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## Information

### *Professional Services Committee*

#### **Discussion of Preconditions for Foundational Mathematics and Foundational Science Single Subject Matter Programs**

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**Executive Summary:** This agenda item presents information related to Preconditions for Foundational Mathematics and Foundational Science Single Subject Matter Programs for Commission discussion.

**Recommended Action:** For information only

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**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

March 2010



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# Discussion of Preconditions for Foundational Mathematics and Foundational Science Single Subject Matter Programs

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## Introduction

Preconditions for Foundational Mathematics Subject Matter Programs were adopted in 2003 and are consistent with the preconditions for other single subject matter programs by requiring 45 semester units of required coursework in the specified content area. Further, the Commission approved new standards for Foundational-Level General Science Subject Matter Programs in August 2008. Regulations for the Foundational Science Credential were finalized in April 2009 but preconditions have not yet been adopted. This agenda item describes the purpose of Preconditions and provides information related to Preconditions for Foundational Mathematics and Foundational-Level General Science Single Subject Matter Programs for Commission consideration.

## Background

Two subject areas that have experienced perpetual teacher shortages are mathematics and science. The Commission over time has repeatedly sought effective and innovative ways to credential teachers who possess appropriate content and pedagogical knowledge in these subjects. Two examples of this are the Single Subject Foundational Mathematics Credential and the Foundational-Level General Science Credential. The rationale for both of these credentials was to create a more focused pathway of subject matter preparation for the fundamental levels of secondary instruction in mathematics and science.

For most of the Commission's teaching credentials, an individual may satisfy the subject matter requirement through the passage of the appropriate Commission-approved subject matter examination, currently the California Subject Examinations for Teachers (CSET), or by completing Commission-approved subject matter preparation program. Due to the requirements of the federal No Child Left Behind law, all prospective multiple subject teachers must take and pass the CSET-MS.

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 specific 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. Preconditions are requirements, either legal requirements or those set by Commission policy, such as the minimum or maximum number of units in a program. The Preconditions for subject matter programs address the required number of units in the approved program and the breadth, depth and concentrations in the subject matter content areas for the program. Provided below is the statement from the Single 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.

In the August 2009 Commission agenda item (<http://www.ctc.ca.gov/commission/agendas/2009-08/2009-08-2C.pdf>), Preconditions for single subject matter programs were described. While the Preconditions related to the number of required units vary 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. A sample set of Preconditions—from the Mathematics subject matter standards—is presented as Appendix A. For comparison purposes, the unit requirement for a major as defined by the No Child Left Behind law (NCLB) is 32 semester units.

### **Preconditions for Foundational Mathematics Subject Matter Programs**

The Single Subject Teaching Credential in Foundational Mathematics authorizes the holder to teach the content taught to the vast majority of California's K-12 public school math students: general mathematics, algebra, geometry, probability and statistics, and consumer mathematics. Instruction is permitted in grades twelve and below, including preschool, and in classes organized primarily for adults. The teaching of Advanced Placement courses is not authorized by this credential. The Foundational Mathematics credential can be a pathway toward earning a Single Subject Mathematics authorization at a later time by meeting additional subject matter course requirements.

Subject matter competence for the Foundational Mathematics Credential can be demonstrated through one of two ways. The first is by passing the first two subtests of the CSET Mathematics examination. Over the last 5 years since the inception of the examination, 9,568 individuals have taken the foundational mathematics examination with a 45% pass rate. The second way is by completing a Commission approved program.

The Preconditions for Single Subject Credential programs in Foundational Mathematics currently require 45 units in mathematics, the same as the full single subject mathematics program (Appendix B). The primary difference between the two programs is that the Foundational Mathematics Program may include 15 units of mathematics-based or affiliated courses, such as engineering, physics and computer science as extended studies rather than the 15 units of extended study of mathematics required for the Mathematics subject matter program. However, 30 units of mathematics courses are still required. The courses appropriate for the Foundational Mathematics would usually be lower division mathematics courses.

To date, no individuals have been able to complete a program of coursework for the Foundational Mathematics Credential because none have been approved by the Commission. Since Foundational Mathematics programs were instituted by the Commission in 2003, only two sponsors have submitted applications for an approved Foundational Mathematics program even though 33 programs have been approved for the Single Subject Mathematics Credential. Neither of the two prospective Foundational Mathematics programs submitted could be approved

because the number of units of mathematics courses required by the Preconditions exceed the introductory courses (lower division mathematics) available at the universities. Program sponsors for mathematics have indicated that they are unable to offer 30 semester units of appropriate mathematics courses without redundancy or including higher level mathematics courses.

At the time that the Commission approved the establishment of a Foundational Mathematics Single Subject credential, it did so to provide additional pathways to teaching in a subject area that was, and continues to be, in critical need of qualified teachers. If the Commission intends to provide two routes for individuals to demonstrate subject matter competency for the Foundational Mathematics subject matter requirement it seems that the number of required units for the program option should be reconsidered. The Foundational Mathematics credential limits the content an individual may teach as is described on page 2. In the examination route for demonstrating subject matter competence an individual must pass three subtests to meet the full Mathematics subject matter requirement while only two subtests are required to be passed for the Foundational Mathematics authorization. It may not be appropriate to require Foundational Mathematics subject matter programs to contain the same number of units as the full Mathematics subject matter programs. The federal NCLB Act identifies 32 semester units as one measure of a qualified teacher. Programs with fewer than 32 semester units would not satisfy the NCLB requirement. Therefore, staff has developed the possible revised units as shown in the table below.

Required Units*	Adopted		Possible
	Mathematics	Foundational Mathematics	Foundational Mathematics
Total	45	45	32
Core Mathematics	30	30	20
Extended Study of Mathematics or Affiliated Courses	15	15	12

\*semester units

A 32 semester unit program with a minimum of 20 units in mathematics and 12 units in affiliated courses is fewer than the number of units required for a full Mathematics Single Subject credential, and may or may not be sufficient to meet a university's definition of a college degree in the subject, but would reflect the foundational nature of the credential and would be consistent with subject matter competence requirements as defined for NCLB.

Currently there is a 32 unit coursework option available for currently credentialed teachers called a Subject Matter Authorization (SMA). The SMA in Mathematics provides a very similar authorization as the Foundational Mathematics authorization; however, the SMA cannot be earned as an initial teaching credential. In addition, a Foundational Mathematics subject matter program would be an approved program with a recommendation from the program sponsor rather than courses in algebra, advanced algebra, geometry, probability or statistics, and the real number system as is the case with the SMA.

**Preconditions for Foundational-Level General Science Subject Matter Programs**

In February 2009 the regulations were finalized for the Single Subject Foundational-Level General Science (FLGS) Credential. The holder of an 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.
- 2) Integrated science in grades preschool and kindergarten through eight.

These assignments are generally found in elementary and middle schools. The new subject area of FLGS provides an additional option for employers to assign qualified individuals to teach introductory science. An individual with a multiple subject credential may earn a single subject credential in FLGS with verification of appropriate subject matter competence and completing a departmentalized setting methodology class. An individual with a single subject teaching credential in another content area may add the FLGS by verifying subject matter. The FLGS credential is also a teaching authorization on the pathway to possibly earning a full science authorization in Science: Biological Science, Chemistry, Geosciences or Physics.

Preconditions for approved FLGS subject matter programs have not yet been adopted by the Commission. The Commission may elect to require 45 semester unit in the FLGS subject matter programs but might also want to consider a program with fewer required units. As with the Foundational Mathematics examination and subject matter programs, an individual must pass three of the CSET subtests for the full science teaching credential. Two of the CSET subtests assess the individual’s knowledge of General Science and the third subtest is in the area of concentration (Biology, Chemistry, Geosciences or Physics) for which the individual is seeking the credential. To demonstrate subject matter competency in FLGS, only the two General Science subtests are required. Because less content is required for the examination route to the FLGS subject matter competency than is required for the Single Subject Science credential examination route, the Commission might consider requiring FLGS programs with fewer than the 45 semester units required of Single Subject Science credential programs. NCLB’s requirement of 32 semester units is one place to begin the discussion of how many units should be the minimum required for a FLGS subject matter program as is provided in the table below.

<b>Required Units*</b>	<b>Adopted Preconditions Science (Biology, Chemistry, Geosciences or Physics)</b>	<b>Possible Preconditions 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

As with the possible revised Precondition for Foundational Level Mathematics, the 32 semester unit program for Foundational-Level General Science is fewer than the number of units required for a full Single Subject Science credential, and may or may not be sufficient to meet a

university's definition of a college degree in the subject, but would reflect the foundational nature of the credential and would be consistent with subject matter competence requirements as defined for NCLB. At this time, staff presents the possible Preconditions for Foundational-Level General Science for Commission discussion.

Similar to the Subject Matter Authorization (SMA) in Mathematics, there is an SMA in Introductory Science. The SMA in Introductory Science provides a very similar authorization as the Foundational Level General Science authorization; however, the SMA cannot be earned as an initial teaching credential. In addition, a FLGS subject matter program would be an approved program with a recommendation from the program sponsor rather than a minimum of 6 semester units in biological sciences, chemistry, geosciences, and physics as is the case with the SMA.

### **Next Steps**

After Commission discussion of Preconditions for these two foundational credentials, if it is appropriate, staff will bring an action item to a future Commission meeting with proposed Preconditions for the Foundational Mathematics and Foundational-Level General Science subject matter programs for consideration and possible adoption.

## Appendix A

### **Adopted Preconditions for the Approval of Subject Matter Programs in Mathematics**

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

- (1) Each program of subject matter preparation for the Single Subject Teaching Credential in Mathematics shall include (a) a minimum of 30 semester units (or 45 quarter units) of core mathematics coursework that is directly related to subjects that are commonly taught in departmentalized mathematics classes in California public schools, and (b) a minimum of 15 semester units (or 22 quarter units) of coursework that provides extended study of the subject. These two requirements are elaborated in Preconditions 2 and 3.
- (2) The core of the program shall include coursework in subjects commonly taught in departmentalized classes of mathematics and related subjects in the California public schools such as algebra (or demonstrated proficiency), geometry, number theory, calculus, history of mathematics, and statistics and probability.
- (3) Extended studies (breadth, depth, perspective, concentrations) in the program shall be designed to supplement the core of the program.

**In addition to describing how a program meets each standard of program quality in this handbook, the program document by an institution shall include the course titles, unit designations, catalog descriptions and syllabi of all courses in the program that are used to meet the standards. Program documents must also include a matrix that identifies which courses meet which subject matter requirements.**

**Institutions may determine whether the standards are addressed through one or more courses for each commonly taught subject or courses offering integrated study of these subjects. Institutions may also define the program in terms of required or elective coursework. However, elective options must all meet the standards. Coursework offered by any appropriate department(s) of a regionally accredited institution may satisfy the preconditions and standards in this handbook. Programs may use general education courses in meeting the standards.**

## Appendix B

### **Adopted Preconditions for the Approval of Subject Matter Programs in Foundational Mathematics**

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

- (1) Each program of subject matter preparation for the Single Subject Teaching Credential in Foundational Mathematics shall include (a) a minimum of 30 semester units (or 45 quarter units) of core mathematics coursework that is directly related to subjects that are commonly taught in departmentalized mathematics classes in California public schools, and (b) a minimum of 15 semester units (or 22 quarter units) of coursework that provides extended study of the subject. These two requirements are elaborated in Preconditions 2 and 3.
- (2) The core of the program shall include coursework in subjects commonly taught in departmentalized classes of mathematics and related subjects in the California public schools such as algebra (or demonstrated proficiency), geometry, number theory, and statistics and probability.
- (3) Extended studies (breadth, depth, perspective, concentrations) in the program shall be designed to supplement the core of the program.

**In addition to describing how a program meets each standard of program quality in this handbook, the program document by an institution shall include the course titles, unit designations, catalog descriptions and syllabi of all courses in the program that are used to meet the standards. Program documents must also include a matrix that identifies which courses meet which subject matter requirements.**

**Institutions may determine whether the standards are addressed through one or more courses for each commonly taught subject or courses offering integrated study of these subjects. Institutions may also define the program in terms of required or elective coursework. However, elective options must all meet the standards. Coursework offered by any appropriate department(s) of a regionally accredited institution may satisfy the preconditions and standards in this handbook. Programs may use general education courses in meeting the standards.**