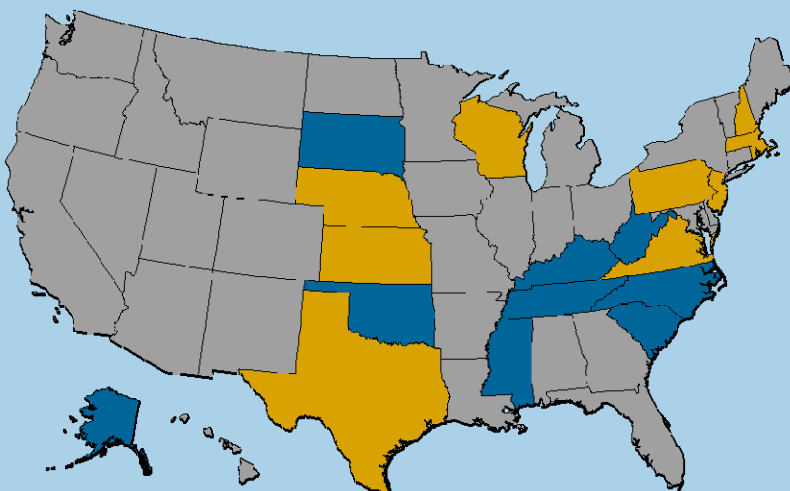
State-to-State Variation in the Availability of Physics Every Year

As shown in Table 1, physics is available every year to 92% of the seniors in U.S. high schools. This national number masks state-to-state variation in physics availability. Figures 3 and 4 provide an overview of the availability of physics in each of the U.S. states. We examine availability in two ways – the proportion of seniors attending high schools where physics is offered every year and the proportion of seniors attending high schools where physics is offered rarely or never. Physics availability in the states shown in gray does not vary significantly from the national average. For states shown in gold, the physics availability is significantly above the national average; those in blue exhibit significantly lower physics availability.

Figures 3 and 4 show that Kansas, Nebraska, New Hampshire, Pennsylvania, Rhode Island, Texas, and Wisconsin do well in terms of both measures of physics availability. Seniors in these states account for about 17% of all seniors in U.S. high schools. At the other end of the spectrum are Kentucky, North Carolina, Oklahoma, South Carolina, and Tennessee; these states account for only 8% of high school seniors in the U.S..

Figure 3

Physics Offered Every Year in U.S. High Schools, 2008-09

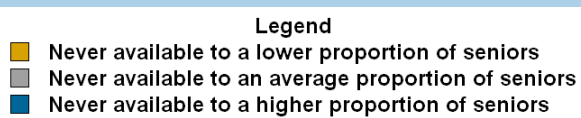
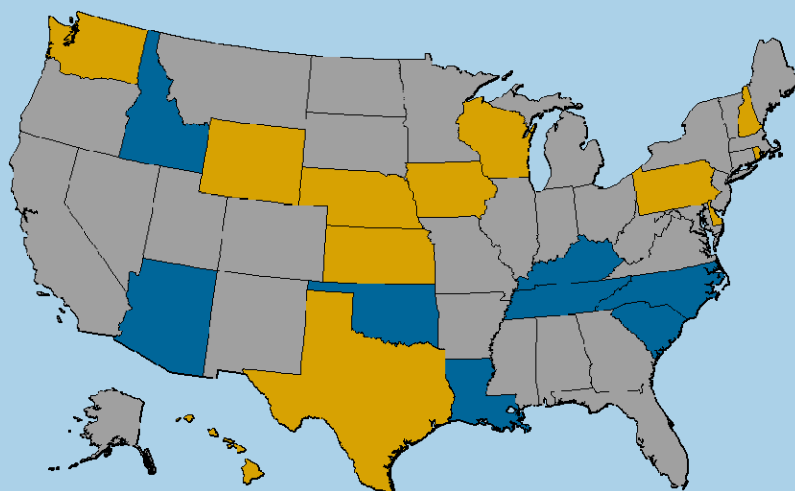


There is a cluster of lower availability in the central eastern states.

Legend

- Always available to a higher proportion of seniors
- Always available to an average proportion of seniors
- Always available to a lower proportion of seniors

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Figure 4**Physics Offered Rarely or Never in U.S. High Schools, 2008-09**

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This map is similar to Figure 3 except that more western states exhibit availability at both ends of the spectrum.

Other states which do well on one of the two availability measures are Delaware, Hawaii, Iowa, Massachusetts, New Jersey, Virginia, Washington, and Wyoming; about 12% of all seniors are in high schools in these states. Finally, Alaska, Arizona, Idaho, Louisiana, Mississippi, South Dakota, and West Virginia do poorly on one of the two measures; another 6% of high schools seniors attend schools here. Almost 30% of seniors attend high schools in states which perform well on at least one measure (or both); less than 15% attend schools in states which do poorly on one or both measures.

Table 4

U.S. States with Enrollment Factors that Affect Physics Availability, 2008-09

Factors Associated with Lower Physics Availability		Factors Associated with Higher Physics Availability	
States with a Higher Proportion of Seniors Enrolled in “Small” Schools	States with a Lower Proportion of Seniors Enrolled in “Large” Schools	States with a Lower Proportion of Seniors Enrolled in “Small” Schools	States with a Higher Proportion of Seniors Enrolled in “Large” Schools
Alabama	Alabama	Arizona	Arizona
Arkansas	Arkansas	California	California
District of Columbia	District of Columbia	Colorado	Colorado
Iowa	Delaware	Delaware	Florida
Maine	Kentucky	Florida	Georgia
Mississippi	Louisiana	Georgia	Illinois
Montana	Maine	Hawaii	Illinois
North Dakota	Mississippi	Illinois	Maryland
Oklahoma	North Dakota	Maryland	Maryland
South Dakota	North Dakota	Nevada	New Jersey
Vermont	Rhode Island	Nevada	Nevada
West Virginia	South Dakota	Texas	Texas
Wyoming	South Dakota	Utah	Utah
	Vermont	Virginia	Virginia
	West Virginia	Washington	Washington

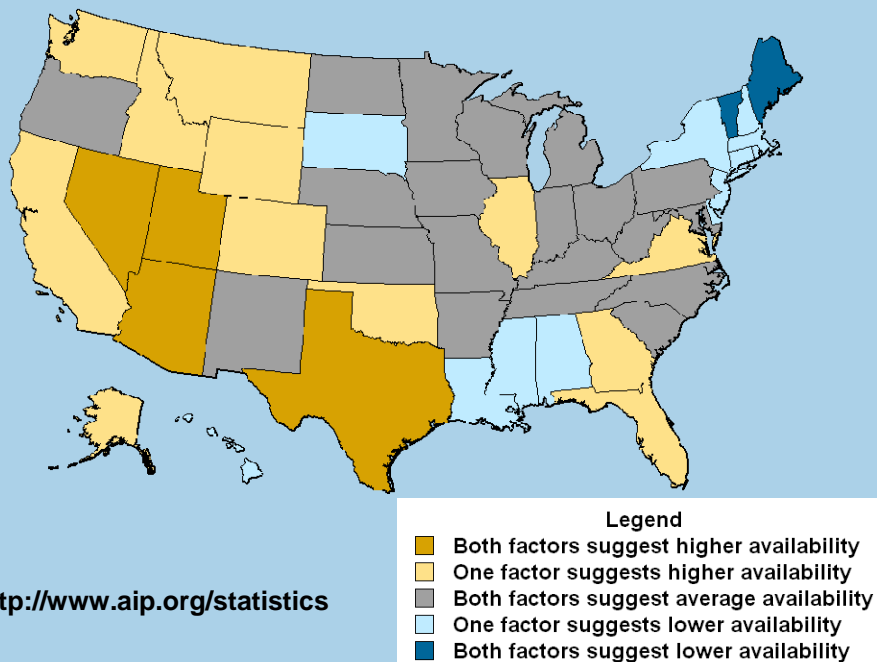
Some states exhibit a combination of enrollment distributions that can positively or negatively affect the availability of physics in high schools in the state.

“Small” schools have fewer than 200 seniors.
 “Large” schools have 300 seniors or more.

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Figure 6

**Physics Availability as Expected Given Enrollment Distribution
& Proportion of Seniors in U.S. Public High Schools, 2008-09**



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Arizona, Nevada, Texas, and Utah exhibit both a high proportion of students in public high schools and more students in larger high schools, so physics availability should be above average in these states.

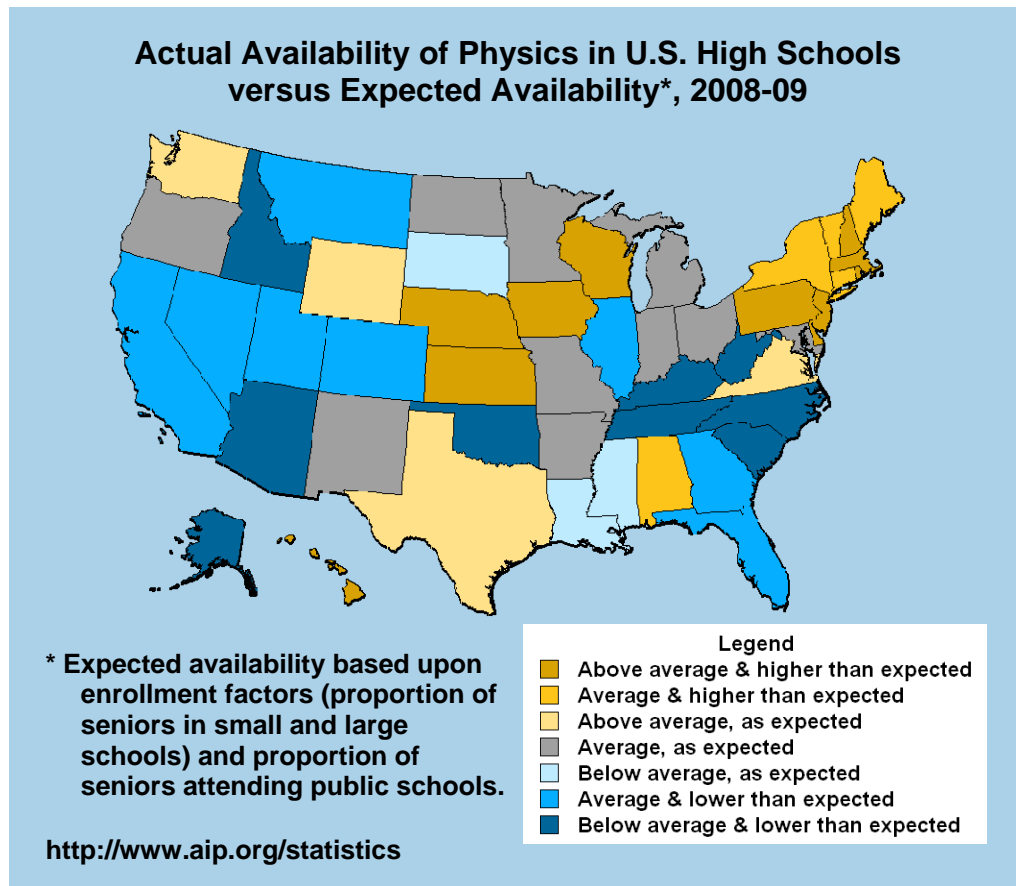
Figure 6 combines the data from Table 4 and Figure 5 to show how the impacts of enrollment distributions (proportion of seniors in small and large schools) and the proportion of students attending public high schools are expected to affect the availability of physics in high schools in each state.

Figure 7 compares the expected availability of physics in high schools in each state, as shown in Figure 6, to the actual availability, measured by combining the proportion of seniors attending high schools where physics is offered every year and the proportion of seniors attending high schools where physics is never offered.

Physics availability in the states depicted in the golden and darker yellow tones in Figure 7 exceeds expectations; for states in the darker blues, it falls below expectations. Those interested in advancing physics in high schools should consider differences and similarities in these states' education systems to better understand the dynamics that drive physics offerings. High schools in the states that are yellow and gold in Figure 7 teach almost 40% of seniors in U.S. schools; high schools in the states that are blue account for just over 40%.

Our next **focus on** in this series will examine physics taking. It will be interesting to see the strength of the relationship between the availability of physics in high schools in a given state and the actual physics taking in that state.

Figure 7



Most of the over-achieving states are in the northeast, and southeastern states under-achieve in terms of physics availability.

Survey Methodology

In the fall of 2008, we contacted a representative sample of over 3,600 high schools in the U.S. – both public and private – to determine whether or not physics was taught there. We received responses from over 99% of the schools. For the schools which indicated they were offering physics, we obtained contact information for the teachers. In the spring of 2009, we contacted each of the teachers who were thought to be teaching physics. We received responses from over 2,500 teachers (a 62% response rate). Our findings are based on their responses.

For a copy of the principal survey or the teacher survey, please contact Susan White at swhite@aip.org.

We are able to conduct this research only with the gracious help of the more than 6,000 people who provided responses, including an administrator at each school and each of the teachers who responded. We are deeply grateful for your assistance and your time.

This marks the seventh time we have conducted a survey examining physics in U.S. high schools. The first six studies were directed by Michael Neuschatz who retired from AIP in 2008. We hope to continue the tradition of the excellent work in this area that he began.