
4C

Action

Professional Services Committee

Specialized Single Subject Science Credentials and Alignment with the Next Generation Science Standards in California

Executive Summary: This agenda item presents the rationale for eliminating Specialized Science teaching credentials once the Next Generation Science Standards (NGSS) are implemented.

Policy Question: Does the proposed alignment of the single subject science credential content areas with the NGSS reflect the Commission's priorities and direction for the 2014-15 academic year?

Recommended Action: That the Commission take action to eliminate Specialized Science credentials once the transition to the NGSS is complete.

Presenters: Phyllis Jacobson, Administrator, and Katie Croy, Consultant, Professional Services Division

Strategic Plan Goal

II. Program Quality and Accountability

- ◆ Develop and maintain rigorous, meaningful, and relevant standards that drive program quality and effectiveness for the preparation of the education workforce and are responsive to the needs of California's diverse student population.

August 2014

Specialized Single Subject Science Credentials and Alignment with the Next Generation Science Standards in California

Introduction

This agenda item presents the rationale for eliminating the option to earn a Specialized Science teaching credential in June 2015 after the last administration of the CSET: Specialized Science examination and for eliminating the Specialized Science teaching credential itself in June 2020, five years after candidates who passed the examination by June 30, 2015 could use the scores towards the credential. This rationale is based on the need to streamline the current nine distinct Single Subject Science teaching credential content areas in alignment with the NGSS. The April 2014 Commission meeting included an overview of the Next Generation Science Standards for California (NGSS) with a focus on the implications for teacher preparation (<http://www.ctc.ca.gov/commission/agendas/2014-04/2014-04-4F.pdf>). Given the Commission's responsibility is to ensure alignment of the content of subject matter and of teacher preparation with the state-adopted K-12 content standards, the Commission needs to consider the steps needed to streamline the single subject science credentials for alignment with the NGSS.

Background

In 1997, the Commission developed four Single Subject discipline-specific science content area authorizations: *Biological Sciences*, *Chemistry*, *Geosciences*, and *Physics* to align with statutory requirements. These four full science content area authorizations are issued on Single Subject teaching credentials and allow the holder to teach coordinated science, introductory science, integrated science, general science, and classes in the specific science content area in Kindergarten through grade twelve.

In 2003, the Commission developed ***Specialized Science*** content area authorizations for Single Subject teaching credentials for these same four science disciplines with the intent of increasing the state's supply of science teachers at the high school level by attracting second career professionals with advanced degrees, coursework and/or knowledge in a specific science discipline. Individuals issued a credential in one of the four specialized science content areas have an authorization limited to teaching content within that specific science discipline only. Individuals with these specialized authorizations do not complete subject matter requirements related to general, introductory, or integrated science and are not authorized to teach an integrated science pathway course at the middle or high school level without earning an additional broad science content area authorization on their Single Subject teaching credential.

In 2009, the Commission developed an additional science content area authorization for Single Subject teaching credentials: Foundational-Level General Science (FLGS). The FLGS authorization was developed with the intent of increasing the potential supply of science teachers at the

middle school level. The holder of a Single Subject teaching credential in FLGS is authorized to teach integrated science in Kindergarten through grade 8. Holders of a FLGS credential are also authorized to teach introductory and general science courses to students through grade 12. Individuals holding a FLGS authorization are not authorized to teach an integrated science pathway course at the high school level without earning an additional science content area authorization on their Single Subject teaching credential.

Information in the April 2014 Commission agenda item referenced above addressed the current multiple and single subject science credential content and how the adoption of the NGSS will impact science education in California. The focus of the NGSS represents a shift in standards-based reform within education with rigorous expectations that K-12 students will be able to apply science concepts across curricular areas. This shift in focus will require candidates to be prepared to teach cross-cutting science concepts *across* science disciplines as compared to *within* a single science discipline, and will also impact the authorizations related to single subject science credentials. A further explanation of the NGSS is provided below.

Next Generation Science Standards

The NGSS focus on a deeper conceptual understanding of science as well as application of the content rather than an emphasis on the knowledge of discrete science facts. The NGSS for California also emphasize:

- learning progressions that develop from kindergarten through grade twelve;
- integration of skills and practices across content areas as the foundation of STEM (Science, Technology, Engineering, and Mathematics) education; and
- integration of both science and engineering practices within the content.

The NGSS describe in detail the key scientific ideas and practices that all students should learn prior to their graduation from high school, along with student performance expectations. The NGSS, however, do not provide or prescribe a specific instructional curriculum.

The State Board of Education (SBE) adopted the *Next Generation Science Standards for California Public Schools, Kindergarten through Grade Twelve and Appendices A - M* on September 2, 2013. In November 2013, the SBE adopted an integrated middle school learning progression for grades 6 through 8 as the preferred model for California. Education Code section 60200.9 requires the SBE to consider the adoption of a revised curriculum framework and evaluation criteria for new instructional materials in science on or before January 31, 2016. Curriculum frameworks in California offer guidance to the local level for implementing the associated content standards and include selected research-based approaches for implementing instruction for all students.

The adopted standards and appendices are available on the California Department of Education website as noted in the References within Appendix A. An abbreviated implementation timeline for the NGSS in California public schools is provided in Appendix B.

Current Single Subject Teaching Credentials Issued in Science Content Areas

This section of the agenda item provides information about the number and type of Single Subject Science credentials recently issued by the Commission. During 2012-2013, a total of 7,825 Single Subject teaching credential content area authorizations were initially issued. Of these, a total of 1,575 (20%) were issued across the nine science content area authorizations, as shown in Table 1 below.

Table 1: Single Subject Teaching Credentials Issued by Science Content Area, 2012-2013

Single Subject Teaching Credential Science Content Areas	Number of Science Content Areas Issued*	Percentage of Total Science Content Areas Issued
Foundational-Level General Science (FLGS)	302	19.17%
Science: Biological Sciences	631	40.06%
Science: Chemistry	258	16.38%
Science: Earth/Geosciences	122	7.75%
Science: Physics	129	8.19%
Biological Sciences (Specialized)	65	4.13%
Chemistry (Specialized)	27	1.71%
Earth/Geosciences (Specialized)	13	0.83%
Physics (Specialized)	28	1.78%
Science Totals	1,575	100%

**Preliminary Single Subject Teaching Credentials as first-time or new-type documents only*

These data show that in 2012-13, 72% of individuals issued a Preliminary Single Subject teaching credential with a science content area authorization earned one of the four full science content areas that include an authorization for teaching introductory, general and integrated science in grades K-12. An additional 19% earned the content area credential that authorizes Integrated Science through grade 8. Approximately 8% of candidates earned one of the four Specialized Science content areas credentials that do not authorize teaching general, introductory or integrated science at any grade level. A summary of this data is provided in Figure A.

Figure A: Single Subject Teaching Credentials by Science Authorization Type, 2012–13

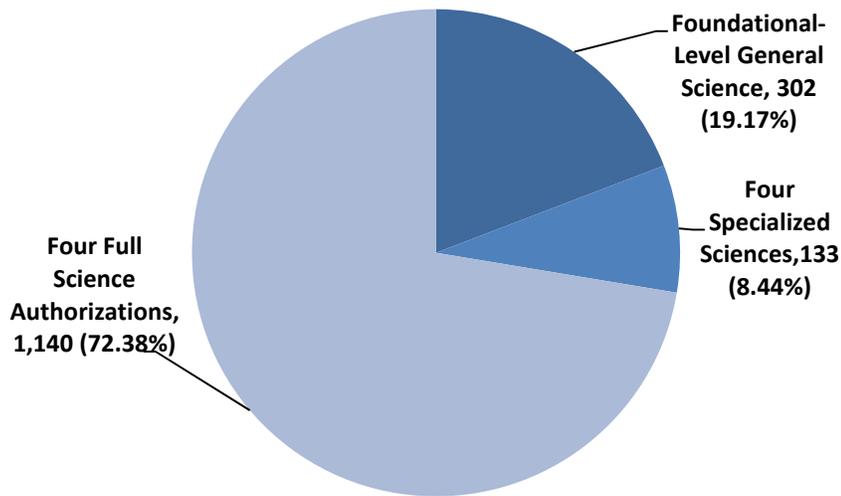


Table 2 provides information on the current alignment between the most common science course content offered in Kindergarten through grade twelve in California public schools and the Commission’s current Single Subject science content area authorization structure. The table is formatted to address first all discipline specific science courses in the first four columns, with introductory level courses in broader science categories addressed in the last four columns. The middle column provides information on those science content area credentials that are authorized to teach integrated science courses at the grade levels indicated.

Table 2: Current Alignment between K-12 Course Content and Science Authorizations

Science Content Area Authorization	All Courses*				Integrated Science	Only Introductory		
	Biological Science	Chemistry	Physics	Earth/ Geosciences		General Science	Life Science	Physical Science
Foundational-Level General Science					K-8	X	X	X
Science: Biological Sciences	X				K-12	X	X	X
Science: Chemistry		X			K-12	X	X	X
Science: Physics			X		K-12	X	X	X
Science: Geosciences				X	K-12	X	X	X
Biological Sciences (Specialized)	X							
Chemistry (Specialized)		X						
Physics (Specialized)			X					
Geosciences (Specialized)				X				

*grades preschool, K - 12, and adults

Proposed Change and Rationale

The four ***Specialized Science*** content area authorizations developed by the Commission in 2003 represent the smallest percentage of new science teachers (8% in 2012-13) and do not authorize teaching the integrated science courses adopted by the SBE as the preferred model for grades 6 through 8 science instruction as aligned to the NGSS. Staff proposes that these four ***Specialized Science*** content areas be discontinued as an option for future science teacher candidates when the Science subject matter requirements are updated to align with the NGSS. Having nine science content area authorizations available for single subject teaching credentials is excessive, particularly with respect to the NGSS, and confusing for future science teacher candidates and employers.

Further, the Teacher Preparation Advisory (TAP) Panel recommended simplifying the structure of the Single Subject teaching credentials in science content areas by reducing the number of Single Subject teaching credentials in science as noted in the References within Appendix A. The TAP Panel considered the preparation and authorization for each single subject science credential as well as data on the number of each type issued. Education Code section 44257.2(c) mandates that the Commission issue Single Subject teaching credentials in science in the four specific disciplines of biological science, chemistry, physics and geosciences. These four full science authorizations represented over 72% of the science content areas issued in 2012-13 and include the broadest preparation and authorization for science teachers.

The TAP Panel also recommended that the Commission continue to issue the Foundational-Level General Science credential as it represents more than 19% of the science content areas issued in 2012-2013 and fills a staffing need at the middle school level. The preparation and authorization for this credential provide a better alignment with the NGSS for California as the authorization includes teaching integrated science through grade 8.

Implementation of Next Generation Science Standards (NGSS) within Teacher Preparation

The major work to be done to implement the NGSS standards encompasses:

- revising the Commission's adopted standards (i.e., subject matter standards, teacher preparation program standards, teaching performance expectations);
- assisting subject matter preparation programs, teacher preparation programs, and Induction programs to transition to these new standards;
- assisting other preparation programs such as Administrative Services Credential preparation programs to prepare candidates to understand the implications of these standards for classroom instruction; and
- implementing the revised CSET examinations for candidates for Multiple Subject credentials and Single Subject Science credentials.

The work to revise the CSET Subject Matter Requirements includes Multiple Subject Science and the five Single Subject Science content areas (Biology/Life Science, Chemistry, Earth and Planetary Science, Physics, and Foundational Level General Science). The work to revise the corresponding program standards could also be accomplished at the same time.

A Budget Change Proposal would be needed in order for the Commission to have the spending authority to use funds from the Test Development Administration Account (TDAA) for this purpose. Staff requests approval from the Commission to prepare and submit a Budget Change Proposal in order to accomplish this work.

The table included in Appendix C provides further details about the implementation process and work to be accomplished. If the Budget Change Proposal were submitted and approved, this work would begin in the 2015-16 budget year.

Staff Recommendation

Staff recommends that the Commission:

1. discontinue the specialized science CSET examinations in Biological Sciences, Chemistry, Geosciences, and Physics, beginning after the June 2015 administration of the CSET;
2. set June 2020 as the final date when an individual can earn a Specialized Science Credential, the last date when candidates currently in process for the credential could qualify for this credential; and
3. direct staff to work with the administration to develop a funding strategy to modify the subject matter requirements, examinations and program standards to address NGSS.

Staff notes that candidates who already hold these authorizations would continue to retain valid specialized science authorizations for as long as their credentials are valid; candidates who have passed the specialized science subject matter examinations prior to June 30, 2015 would have five years from the date of the examination to use the score towards the applicable California specialized science credential; and that the credential holder will also have the option of verifying competency in additional science areas to earn the broader science authorization.

Next Steps

Based upon Commission action and direction, staff will continue the work to address the Next Generation Science Standards in the Commission's subject matter requirements, examinations, and program standards. Additional agenda items will be brought to the Commission as the work progresses.

Appendix A References

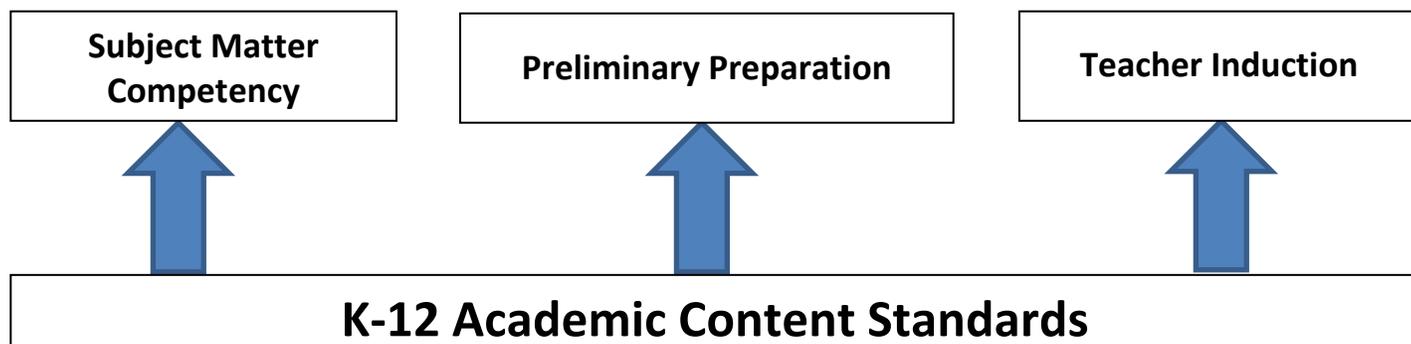
1. *Next Generation Science Standards for California Public Schools, Kindergarten through Grade 12*: <http://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp>
2. *Next Generation Science Standards: Appendices A-M* adopted to assist teachers in the implementation of NGSS and in the development of the new science curriculum framework: <http://www.nextgenscience.org/next-generation-science-standards>
3. National Research Council (NRC) National Science Framework (2012) – *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*: http://www.nap.edu/catalog.php?record_id=13165#
4. California Department of Education Next Generation Science Standards - Frequently Asked Questions: <http://www.cde.ca.gov/pd/ca/sc/ngssfaq.asp>
5. Teacher Preparation Advisory (TAP) Panel Recommendations: <http://www.ctc.ca.gov/commission/agendas/2013-06/2013-06-4D.pdf>

Appendix B
NGSS Implementation Timeline for California’s Public Schools

2013	
September	California’s State Board of Education (SBE) adopts the Next Generation Science Standards (NGSS) for California Public Schools, Kindergarten through Grade 12
November	SBE approves a middle school learning progression that specified integrated science content with cross-cutting concepts as California’s preferred model as well as authorized the development of an alternative discipline specific model by the State Superintendent of Public Instruction’s Science Expert Panel
2014	
January	SBE approves Instructional Quality Commission (IQC) schedule of significant events for 2016 revision of the Science Framework for California public schools
2015	
May	IQC approves draft Science Framework for initial 60-day public review period
Fall	NGSS Transition Phase begins for LEA’s and concentrates on building foundational resources, implementing needs assessments, establishing new professional learning opportunities, and expanding collaborations between all stakeholders
2016	
January	SBE action on IQC’s recommended Science Framework includes public hearing with a statutory deadline of January 31, 2016 per SB 300
2016/2017	NGSS Implementation Phase expands new professional learning support, fully aligns curriculum, instruction, and assessments, and effectively integrates these elements across the field
2017/2018	
2017/2018	Instructional Materials Adoption

Appendix C Overview of Teacher Preparation Work Relating to the Alignment with Next Generation Science Standards (NGSS)

I. Role of Student Content Standards in Teacher Preparation



II. 3 Major Phases of Teacher Preparation Require NGSS Alignment

Phase I	Developing subject matter competency – Commission-approved programs and CSET exams
Phase II	Review and revise Teaching Performance Expectation 1/Pedagogy Standard 8
Phase III	Job-embedded induction for novice teachers to refine and further develop subject specific pedagogical skills

III. 2 Teaching Credentials and 6 Content Areas Require NGSS Alignment

Multiple Subject	General Subjects (<i>subject matter by examination only</i>)
Single Subject	Foundational-Level General Science - <i>subject matter by exam or program</i>
Single Subject	Science: Biology/Life Science - <i>subject matter by exam or program</i>
Single Subject	Science: Chemistry - <i>subject matter by exam or program</i>
Single Subject	Science: Earth and Planetary Science - <i>subject matter by exam or program</i>
Single Subject	Science: Physics - <i>subject matter by exam or program</i>

IV. SMRs and Standards Revision Process

Three typical activities in the exams development process:

- Defining the content for the exam.** In the case of NGSS, there are already sets of Subject Matter Requirements in Science that will form the basis for NGSS-related revisions (1 year activity). This work is done with a panel of California subject matter experts and is validated through a field review. The final revised content is adopted by the Commission.

1a. *Parallel activity: Revising subject matter program standards to align with the updated content* (1 year activity). This work is done with the same panel of California

subject matter experts and is validated through a field review. The final revised standards are adopted by the Commission.

1b. *Parallel activity: Revising Teaching Performance Expectation 1 and Preparation Program Standard 8 (pedagogy)*. This work is done with a panel of California content pedagogy experts and is validated through a field review. The final revised TPE 1 and Preparation Program Standard 8 are adopted by the Commission.

2. **Developing test items.** In the case of NGSS, there is already item banks for each of the science areas that will form the basis for looking at each item, determining if it is still congruent with NGSS, making revisions to existing items, and developing new items as necessary (1 year activity). This work is done with a panel of California subject matter experts and is reviewed with the Commission's standing Bias Review Committee.
3. **Setting passing score standards.** In the case of NGSS, once the exams are revised, there will need to be a passing standard study. A separate Standard Setting panel of content experts assists with this activity. This will be done after the first administration of the revised examinations and a recommendation will be provided to the Commission for action (2-4 months after initial examination administration).

V. Transition to New Standards

- a. Commission adoption of transition timeline for preparation programs and subject matter programs
- b. Transition of Commission-approved subject matter programs to revised SMRs and of Commission-approved teacher preparation programs to revised TPE 1 and Preparation Program Standard 8
- c. Teaching Performance Assessments will need to include NGSS (Multiple subject and Single Subject Science content areas)