Leveraging ESSA To Promote Science And STEM Education In States

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Science and STEM in ESSA

- The passage of the ESSA provides states the opportunity to craft new goals and strategies for science education.
- By setting clear goals for science achievement, states can leverage existing policies, including assessments and graduation requirements, to help drive toward those goals.

Science and STEM in ESSA

Achieve's brief examines:

- The current goals and approaches to science included in the ESSA plans submitted to the U.S. Department of Education by 16 states and the District of Columbia; and
- The broader science policy landscape around assessments and graduation requirements.

Accountability	Assessments	Graduation Requirements	ESSA-funded Programs or Initiatives

Takeaways

ESSA has given states the opportunity to review their current goals, policies, and initiatives around science and to elevate the importance of science in their states, both through accountability systems and through funding of programs and initiatives to provide better support to STEM.

Of the states that have submitted ESSA plans,

- more than half of states propose the **inclusion of science assessment results as part of their accountability system**; and
- many states have articulated a need to **increase student interest and engagement in STEM**, focus on **equity**, and provide opportunities to teachers for STEM professional learning.

State ESSA plans provide just one lens through which to evaluate how states have prioritized science education in their state. States have many opportunities to promote science in their states through policy decisions in graduation and assessment policy and through programming using other sources of state funding.

Science and Accountability in ESSA

Setting goals for science achievement

Michigan

- 75 percent of schools and 75 percent of student subgroups meet the 2016–17 statewide proficiency rates at the 75th percentile in science by the end of the 2024–25 school year.

Tennessee

- Rank in the top half of states on NAEP by 2019 and by 2024–25, achieve a 50 percent reduction in the number of students not meeting the on track or mastered level on the state's annual assessment.

States Proposing to Include Science in Their Accountability Systems Under ESSA

State	Indicator	Grades Included
Arizona	Academic Achievement	Grades 4, 8 and high school
Colorado	Academic Achievement	Grades 3-11
Connecticut	Academic Achievement	Grades 5, 8, and 10
Delaware*	Academic Achievement	Grades 5, 8, and 10
Louisiana	Academic Achievement	Grades 3–8 and high school end-of-course
Massachusetts	Academic Achievement	Grades 5, 8, and 10
Michigan**	Academic Achievement	Grades 4, 7, and 11
Nevada	Academic Achievement	Grades 8 and 10
Tennessee	Academic Achievement Goal	Grade band success rate in 3-5, 6-8, and high school
Vermont	School Quality or Student Success	Grades 4, 8, and 11

**Delaware's original submission included science as an Academic Achievement indicator, but the state's revised plan proposes moving science achievement to another indicator.*

***Michigan is also including science assessment results as part of the Academic Progress Indicator.*

Accountability Indicators Required by ESSA

ESSA requires that states include these five indicators in their accountability plans:

Academic achievement indicator

Measured by proficiency or student growth on annual assessments

Academic progress indicator

For elementary and middle schools only, measured by student growth or another valid and reliable academic indicator

Graduation rate indicator

For high schools only

English language proficiency indicator

Applies to any school with an EL subgroup that meets the State's minimum n-size in the grades for which it administers its statewide ELA and math assessments

School quality or student success indicator

Measured student or educator engagement, student access to advanced coursework, postsecondary readiness, school climate and safety, or any other indicator that meets the requirements

The K–12 Science Assessment Landscape in States

- Unlike English language arts and mathematics, science assessments do not have to be administered annually in grades 3–8.
- States must test once per grade band in science in grades 3–5 and 6–9.
- States must administer a science assessment once in high school in grades 10–12.
- Consequently, states have more leeway when they assess in science, especially in the early grades, in comparison to English language arts and mathematics.

Elementary School Science Assessment Tested Grades in 2016–17

In grades 3–8, 6 states test students more than once per grade band: Arkansas, Kentucky, Louisiana, Nebraska, South Carolina, and Utah.

Grade Tested	States
Grade 3	**5 states:** AR, KY, LA, NE, TN
Grade 4	**24 states:** AK, AZ, AR, HI, IN, KY, LA, MI, MT, NE, NH, NJ, NM, NY, ND, PA, RI, SC, TN, UT, VT, WV, WI, WY
Grade 5	**33 states and the District of Columbia:** AL, AR, CA, CO, CT, DE, DC, FL, GA, ID, IL, IA, KS, KY, LA, ME, MD, MA, MN, MS, MO, NE, NV, NC, OH, OK, OR, SC, SD, TN, TX, UT, VA, WA

Note: Total exceeds 50 because some states test in multiple grades.

Middle School Science Assessment Tested Grades in 2016–17

- Arkansas, Kentucky, Louisiana, and Nebraska test each year in grades 3–8 while South Carolina and Utah test grades 4–8.
- Arkansas also administers a science assessment in grade 9.

Grade Tested	States
Grade 6	**9 states:** AR, IN, KY, LA, NE, SC, TN, UT, WV
Grade 7	**11 states:** AL, AR, ID, KY, LA, MI, NE, NM, SC, TN, UT
Grade 8	**44 states and the District of Columbia:** AK, AZ, AR, CA, CO, CT, DE, DC, FL, GA, HI, IL, IA, KS, KY, LA, ME, MD, MA, MN, MS, MO, MT, NE, NV, NH, NJ, NY, NC, ND, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WI, WY
Grade 9	**3 states:** AR, WI, WY

Note: Total exceeds 50 because some states test in multiple grades.

High School Science Assessment Tested Grades in 2016–17

- In high school, **24 states** and the **District of Columbia** administer end-of-course assessments in science.
- The other half of states administer a comprehensive assessment either in grade 10 or 11, or sometimes in both grades.

Grade Tested	States
End-of-Course Assessments	**24 states and the District of Columbia:** DC, FL, GA, HI, ID, IL, IN, KY, LA, MD, MA, MN, MS, MO, NJ, NY, NC, OH, PA, SC, TN, TX, UT, VA, WA
Grade 10	**12 states:** AL, AK, AZ*, AR, CT, DE, MT, NV, OK, WV, WI, WY
Grade 11	**16 states:** AL, CO, IA, KS, ME, MI, NE, NH, NM, ND, OR, RI, SD, VT, WI, WY

California is currently piloting a new assessment and is doing selected testing in grades 10, 11, and 12. The assessment is expected to be operational in 2018–19.

*In Arizona, students take the science assessment in grade 10, but the assessment may be taken by grade 9 students who are enrolled in a life sciences course.

Note: Total exceeds 50 because some states test in multiple grades.

High School End-of-Couse Assessments by State and Content Area

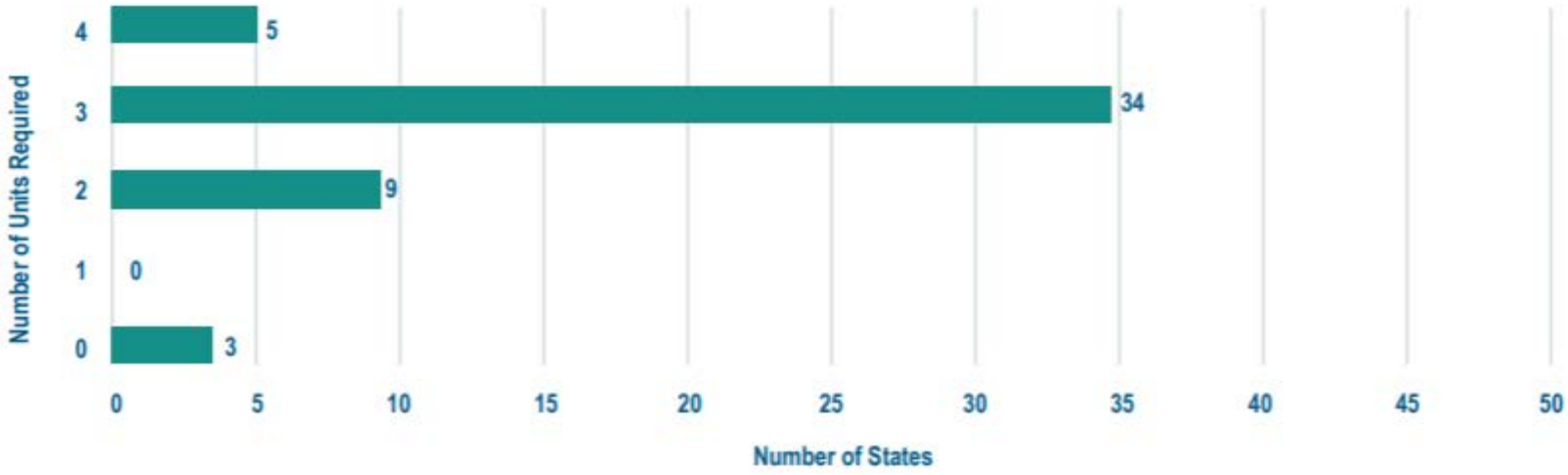
- Of the states administering an end-of-course exam, **16 states** and the **District of Columbia** are offering only one assessment in biology.
- Eight states offer multiple end-of-course exams. The most common end-of-course exam is biology, then chemistry.

End-of-Course Assessment Content Area	States
Biology	**23 states and the District of Columbia:** DC, FL, GA, HI, ID, IL, IN, KY, LA, MD, MA, MN*, MS, MO, NJ, NC, OH**, PA, SC, TN, TX, UT, VA, WA
Chemistry	**6 states:** ID, MA, NY, TN, UT, VA
Other	GA: Physical Science MA: Technology Engineering, Introductory Physics MO: Physical Science NY: Physical Setting Earth Science, Physical Setting/Physics, Living Environment UT: Earth Science, Physics VA: Earth Science

*Minnesota's end-of-instruction science assessment is in life science or biology.
**In Ohio, beginning with the class of 2018, the physical science EOC will be administered.

States' Science Graduation Requirements for the Class of 2017

- Nearly **two-thirds of states** require students to complete at least three units of science prior to graduation.
- **Four states** and the **District of Columbia** expect students to complete four units of science prior to graduation.
- **Nine states** require only two units of science prior to graduation.



States' Graduation Requirements and Course Specificity

- In terms of course specificity, states range from providing no guidance, to specifying some topics or concepts to be covered, to specifying courses.
  - Over half of states specify that students complete biology prior to graduation.
- Many states require students to complete, in addition to biology, either chemistry, physics, or a physical science.
  - Texas requires students to complete biology, chemistry, and physics, with flexibility in which course can fulfill the fourth science requirement.
  - Maryland requires "three credits; one in Biology; two that must include laboratory experience in any or all of the following areas: earth, life, environmental, or physical science."

States' STEM Diploma or Endorsement Options

- **Hawaii**, **New York**, and **Texas**, have STEM diploma or endorsement options that students can choose to complete.
  - Hawaii and Texas require students to complete four units of science rather than three units to earn the STEM option.
  - Ohio recently approved an Honors STEM diploma that requires five units of science.
- Other states are in the process of developing or implementing STEM diploma or endorsement options.

New ESSA-Funded Strategies and Programs

Using ESSA funds to advance STEM:

- Several provisions in ESSA allow — and even encourage — the use of federal funds to support STEM education.
- April 2017 U.S. Department of Education Guidance, *Resources for STEM Education*, is meant to "help SEAs, LEAs, and their partners better understand how to use Federal funds to support innovative, equity-focused STEM education strategies.
- Actual funding remains unknown until a budget is passed in fall 2017.

Title I Strategies and Programs

ESSA Provision	Purpose	How STEM fits in
Title I, Part A: Improving Basic Programs Operated by State and Local Educational Agencies	To provide all children significant opportunity to receive a fair, equitable, and high-quality education, and to close educational achievement gaps	**ESSA Provision** No explicit reference to STEM **USED Guidance** Schools operating a Title I schoolwide program may use these funds to: • acquire devices, including tablets and laptops; • support STEM coursework; and • expand learning time through before- and after-school programs and summer programs and opportunities
Title I, Part B: State Assessment Grants	To pay for the development of state assessments, standards, and to carry out assessment activities	**ESSA Provision** States can use these funds to update science assessments to include engineering design and practices **USED Guidance** No mention of this provision

Title II Strategies and Programs

ESSA Provision	Purpose	How STEM fits in
Title II, Part A: Supporting Effective Instruction	To (1) increase student achievement consistent with the challenging State academic standards; (2) improve the quality and effectiveness of teachers, principals, and other school leaders; (3) increase the number of teachers, principals, and other school leaders who are effective in improving student academic achievement in schools; and (4) provide low-income and minority students greater access to effective teachers, principals, and other school leaders	**ESSA Provision** States can award subgrants to districts to provide incentive pay to attract teachers in "high-need academic subject areas," provide increased teacher supports in various forms (e.g., hiring STEM coaches, partnering with non-profits), and recruit qualified individuals from other fields to become teachers **USED Guidance** Opportunity to support and recruit educators in STEM disciplines • Implement alternate routes to obtain teacher certification • Provide STEM teachers with professional learning and leadership support
Title II, Part B: National Activities	To research and support comprehensive performance-based compensation systems or human capital management systems for teachers or school leaders who raise student academic achievement and close the achievement gap between high- and low-performing students and to evaluate the effectiveness, fairness, quality, consistency, and reliability of those systems	**ESSA Provision** State grant to create and elevate a STEM Master Teacher Corps **USED Guidance** Can fund teacher recruitment in STEM fields through the Teacher and School Leader Incentive Program

Title III Strategies and Programs

ESSA Provision	Purpose	How STEM fits in
Title III, Part A: English Language Acquisition, Language Enhancement, and Academic Achievement Act	To help ensure that English learners attain English proficiency and can meet the same challenging State academic standards that all children are expected to meet; to support development and capacity to provide effective language instruction educational programs, and promote family and community participation in those programs	**ESSA Provision** No explicit reference to STEM **USED Guidance** • States may use these funds to upgrade programs to increase digital learning resources and materials in non-English languages to support achievement in STEM areas • States may use these funds to assist English learners in achieving at higher levels in science. Strategies can include science professional learning for educators, providing technical assistance to districts, or implementing or upgrading programs

Title IV Strategies and Programs

ESSA Provision	Purpose	How STEM fits in
Title IV, Part A: Student Support and Academic Enrichment Grants	To increase capacity of states and districts to 1) provide students with access to a well-rounded education, 2) improve school conditions for student learning, and 3) improve the use of technology to increase digital literacy of all students	**ESSA Provision** These funds may focus on increasing access and student engagement in STEM for underrepresented students. Allowable activities that promote STEM education include: • expanding high-quality STEM courses; • increasing access to STEM for underserved and at-risk student populations; • supporting the participation of students in STEM nonprofit competitions; • providing hands-on learning opportunities in STEM; • integrating other academic subjects, including the arts, into STEM subject programs; • creating or enhancing STEM specialty schools; integrating classroom-based and after-school and informal STEM instruction; and • integrating other subjects (including the arts) into STEM programs **USED Guidance** Reiterates allowable activities listed in the law, and adds that these funds can be used to: • provide professional development to educators on incorporating technology into effective STEM instruction through personalized learning or blended learning • build technological capacity and infrastructure by acquiring software and devices

Title IV Strategies and Programs

ESSA Provision	Purpose	How STEM fits in
Title IV, Part B: 21st Century Community Learning Centers	To provide opportunities for communities to establish or expand activities in community learning centers that provide academic enrichment, particularly by offering students who attend low-performing schools a broad array of additional services, programs, and activities; to offer families of students served by community learning centers opportunities for active and meaningful engagement in their children's education	**ESSA Provision** These funds can support the creation of programs promoting STEM skills and "nontraditional STEM teaching methods" **USED Guidance** Further clarifies that these nontraditional methods include "hands-on, active STEM-rich experiences"

Recommendations

State policies should signal the value of science education.

- States should find multiple ways to include science in their accountability plan.
- Assessments should be high-quality and aligned to state content standards.
- Graduation requirements should expose students to critical science content prior to graduation.
- States should use data and evidence to determine the most effective use of ESSA funding.