



PROGRAM SPONSOR ALERT

Date: April 21, 2011

Number: 11-07

Subject: **Proposed** Revision to Standard 8-A(a): Pedagogical Preparation for Mathematics Content Instruction by Multiple Subject (MS) Candidates

Summary

This notice is to alert all interested parties of two recent Commission actions relating to preparation for teaching mathematics. The first action relates to authorizations to teach mathematics. On September 30, 2010 the Commission on Teacher Credentialing approved a proposal that revised the standards for, and renamed the Mathematics Specialist Credential as the *Mathematics Instructional Leadership Specialist Credential* and also approved creating a second level authorization, the *Mathematics Instructional Added Authorization*. Included in this Program Sponsor Alert (PSA) are the links to the adopted standards and to the Handbook for Teacher Educators (see resource area).

In addition, the Teaching Mathematics Advisory Panel (TMAP) submitted to the Commission a proposed revision to Standard 8-A(a): Pedagogical Preparation for Mathematics Content Instruction by Multiple Subject (MS) Candidates. Included with this PSA is this **proposed** revised Standard 8-A(a) (See Appendix A). The focus of this PSA is the **proposed** revised Standard 8-A(a).

Approved Multiple Subject Programs are not required to redesign the preparation program at this time to meet the proposed Standard 8A(a). Instead, the Commission is providing the proposed language to all interested stakeholders and suggests that Multiple Subject programs may wish to review the proposed language and consider if any modifications would be appropriate in the multiple subject program at this time. The current adopted version of Standard 8-A is provided in Appendix B for comparison purposes.

Background

The California Teaching Mathematics Advisory Panel (TMAP) was established in 2009 by the Commission and charged with reviewing California's structure for Mathematics credentials in order to support and expand the teaching knowledge and subject matter expertise of California teachers of Mathematics K-12. The panel came to agreement that although teachers of Mathematics have at least a basic level of knowledge and expertise regarding teaching mathematics, there was a pressing need to provide additional support to teachers by increasing access to mathematics teaching expertise on a consistent basis, especially at the elementary and middle grades levels.

Issues Identified in the Preparation of Individuals to Teach Mathematics

Based on the study and discussion of research articles, national panel recommendations, Commission agenda reports, and the California mathematics curriculum framework, the panel decided to focus its work in two areas: 1) expanding the mathematical pedagogy preparation for multiple subject credential candidates, and 2) restructuring and updating the authorizations and standards for the Mathematics Specialist Credential. These foci were chosen because they provided a mechanism for responding relatively quickly to the critical need for mathematics teaching expertise at the K-8 grade levels and for a longer-term solution to the needs of K-8 students for mathematically-competent multiple subject teachers.

Improved Preparation to Teach Mathematics for Multiple Subject Teachers

The current standards for multiple subject preparation programs contain one standard devoted specifically to the teaching of reading: Program Standard 7A. One result of this emphasis is that teacher preparation programs typically have at least one course that focuses exclusively on developing candidates' knowledge and skills for teaching reading. In contrast, program standards for preparing candidates' pedagogical skills in mathematics are found in a standard that also defines the content for subject-specific pedagogical preparation for science, history-social science, the visual and performing arts, physical education, and health.

The panel determined that the current single standard that includes mathematics along with other content areas does not provide enough specificity to ensure that multiple subject candidates develop the mathematical pedagogical knowledge for teaching identified as essential for ensuring that children in K-8 classrooms receive effective instruction in mathematics. To address the need for placing more focus on developing the mathematics knowledge of multiple subject teachers, the panel developed draft language for a mathematics-specific teacher preparation program standard that addresses candidates' mathematics content knowledge, specialized content knowledge for teaching mathematics, and mathematics pedagogical skills.

The following excerpt from the proposed draft program standard illustrates this focus:

“The program coursework and fieldwork consider three domains of professional knowledge to be central to the work of teaching mathematics: mathematics content knowledge, specialized content knowledge for teaching mathematics, and general pedagogical knowledge (Ball, Thames, & Phelps, 2008). The specifications for the Multiple Subject CSET provide a basis for documenting candidates' foundational mathematical content knowledge prior to field experiences. The program develops candidates' specialized mathematical knowledge for teaching and integrates

mathematical content knowledge and pedagogical knowledge. The program teaches candidates’ to use and integrate these three domains of knowledge in their developing practice.”

The *proposed* revised standard is included in Appendix A and may in the future replace the current language in Standard 8-A(a) which is provided in Appendix B.

Next Steps

At this time the *proposed* language provided in Appendix A is only advisory. The draft language represents the best thinking of the TMAP. The Commission encourages all multiple subject programs to review the proposed language and consider if the multiple subject preparation program addresses the components identified in the *proposed* language.

The incorporation of the proposed language into required program standards may take place as part of the full review of the preparation of multiple and single subject teacher preparation. If revised language is adopted in the future by the Commission, all approved programs will be notified.

Resources

Program Standards

- Mathematics Instructional Added Authorization and Mathematics Instructional Leadership Specialist Credential Program Standards <http://www.ctc.ca.gov/educator-prep/standards/mathematics-specialist.pdf>

Handbook for Teacher Educators

- A Handbook for Teacher Educators and Program Reviewers: Mathematics Instructional Certificate and Mathematics Credential Program Standards <http://www.ctc.ca.gov/educator-prep/standards/mathematics-specialist-handbook.pdf> . The *Handbook* also includes information about how to submit program applications.

Contact Information:

The Professional Services Division provides a full list of topic specific dedicated email addresses as well as program areas with the most up to date Commission staff member’s email address here <http://www.ctc.ca.gov/educator-prep/PSD-contact.html>.

Appendix A

Proposed Revised Standard 8-A(a): Pedagogical Preparation for Mathematics Content Instruction by Multiple Subject (MS) Candidates

Program coursework and fieldwork provide candidates with an environment conducive to intellectual risk-taking and multiple ways of approaching mathematical and pedagogical problems, thereby providing a model for candidates to enact in their own practice. The program teaches candidates to apply the *Teaching Performance Expectations* (TPEs) to the teaching of mathematics by implementing curriculum frameworks, state-adopted academic content standards for students, and adopted curriculum materials.

Overall, the program design needs to ensure that candidates are able to create a mathematical instructional program that meets the diverse needs of California’s student population. The program prepares candidates to teach mathematics using the balanced approach, including computational and procedural skills, conceptual understanding, and problem solving, outlined in the *California Mathematics Framework*. The program provides opportunities for candidates to develop and implement teaching and learning strategies designed to enable all students to become mathematically proficient in the intertwined strands of adaptive reasoning, strategic competence, conceptual understanding, productive disposition, and procedural fluency.

Specifically, the program coursework and fieldwork considers three domains of professional knowledge to be central to the work of teaching mathematics: mathematics content knowledge, specialized content knowledge for teaching mathematics, and general pedagogical knowledge. The specifications for the Multiple Subject CSET provide a basis for documenting candidates’ foundational mathematical content knowledge prior to field experiences. The program develops candidates’ specialized mathematical knowledge for teaching and integrates mathematical content knowledge and pedagogical knowledge. The program teaches candidates to use and integrate these three domains of knowledge in their developing practice.

The three domains, when applied to preparing candidates to teach mathematics, are integrated, mutually supportive, interdependent, and interactive. Each domain is defined by the following elements that provide structure for the program design:

Mathematical Content Knowledge	Specialized Mathematical Knowledge for Teaching	Pedagogical Knowledge
Multiple subject CSET topics provide foundation	Children’s mathematical thinking	Mathematics Curriculum
	Modes of mathematical representation	Planning instruction
	Mathematical language	Classroom discourse
		Assessment

The program should provide documentary evidence of how it deeply and coherently integrates the elements across domains to develop and strengthen candidate competencies in mathematics teaching.

Below are examples of topics representative of each of element within the three domains to illustrate depth and coherence (these examples are not intended to be used as a checklist). Candidates must demonstrate competence in:

1. Children's mathematical thinking:
 - a. Use and analyze student misconceptions and conduct error analysis.
 - b. Use developmental trajectories and challenges-to-understanding mathematics concepts.
 - c. Explain algorithms and alternative algorithms and solution strategies.
2. Modes of mathematical representation:
 - a. Use a variety of modes of representation (oral language, written symbols, pictures, concrete materials/models, real-world situations) for mathematics concepts.
 - b. Recognize limitations related to representing mathematical concepts.
 - c. Link representations to underlying mathematical theories and to other representations.
3. Mathematical language:
 - a. Connect mathematical vocabulary to the mathematical concepts when listening and responding to students' mathematical questions.
 - b. Effectively use mathematical definitions and academic language, while not over-emphasizing form over function.
4. Mathematics curriculum:
 - a. Review, analyze, and sequence state-adopted curriculum materials.
 - b. Identify, implement, and connect high-leverage math topics, such as place value, fractions, and real numbers.
5. Planning instruction for learning mathematics:
 - a. Select and develop tasks to enable students to make conjectures and generalizations.
 - b. Align instructional goals, assessments, instructional strategies, and practice (assignments, homework).
 - c. Use flexible grouping strategies (homogeneous, semi-homogeneous, heterogeneous, large group, small group, and individual learning) according to students' needs and achievement.
 - d. Sequence curriculum or instruction, focusing on the mathematics content standards and the key concepts within the standards.
6. Classroom discourse:
 - a. Use questioning strategies to lead discussions.
 - b. Select generative examples and reframe problems for deeper understanding.
 - c. Foster positive attitudes toward mathematics and encourage student curiosity, flexibility, and persistence in solving mathematical problems.
7. Assessment:
 - a. Use formative, summative, standardized, and authentic assessments.
 - b. Use assessment results to adapt instruction.

Appendix B

Adopted Multiple Subject Standard 8-A

8-A: Pedagogical Preparation for Subject-Specific Content Instruction by Multiple Subject (MS) Candidates

8-A(a) **Mathematics.** During interrelated activities in program coursework and fieldwork, MS candidates learn specific teaching strategies that are effective in supporting them to teach the state-adopted academic content standards for students in mathematics (K-8). They enable students to understand basic mathematical computations, concepts, and symbols; to use these tools and processes to solve common problems; and to apply them to novel problems. They help students understand different mathematical topics and make connections among them. Candidates help students solve real-world problems using mathematical reasoning and concrete, verbal, symbolic, and graphic representations. They provide a secure environment for taking intellectual risks and approaching problems in multiple ways. Candidates model and encourage students to use multiple ways of approaching mathematical problems, and encourage discussion of different solution strategies. They foster positive attitudes toward mathematics, and encourage student curiosity, flexibility, and persistence in solving mathematical problems.