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## Information

### *Professional Services Committee*

### **Proposed Preconditions for Foundational Science Subject-Matter Programs**

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**Executive Summary:** Draft preconditions for Foundational Science Subject-Matter programs were provided to the Commission at its March 2010 meeting. The Commission requested additional information be gathered from the field on the draft preconditions. This agenda item presents the additional information regarding the Preconditions for Foundational Science Subject-Matter Programs as requested.

**Recommended Action:** For information only

**Presenter:** Helen Hawley, Consultant, and Teri Clark, Acting Director, Professional Services Division

**Strategic Plan Goal: 1**

**Promote educational excellence through the preparation and certification of professional educators**

- ◆ Sustain high quality standards for the preparation and performance of professional educators and for the accreditation of credential programs

December 2010



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# Proposed Preconditions for Foundational Science Subject-Matter Programs

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## Introduction

The Commission approved new standards for Foundational-Level General Science (FLGS) Subject-Matter programs in August 2008. Regulations for the Single Subject Foundational Science Credential were finalized in April 2009. In March 2010, Commission staff presented an agenda item with proposed preconditions for Foundational-Level General Science Subject-Matter programs (<http://www.ctc.ca.gov/commission/agendas/2010-03/2010-03-2C.pdf>). At the March 2010 meeting, the Commission directed staff to conduct a survey to further inform the development of the preconditions. This agenda item provides the results of the field survey and presents the proposed preconditions for further discussion.

## Background

A Commission-approved subject-matter preparation program is defined by the appropriate adopted program standards and Preconditions (<http://www.ctc.ca.gov/educator-prep/STDS-subject-matter.html>). The content (depth and breadth) of the subject-matter preparation program is defined by the adopted standards which address issues of quality of the preparation program. The Preconditions for subject-matter programs address the required number of units in the approved program and set the breadth, depth and concentrations of the subject-matter content areas which must be included in the program. Provided below is the statement from the subject-matter handbooks regarding Preconditions:

A precondition is a requirement for initial and continued program approval. Unlike standards, preconditions specify requirements for program compliance, not program quality. The Commission determines whether a program complies with the adopted preconditions on the basis of a program document provided by the college or university. In the program review sequence, a program that meets all preconditions is eligible for a more intensive review to determine if the program's quality satisfies the Commission's standards.

While the number of required units set by the Preconditions varies slightly across the content areas of the subject-matter preparation programs, the Commission has required a minimum of 45 semester units in the specified subject for all thirteen content areas. The Preconditions for Science in Biology, Chemistry, Geoscience, and Physics read as follows:

*To be approved by the Commission, a Subject Matter Program in Science must comply with the following preconditions.*

- (1) Each Program of Subject Matter Preparation for the Single Subject Teaching Credential in Science shall include (a) a minimum of 24 semester units (or 36 quarter units) of core coursework in science subjects and related subjects that are commonly taught in departmentalized classes in California public schools, and (b) a minimum of 18 semester units (or 27 quarter units) of coursework that provides extended study of the subject, and (c) 3 semester units (or 5 quarter units) in the subject. These requirements are elaborated in Preconditions 2 and 3.*
- (2) The core of the program (Breadth of Study) shall include coursework in (or directly related to) biological sciences, chemistry, geosciences and physics as commonly taught in departmentalized science classes in California public schools.*
- (3) Extended studies in the program (Depth of Study) shall include at least one concentration of the four science areas. Each concentration shall comprise at least 18 semester units or 27 quarter units. In addition the program shall include at least 3 semester units (5 quarter units) of additional extended study, either designated as breadth or depth studies at the discretion of the institution.*

#### **Foundational-Level General Science Credential Authorization**

The holder of a credential authorization in FLGS is authorized to teach:

- 1) Introductory and general science, introductory life science, and introductory physical science in grades preschool, kindergarten through twelve, and in classes organized primarily for adults; and
- 2) Integrated science in grades preschool and kindergarten through eight. (Title 5 Section 80004).

These teaching assignments are generally used in elementary and middle schools. As with other single subject credentials, an individual may meet the subject-matter requirement for FLGS by taking coursework or passing a subject-matter examination (CSET). For this credential an individual must pass the two General Science subtests but not the specific science subtest (biology, chemistry, geoscience, or physics) of the CSET required for the full science teaching credential.

#### **Proposed Foundational-Level General Science Preconditions**

A narrower scope of content knowledge is assessed by the CSET examination for purposes of establishing FLGS subject-matter competency than would be assessed for a full Single Subject Science credential. Given the reduced scope of required subject-matter competency for this credential, the Commission might consider also requiring fewer course units for FLGS programs than the 45 semester units required of full Science subject-matter programs. NCLB's requirement of 32 semester units might be an appropriate consideration in determining the number of units to require for FLGS. The chart below shows the comparison of the adopted Preconditions for Science to possible Preconditions for FLGS.

<b>Required Units*</b>	<b>Adopted Preconditions for Science (Biology, Chemistry, Geosciences or Physics)</b>	<b>Possible Preconditions for Foundational-Level General Science</b>
Total	45	32
Core Science	24	32
Extended Study in the Program	18	NA
Additional Extended Study	3	NA

\*semester units

A 32 semester unit program for FLGS would have fewer than the number of units required for a full Single Subject Science credential, would reflect the scope of the CSET examination content, and would be consistent with subject-matter competence requirements as defined by the No Child Left Behind Act (NCLB). The FLGS subject-matter programs would be expected to include at least two courses for each of the four sciences as defined by the general science subject-matter requirements. In addition, a FLGS subject-matter program is an approved program of coursework requiring a recommendation from the program sponsor, and the subject-matter requirements specify the scope of content for each of the four science areas which must be included in the program

When the topic of Preconditions for the FLGS credential was discussed at the March 2010 Commission meeting, questions were raised about supplementary authorizations and subject-matter authorizations (SMA). A supplementary authorization requires the completion of 20 semester or 10 upper division semester units, or equivalent quarter units, of coursework in the subject requested. A supplementary authorization may only be added to a valid basic general education teaching credential and does not meet the requirements of NCLB. The Commission also offers a SMA in Introductory Science. The SMA in Introductory Science provides a similar authorization to the FLGS authorization in that it is limited by grade level, includes the same science areas, and meets the requirements of NCLB. However, the SMA cannot be earned as an initial teaching credential but can only be added to a valid basic general education teaching credential. The SMA cannot be added by an examination.

### **Field Survey for Foundational-Level General Science**

Following Commission direction, staff conducted a field survey to ascertain the level of preparation that science educators deem appropriate for teaching FLGS. An electronic survey was posted on the Commission's web site. In addition information about the survey was also included in the Professional Services Division (PSD) E-News and through direct email to science educators who have worked with the Commission. The survey was available for respondents from October to November 2010. The survey elicited 47 total responses including fully completed surveys from 41 respondents. The majority of respondents were higher education faculty (75.6%), evenly split between science and education, and most of those (62.2%) were affiliated with the CSU system. The results of the survey are as follows:

**Table 1. Field Survey Questions**

Questions	Responses	Response Count
The Foundational Level General Science Credential should require the same general science requirements as the full science credential (27 semester units).	Yes 51.2%	21
	No 48.8%	20
The Foundational Level General Science Credential should require 32 semester units of foundational science coursework to ensure that the teachers are NCLB compliant.	Yes 63.4%	26
	No 36.6%	15
The Foundational Level General Science Credential should require 45 semester units of foundational science coursework.	Yes 26.8%	11
	No 73.2%	30

**Table 2. Field Survey Demographics**

Questions	Responses	Response Count
Please select the one that best describes your role in science education.	Science teacher 20.0%	9
	Faculty in science 37.8%	17
	Faculty in education 37.8%	17
	Other 4.0%	2
In science education, which segment of the education community do you work in?	CSU 62.2%	28
	Private/Independent 17.8%	8
	UC 4.4%	2
	School District 24.4%	11
	County Office 0.0%	0
	Other 2.2%	1
Please provide any additional information related to the teaching of foundational science that you think might be helpful in addressing this issue.	Provided in Appendix A.	

The survey data showed the strongest response in favor (63.4/36.6%) of 32 semester units of science coursework. There was also significant support for 27 units of general science (51.2/48.8%), but some of the comments suggest that this question may have been misunderstood as an option for the total units rather than as it was intended—the scope of content for general science consistent with the full science credential (see Appendix A). Other comments indicated that while some respondents believed that 32 units were not enough, others thought that it was too much. In addition, many comments focused on pedagogical concerns rather than science content.

Given the information obtained from the field survey data, staff proposes the following Preconditions for Subject-Matter programs in Foundational-Level General Science:

*To be approved by the Commission, a Subject Matter Program in Foundational-Level General Science must comply with the following preconditions.*

- (1) *Each Program of Subject Matter Preparation for the Single Subject Teaching Credential in Foundational-Level General Science shall include (a) a minimum of 32 semester units (or 48 quarter units) of coursework in science as commonly taught in departmentalized science classes in California public schools through grade 9.*
- (2) *The program of study shall include at least 8 semester units (12 quarter units) as defined by the General Science Subject Matter Requirements in each of four science areas: biology, chemistry, geosciences, and physics.*

### **Next Steps**

The proposed preconditions will return to the Commission at the January 2011 meeting for consideration and possible adoption. Once the Commission adopts Preconditions for the Foundational-Level General Science subject-matter program, staff will begin implementation of the Commission's action. This will include issuance of a Program Sponsor Alert (PSA) and revision of all relevant web-based standards documents.

Program sponsors would be allowed to apply for approval of Foundational-Level General Science subject-matter programs. Programs that are currently approved to offer the full science subject-matter programs for biology, chemistry, geosciences and physics would be allowed to recommend candidates for the FLGS credential immediately through written statement to the Commission that the program intends to use its approved general science coursework as an approved FLGS subject-matter program.

## **Appendix A**

### **Foundational Science—Required Units Survey Comments**

**Question 1: The Foundational Science Credential should require the same general science course requirements as the full science credential (27 semester units).**

High school teachers usually do not teach across the full range of science disciplines. Therefore, they do not need as much background outside their particular subject-matter.

Yes, but these courses are insufficient by themselves.

This would seem to not require labs, or at least, not many. Especially for middle school science, Lab experience is essential in all of the disciplines.

The science major goes on to take 21 more science units; this will improve their understanding of the basic science. If only 27 semester units are required, we are sending non-science majors to teach science courses with the bare minimum of courses (essentially two in each discipline).

I think teachers should have good content background. I am not sure what is the basis for any of these numbers? Why have we not studied this more empirically? Is there any basis for any of these numbers?

This seems like a nice minimal level to start from - additional unit are usually taken by teachers after they are in the classroom to meet the needs of the school or just pay scale advancement.

Some people have learned much science without taking college-level courses. Keep the requirement at the level of passing CSET tests 118 and 119.

**Question 2: The Foundational Science Credential should require 32 semester units of foundational science coursework to ensure that the teachers are NCLB compliant.**

1 year in each science discipline= 4 units/course\* 2 semesters/year\* 4 disciplines = 32.

I'm not happy about this number, but I realize 45 semester isn't realistic because 45 units amounts to getting a second major. The 32 units will require that to be qualified requires that you take a course or two beyond the bare minimum in at least some area of science. If these courses had to do with building PCK in science that would be outstanding.

This is normally the amount of credits needed for an undergraduate degree in a subject area.

Schools need to be compliant to receive \$\$\$.

I don't know what NCLB stands for.

Junior high science content focuses on basic general science concepts and not an in-depth study. They are designed as survey courses. But the teacher should have a deeper understanding of how all areas work together which can be better appreciated with more advanced science courses.

This may be too much to ask if the students are also taking science methods courses that would enhance their application of the knowledge in the content areas and ask them to understand that content within the CONTEXT of actually teaching it.

This is excessive.

**Question 3: The Foundational Science Credential should require 45 semester units of foundational science coursework.**

Part of the courses (and I would recommend more than 1/2) need to focus on themes (such as water) or cross subject concepts such as energy or change.

While more is often better, I believe 32 sufficient given all the other requirements of the credential.

Actually, I think 40 would be sufficient - the 32 representing one full year of introductory science in each of the 4 areas plus at least one science, technology, and society course, and one integrated science research/seminar course.

These units cannot be incorporated in a current Bachelor's program.

I would feel more comfortable if we required 45 units with some of the courses dealing directly with PCK. I realize this isn't practical.

The more science content classes, the better equipped the teachers will be to teach Grades 6-12.

Then what is the need for this credential if they have the coursework to qualify for the full single subject credential.

The general science portion of the full credential provides the breath of content necessary to teach any science at a foundational level. However, there were additional concepts required in the specialty areas that would still be considered as part of the breath category. In other words the general course requirements do not contain ALL the general science content necessary to teach general science.

Some teacher mentoring and more practice in TEACHING the content will be more beneficial to these students.

The establishment of the Foundational Science credential, if at a credit level below the other credentials which require a concentration and additional coursework, will only serve to further perpetuate the problems of science illiteracy among students. It creates a "lesser" pathway which will allow less able science credential seekers to become credentialed without having to sit for the CSET and obtain a passing score. Keep the # of credits at the same level as the other credentials in order to keep the rigor of the preparation in our classrooms for those who choose not to take CSET.

