After adopting the Next Generation Science Standards (NGSS) or other new standards, state boards of education face the need to enact other policies that support the vision of the NGSS as well as other reforms being introduced in districts and schools. State high school graduation requirements are one of those policies. Reviewing graduation requirements for science today requires a renewed effort not only because of new approaches taken by the NGSS, but because of other innovations being implemented at the local level.

The NGSS creates the endpoints for the learning of science—what we want students to be able to know and do by the time they leave high school—but gives states the flexibility to decide how to get students to and beyond those endpoints. Graduation requirements help establish the science program and course requirements for students to meet those endpoints. The NGSS does not define those courses, how they are offered, the curriculum in those courses, or how well students must do in those classes for graduation. Those are issues of program, curriculum, and accountability that are left to state and local leaders to address.

Overview of State Graduation Requirements in Science

State graduation requirements for science vary considerably. One key component of them is credits. In some states the science requirement is a low of 2 credits, while in others up to 5 or 6 credits are required to graduate. A credit is most often a year-long course of study, but in several instances a credit is only a one-semester course. Most states have a 3-credit requirement (table 1). When one looks more closely at these requirements, different states have caveats about those courses (credits), including separate requirements for different disciplines (biology, chemistry, physics, or Earth and space sciences), lab and non-lab courses, engineering and STEM selective credits, or certain career-technical education (CTE) courses.

Some states are increasing the number of course requirements in the sciences beyond the national average of 3 credits. However, there is a trend for the inclusion of new STEM, engineering and computer science courses increasing total the graduation credit requirements for students.

Steps in Reviewing Graduation Requirements

1. Conducting Background Research

Understanding today’s college and career readiness landscape is helpful when reviewing graduation requirements. Asking questions such as:

- How well prepared are our students for university level work?

Table 1. State Science Credits Required for Graduation

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Number of States*</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 credits</td>
<td>7</td>
<td>States in this category require 3 credits for an advanced diploma.</td>
</tr>
<tr>
<td>3 credits</td>
<td>28</td>
<td>Some states include within the three credits a CTE course that meets at least one other academic requirement and/or include an engineering or technology course as fulfilling the requirement.</td>
</tr>
<tr>
<td>4 credits</td>
<td>8</td>
<td>These credits are for year-long courses</td>
</tr>
<tr>
<td>5 or 6 credits</td>
<td>2</td>
<td>These credits are for one-semester not year-long courses</td>
</tr>
</tbody>
</table>

*Some states are in the process of revising their requirements and are not included here.
frames each state’s landscape and can guide state board deliberations about graduation requirements.

A review of your state’s student performance dynamics is helpful. Nationally, high school attendance in colleges and universities has been increasing. Yet according to Complete College America, 4 in 10 high school graduates are required to take remedial courses. A recent ACT report indicates only about one-third of high school students in 2011 were college-ready. Fast paced changes in the roles and skills required by companies today have resulted in specific skills gap for many careers. Some CTE programs address these gaps, but the career landscape continues to change rapidly. The 2012 PISA assessment on problem solving reported that U.S. students scored above the international average, but below students from Singapore, Korea, Hong Kong–China, Shanghai-China, and Japan. These national indicators of college and career readiness may be similar to those in your state, but knowing them is helpful answering the questions posed above.

2. Aligning Graduation Requirements with NGSS Expectations and the State’s Overall Vision for Science Education

Selecting and revising the number of credits and then addressing any anomalies such as selective courses in engineering or CTE is the traditional way to review graduation requirements. Since the NGSS doesn’t explicitly address what credits are necessary for students to graduate, it is up to the states to set them. There are some specific content differences of note between the NGSS and most existing state science standards to consider, such as the inclusion of engineering and Earth and space sciences and how the NGSS integrate the disciplines, the practices of science, and the cross cutting concepts in science. In addition, the explicit inclusion of English Language Arts skills as a performance expectation in the NGSS requiring students to research, write and speak using evidence is a major shift from prior science standards. Finally, the alignment of CTE and GED programs with the NGSS requires a thoughtful review of current graduation requirements imperative.

3. Providing Flexibility While Ensuring High Standards

Other educational strategies that are growing and demonstrating positive student results are new, more integrated perspectives on the discipline of science and instructional approaches for deeper learning. For example, some STEM schools with a more integrated approach (i.e., integrated across science disciplines and with mathematics) might find the traditional discipline-based credits structure as a barrier. This could also be the case with schools moving toward a more individualized course of study (e.g., in competency-based programs or project-based learning).

A case in point is the High Tech High School model. According to the school, “the design principles...[include] the openness of the facilities, the personalization through advisory, the emphasis on integrated, project-based learning and student exhibitions, the requirement that all students complete internships in the community, and the provision of ample planning time for teacher teams during the work day.” Clearly, a traditional credits structure could reduce the instructional flexibility needed for such schools to function as intended.

Indeed, researchers have been finding that one of the critical components of inclusive, STEM-focused high schools is that their STEM classes emphasize research-based instructional practices and strategies that promote active teaching and learning. Opportunities for project-based learning are key to helping all students succeed in these schools. Similarly, apprenticeships that combine academic and real-world training (whether in new model high schools, CTE, or the traditional high schools) may not match the current course credit requirements. To provide the opportunity for these distinctive approaches to develop, states would need to review their graduation requirements with flexibility in mind.

With the adoption of the NGSS, there is an opportunity for states to develop a vision for science education. Articulating the state’s aspirations for student learning in science will help schools and students make a smoother transition to the NGSS.

References


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