

Date of Hearing: March 13, 2019

ASSEMBLY COMMITTEE ON EDUCATION
Patrick O'Donnell, Chair
AB 28 (Obernolte) – As Introduced December 3, 2018

SUBJECT: High school diplomas: State Seal of STEM

SUMMARY: Establishes the State Seal of STEM, to be affixed to high school diplomas of qualified students, which recognizes students who have attained a high level of proficiency in the subjects of science, technology, engineering, and mathematics (STEM). Specifically, **this bill:**

- 1) States that the purposes of the State Seal of STEM are to:
 - a) encourage students to study science, technology, engineering and mathematics
 - b) certify high achievement within the STEM fields
 - c) provide students with tools to demonstrate STEM competency to employers
 - d) provide universities with a method to recognize and give academic credit to applicants seeking admission
 - e) prepare students for with 21st century skills
 - f) engage students in STEM learning at an early age
 - g) prepare students for a job market increasingly in need of individuals with STEM skills
- 2) Requires that a high school student who meets all of the following criteria is eligible for the State Seal of STEM:
 - a) Attained a 3.0 grade point average on a 4.0 scale for all science, technology, engineering, and mathematics courses taken in high school.
 - b) Successfully completed four year-long courses, or the equivalent, in mathematics and four year-long courses, or the equivalent, in science while enrolled in high school. States that the requirement for completion of up to one of the year-long courses in mathematics may be satisfied by completion of a course or courses in computer science.
 - c) Has one of the following:
 - i. a score of 3 or higher on an advanced placement examination in science.
 - ii. a score of 600 or higher on an SAT subject test in science.
 - iii. a score of 4 or higher on an international baccalaureate examination in science.
 - iv. a grade of B or higher in a college-level science course taken through concurrent enrollment.

- v. a score indicating that the pupil has met or exceeded standards on a state-standards-aligned assessment in science.
- d) Has one of the following:
- i. a score of 3 or higher on an advanced placement examination in mathematics
 - ii. a score of 600 or higher on an SAT subject test in mathematics
 - iii. a score of 4 or higher on an international baccalaureate examination in mathematics
 - iv. a grade of B or higher in a college-level mathematics course taken through concurrent enrollment
 - v. a score indicating that the pupil has met or exceeded standards on a state-standards-aligned assessment in mathematics
- 3) States that school district participation in this program is voluntary.
- 4) Requires the Superintendent of Public Instruction (SPI) to prepare and deliver to participating school districts an appropriate insignia to be affixed to the diploma or transcript of the student indicating that he or she has been awarded a State Seal of STEM.
- 5) Requires each school district that participates in the State Seal of STEM program to maintain appropriate records in order to identify students who have met the established criteria for the award and to affix the appropriate State Seal of STEM to the diploma or transcript of each qualifying student.
- 6) Prohibits students from being charged a fee to receive the Seal.
- 7) States that the act shall not become operative until after data from the statewide administration of state science assessments aligned to the California Next Generation Science Standards are available. States that data from a field test of a state science assessment does not satisfy this requirement.
- 8) States that the act shall not become operative until the state board, in a public meeting, makes a declaration of all of the following:
- a) All California pupils have a reasonably equal opportunity to engage in the coursework and other requirements that would be necessary to earn the State Seal of STEM.
 - b) The State Seal of STEM would confer value to the pupil through recognition by postsecondary educational institutions or employers.
 - c) The State Seal of STEM would be earned through recognized excellence or outstanding achievement in the field of study.

- d) The State Seal of STEM would not be based primarily on achievement that is already recognized through other means, such as grades, assessment results, other measures of academic achievement, or industry certifications.

10) Makes the act inoperative on July 31, 2026, and, as of January 1, 2027, repealed.

EXISTING LAW:

- 1) Establishes the State Seal of Civic Engagement, which to recognize demonstrated excellence in civics education and participation and have demonstrated an understanding of the United States Constitution, the California Constitution, and the democratic system of government.
- 2) Establishes the State Seal of Biliteracy, which provides recognition to high school students who have demonstrated proficiency in speaking, reading, and writing in one or more languages in addition to English. Requires each school district, county office of education, or direct-funded charter school that confers the SSB to maintain appropriate records in order to identify students who have met the established criteria for the award and to affix the SSB insignia to the diploma or transcript of each qualifying student.
- 3) Establishes the Golden State Seal Merit Diploma (GSSMD), which provides recognition to public high school graduates who have demonstrated mastery of high school curriculum in six designated subject areas, four of which must be mathematics, English language arts, science, and United States history. Eligibility requirements for the GSSMD include a combination of course grades, results from assessments produced by private providers or local education agencies (LEAs), and/or qualifying Smarter Balanced Summative Assessment of California Standards Tests scores for use by LEAs to award the GSSMD to graduating students.
- 4) Declares a policy of the State of California that all students in grades 1 – 12 must have equitable access to educational programs designed to strengthen technological skills, including computer education programs, and that funds appropriated for these educational programs have the goal of ensure equitable access to those programs for all students.

FISCAL EFFECT: Unknown

COMMENTS:

Need for the bill. The author’s office states, “Assembly Bill 28 seeks to get more Californians qualified to fill the readily available, well-paying STEM jobs by getting students interested in STEM early. This seal will reward students that demonstrate proficiency in science, technology, engineering, and math curricula. It will also serve to incentivize school districts to focus on offering STEM classes so that their students can earn this distinction. California has a quickly growing STEM field, while at the same time lacking a skilled workforce qualified to fill the open positions in this field. In fact, in the most recent year for which data is available, the California Employment Development Department reported that the number of online job postings for STEM-related jobs outstripped the number of unemployed STEM workers by a ratio of 2:1. Additionally, of the more than one million STEM jobs California will need over the next decade, around 75 percent will require a bachelor’s degree or higher. When you stack this against the fact that only 33 percent of California’s working-age population currently have degrees that serve as

a prerequisite for the vast majority of these STEM and health jobs, it becomes very clear that California must take action. This bill provides a step in the right direction.”

Access to high-quality STEM education. STEM education includes four disciplines: science, technology, engineering, and mathematics. In recent years the state has undertaken a number of policy reforms to address STEM teaching and assessment practices, curriculum, and policies that expand STEM opportunities for all students.

There is wide acknowledgement that many California students have insufficient access to high quality STEM education. The SPI’s STEM Education Task Force, in a 2014 report on STEM education titled *INNOVATE: A Blueprint for Science, Technology, Engineering and Mathematics in California Public Education*, found:

Many of California’s students lack consistent access to high-quality STEM education. Although the importance of STEM learning has been widely acknowledged, several factors have limited access to STEM education: the focus on English language arts and skill-based mathematics required by No Child Left Behind; insufficient focus on science as well as on STEM education in the classroom; lack of access to high-quality STEM materials and instruction; insufficient opportunities for students to engage in hands-on, inquiry based learning; and insufficient professional preparation by teachers at all levels.

In recognition of this problem of access, the SPI’s STEM Education Task Force recommends that the state “Make access to high-quality STEM experiences and programs universal to all K-12 students through a variety of opportunities in school, expanded learning, and community partnerships through informal, formal, and digital pathways.”

Balancing equal opportunity and rigor when the landscape is uneven. In designing criteria for a diploma seal or other state recognition, it’s important to ensure that all students have the opportunity engage in coursework and activities required to meet those criteria. It’s also important to set the bar high, in order for the award to carry meaning as a mark of outstanding achievement. This is fairly easy to achieve when all students have access to the required coursework, as is the case for world language courses required to earn the State Seal of Biliteracy.

But finding the right balance between equal opportunity and rigor is very challenging when the opportunity to learn is uneven. If the bar is set high, some students will never have the opportunity to earn the diploma seal, simply by virtue of where they attend school. If the bar is set low, the diploma seal ceases to have any meaning as a mark of excellence. ***The Committee may wish to consider*** whether it is possible to strike the right balance when access to STEM learning opportunities is uneven.

Opportunity to study STEM. To earn the State Seal of STEM proposed by this bill, students would need access to a number of opportunities to engage in STEM education:

- ***AP Courses:*** According to the *10th Annual AP Report to the Nation*, out of nearly 500,000 California high school seniors, in 2013:
 - 7.9% took the Calculus AB exam
 - 2.9% took the Calculus BC exam
 - 4.7% took the Statistics exam

- 0.7% took the Computer Science exam
- 1.5% took the Physics C-Electricity and Magnetism exam
- 2.4% took the Physics B exam
- 3.3% took the Chemistry exam
- 5.7% took the Biology exam
- 3.5% took the Environmental Science exam

Of students graduating in 2013:

- 9.8% had received a score of 3 or higher on an AP exam in mathematics or computer science.
- 8.2% had received a score of 3 or higher on an AP exam in science.

According to this report, students of color and low-income students are far less likely to have access to STEM AP classes. The College Board states, “in many cases, schools serving large numbers of traditionally underrepresented minority students do not yet provide AP course work in STEM disciplines.”

A 2013 report by the Education Trust found that, nationally, low-income students (15%) were almost twice as likely as other students (8%) to attend a school without a full complement of AP courses (defined as at least one course each in English, mathematics, science, and social science) and that Native American (18%) and African American (15%) students were far more likely than white (9%) students to have more limited course options.

- ***International Baccalaureate programs:*** While there are 1,337 public high schools in California, it appears that there are 94 public, diploma IB schools in the state. Nationally, according to the 2015 report, *International Baccalaureate National Trends for Low-Income Students*, only 20% of low-income students scored well enough on at least one IB high-level exam to earn college credit from most U.S. colleges and universities.
- ***SAT Subject Tests:*** The SAT Subject Tests measure student knowledge in particular subject areas closely linked to the high school curriculum and their ability to apply that knowledge. There are over 20 different SAT Subject Tests that cover Literature, Math, Sciences, and Foreign Languages. These tests are a voluntary supplement to the general SAT test many students take for college admissions purposes.

According to the 2014 College Board report on SAT data, *College-Bound Seniors State Profile Report - California*, SAT Subject Tests are taken by a much smaller and more select population of students compared to those who take the SAT. In 2014, 53,772 California students took a single Subject Test, compared to the 236,923 students who took the SAT. In 2014, of the 500,000 high school seniors who had taken subject tests at any point in high school:

- 1.2% of seniors took the Mathematics I examination
- 7% of seniors took the Mathematics II examination
- 1.6% of seniors took the Biology E examination
- 1.8% of seniors took the Biology M examination
- 2.6% of seniors took the Chemistry examination

- 1.4% of seniors took the Physics examination

In 2009 the University of California eliminated the use of the SAT II as an admissions requirement, responding to concerns that the exams did not provide useful information about applicants, and that the tests were barriers for otherwise qualified students in urban and rural schools who might not be advised by counselors to take them. Research also indicates that while such test scores are highly correlated with parental income, high school GPA, which is only weakly correlated with parental income, is a better predictor of success in college.

- **Computer science courses:** According to a May 2015 report issued by the Level Playing Field Institute titled *Path Not Found: Disparities in Access to Computer Science Courses in California High Schools*, access to computer science courses varies considerably. The report found that in California public high schools:

- Of the more than half a million high school students in the largest 20 districts, 1% are enrolled in any computer science course.
- Nearly 75% of schools with the highest percentage of underrepresented students of color offer no computer sciences courses.

- African-American and Latino students make up 59% of California high school public school students but were just 11% of the 2014 AP Computer Science test takers.

California High Schools Offering CS Courses, 2016-17

Course Name	% of Schools offering course
Exploring Computer Science	12%
Computer Science	12%
AP Computer Science Principles	3%
AP Computer Science A	10%
Robotic Technologies	13%

- Only 4% of schools with the highest percentage of low-income students offer AP Computer Science.
- Only 8% of schools with the highest percentage of English Learners offered AP Computer Science.

Source: *Draft CS Strategic Implementation Plan, 2018*

- **Out-of-school STEM learning opportunities:** Research has shown that after school and summer learning, known as out-of-school (OST) learning, can increase interest in STEM-related careers. According to a 2014 study commissioned by the Association of Children’s Museums Committee on Successful Out-of-School STEM Learning, titled *Broadening Access to STEM Learning through Out-of-School Learning Environments*, “there are still significant challenges to ensuring youth in low socioeconomic communities have equitable access to OST STEM learning opportunities, most of which revolve around issues of finances and funding.”

The report notes that most OST programs – including STEM-focused programs – are fee-based in some form, and even when the fees are nominal or nonexistent, “participation

still requires a significant amount of resource investment from families in terms of time and resources.” The report notes that transportation is a particularly troublesome issue when programs are based at sites beyond the neighborhood, and that while many OST programs work to ensure affordability, “there is growth in high-profile and high-visibility robotics programs, which require a buy-in cost in the thousands of dollars, and also require the recruitment of multiple STEM professional volunteers, multiple adult coordinators, etc. – all structural requirements that are well outside the reach of most youth, but especially those in low socio-economic status communities.”

As noted above, robotics teams are a popular OST high school STEM activity. A review of the fundraising plans for three high school robotics teams indicates that the cost for robot parts and other materials, trailers for transporting robots, competition fees, and travel, requires between \$20,000 and \$40,000 most of which are recurring annual costs. This estimate does not include staff and parent time and facility costs, and assumes that skilled staff and parents are available to coach the team. High school robotics teams typically fundraise by seeking community and corporate sponsorship.

- ***Access to dual enrollment opportunities:*** According to a June 2014 study by the Education Commission of the States titled *Dual enrollment: Challenges in Rural Areas*, rural areas face unique challenges in providing high-quality dual enrollment programs. Students also face access issues based on their geography or ability to get to and from a college campus. Other issues include covering program costs, a lack of available technology or equipment necessary for the coursework, and access to qualified teachers.

While some urban and suburban high school offer dual enrollment courses led by postsecondary faculty who travel to the high school campus, the report notes that longer travel distances in rural areas can render these arrangements unfeasible.

Finally, this bill requires that recipient of the Seal earn an overall GPA of 3.0 or higher in all STEM courses. While no state data on GPA appear to be available, national data from 2009 (U.S. Department of Education) indicate that students earn the lowest GPA in math and science courses of any discipline, averaging 2.65 and 2.70 in math and science, respectively.

Underrepresentation in STEM education. According to a 2009 report from the Institute for Higher Education Leadership and Policy at California State University, Sacramento titled *Technical Difficulties: Meeting California’s Workforce Needs in Science, Technology, Engineering, and Math (STEM) Fields*, the supply of STEM-educated workers is not keeping pace with the employment demand in STEM fields. To ensure that there are enough STEM workers, the report concluded that increasing STEM achievement by underrepresented groups is essential. The report noted that only three percent of STEM majors in the state are African-American, and 18% are Latino. Women are also far less likely to earn STEM degrees, particularly in engineering.

Benefit to students. Diploma seals can be powerful incentives for students. They can influence students’ course taking patterns, assessments taken, and extracurricular choices. All such choices involve trade-off and opportunity costs. So what is the effect on students if a diploma seal is designed so that it confers no advantage to students beyond high school?

It may be instructive to consider the Golden State Seal Merit Diploma in this context. When originally authorized in the 1990's, Governor Wilson argued that this diploma would serve as recognition of outstanding achievement that would both shape teaching and inspire students. It was envisioned as California version of the New York's Regent's Diploma, conferring advantages in UC and CSU admission. The state created a series of assessments, called the Golden State Merit Examinations, which were taken by hundreds of thousands of students, who spent time and resources preparing to take the exams. These examinations were eliminated in 2009, and now the GSSMDs are awarded based on grades, SBAC scores, and, in some cases, local assessments.

According to the CDE, 100,000 students earn the GSSMD each year, taking the time to prepare for and take assessments. But the GSSMD appears to confer no advantage to students in terms of postsecondary education or employment.

Achievement thresholds. Forms of special recognition in high school, such as the honor roll, valedictorian awards, or an International Baccalaureate diploma, recognize outstanding achievement. Because the threshold for achieving this recognition is set high, it's widely understood that these forms of recognition represent outstanding achievement.

But if the bar is set too low – for example, recognizing that a student has taken a required course and received a passing grade – a diploma seal ceases to carry any significance. In addition, schools already provide recognition, in the form of grades or test scores, for proficiency in a given subject. ***The Committee may wish to consider*** the importance of using diploma seals to recognize outstanding achievement, particularly achievement not already recognized by schools in other ways.

Guiding questions for this Committee's review of diploma seal bills. Staff recommends that this Committee consider the following questions when evaluating any measure seeking to establish a diploma seal meet the following criteria:

- Does the diploma seal confer a benefit to the student through recognition by postsecondary institutions, employers, or other institutions outside of high school?
- Is the diploma seal designed so that all students have an opportunity to earn it?
- Does the diploma seal recognize excellence or outstanding achievement, not simply proficiency in a required or widely studied subject?
- Is eligibility for the diploma seal based primarily on achievement which is already recognized through grades or other standard measure of student achievement?

Golden State Seal Merit Diploma does not meet these criteria. As noted above, the Golden State Seal Merit Diploma 1) does not confer a benefit to students after high school, 2) may provide uneven opportunity for students to earn the award, since current criteria allow for locally determined measures of achievement, 3) does not appear to recognize excellence or outstanding achievement, as the grade threshold is a B or B+ in the required subjects (and an unknown threshold for locally determined assessments), and 4) does not involve criteria beyond those already used to recognize student achievement. In addition, the number of measures introduced in the Legislature on more limited areas of study (biliteracy, STEM, civic engagement, career technical education) indicates more interest in recognizing merit in specialized, rather than general, areas of study. As this program does not meet the criteria discussed above, ***staff***

recommends that the bill be amended to repeal Golden State Seal Merit Diploma, effective with the graduating class of 2022.

Proliferation of diploma seals. In recent years the state has established two state diploma seals, in biliteracy and civic engagement. Last year two measures proposed new diploma seals, in STEM and Career Technical Education. If this legislation is enacted (and perhaps even if it isn't), it is likely that this Committee will continue to see similar measures to establish Seals in other subject areas. ***The committee may wish to consider*** the policy implications of numerous options for students to earn Seals.

Related and prior legislation. AB 2265 (Oberholte) of the 2017-18 Session would have establishes the State Seal of STEM, to be affixed to high school diplomas of qualified students, which recognizes students who have attained a high level of proficiency in the subjects of science, technology, engineering, and mathematics. This bill was held in the Assembly Appropriations Committee.

AB 2979 (Burke) of the 2017-18 Session would establish a State Seal of Career Technical Education (CTE) Pathway Completion, to recognize high school graduates who have attained a high level of knowledge and proficiency in fields of study within one of the 15 industry sectors described in the California Career Technical Education Model Curriculum Standards. This bill died on the Senate Floor.

AB 2072 (Chang) of the 2015-16 Session, as it passed this Committee, would have established the State Seal of STEM, to be affixed to high school diplomas of qualified students, which recognizes students who have attained a high level of proficiency in the subjects of science, technology, engineering, and mathematics (STEM). This bill died in the Senate Appropriations Committee.

AB 2237 (Olsen) of the 2015-16 Session establishes the Science, Technology, Engineering, and Mathematics Partnership Academies program, for the purposes of providing grants to school districts to establish up to 100 partnership academies dedicated to training students in STEM occupations. This bill was held in the Assembly Appropriations Committee.

AB 2275 (Dababneh) of the 2015-16 Session would authorize a person who holds a single subject credential in business, industrial and technology education, mathematics or science to teach courses in computer science. This bill died in the Assembly Education Committee.

AB 2329 (Bonilla) Chapter 693, Statutes of 2016 established a computer science strategic implementation advisory board to develop a K-12 computer science strategic implementation plan.

AB 1258 (Chau) of the 2015-16 Session would have established a Computer Science Start-Up Courses Grant Pilot Program and a Computer Science Educator Training Grant Pilot program, for the purposes of providing grants to school districts to establish and maintain computer science courses and provide professional development for educators to teach computer science. This bill was held in Senate Appropriations Committee.

AB 252 (Holden) of the 2015-16 Session would have established a grant program to award funds to cover the costs associated with a high school establishing or expanding its advanced placement STEM curriculum. This bill was held in Senate Appropriations Committee.

AB 815 (Brownley), Chapter 618, Statutes of 2011, establishes the State Seal of Bilingualism to recognize high school graduates who what attained a high level of proficiency in speaking, reading, and writing in one or more languages in addition to English.

SB 253 (Wyland) of the 2009-10 Session would have authorized school districts and county offices of education to offer pupils a CTE certificate upon meeting specified requirements. This bill was held in the Assembly Appropriations Committee.

REGISTERED SUPPORT / OPPOSITION:

Support

California Faculty Association
California School Boards Association
Children Now

Opposition

None on file

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