

UCI Mathematic SMPP Capstone And Culminating Interview for Math Subject Matter Preparation Program Candidates

Instructions for Math SMP Candidates

As one of several steps in certifying your subject matter competency in the UCI Math SMP program, and your readiness to use your subject matter knowledge as you enter a teacher credentialing program, you will prepare for and participate in an SMP program culminating interview. You will select a particular question (from a list of several choices) that you are prepared to critically discuss in the culminating interview. The interview questions have been designed to allow you to synthesize and demonstrate your understanding of important mathematical ideas, the interconnectedness and development of those ideas, and issues associated with teaching and learning those ideas.

You should view your preparation for and participation in the culminating interview as a positive learning opportunity with a chance to dialog with faculty and others about your ideas. The interview topics represent the kinds of intellectual activities in which math teachers should engage as part of their ongoing professional development as they build their teaching competency. In the culminating interview, you will present your question response and engage in a collaborative discussion of the topic with several individuals that you select for your panel.

The first step in preparing for this “capstone” project in the UCI Math SMP program is to register for 2 units of Math 193¹ during your senior/final undergraduate year. Select the section that is taught by the Math SMP faculty advisor, Larry Chrystal. He will provide guidance with selecting and preparing your interview topic in preparation for the culminating interview.

The interview panel should be comprised of at least three, but not more than five people from the following:

- a. A UCI Math faculty member (required)
- b. A UCI Education faculty member (someone with an interest in math education)
- c. A mathematics graduate student
- d. A K-12 mathematics teacher or a UCI Math SMP program graduate (If you select a teacher, it is recommended that he/she be a mentor teacher or be national board-certified for the grade level(s) that you think you will teach.)

The Math SMP program faculty advisor can supply suggested names from which to choose.

Following are the steps you will follow to prepare for and participate in the interview:

- a. Select one of the interview questions to which you will respond. (The interview questions are listed at the end of this document.)

¹ Students should check with the Math SMP faculty advisor or the Department of Education Student Services Office to confirm the correct course number for this Math SMP capstone course.

- b. As you get started on your response, meet with a math faculty member (someone that you will want on the interview panel) to discuss the topic, ask questions, and get some advice about the approach you will take.
- c. Contact individuals that you want to sit on the interview panel and find a mutually convenient date for scheduling the interview. You will want to reserve a room once a date has been set. It is important that you make these arrangements at least 5-6 weeks in advance of the interview. Do not leave it to the last minute.
- d. Prepare a written response to the interview question that you have selected. Prepare any visual aids that you will want to use in the interview to present your response.
- e. Provide the interview panel with copies of your written response at least one week prior to the interview, so that they have time to read it.
- f. During the interview, you present your response, and then the panel will have the opportunity to ask you questions and engage in a dialog with you about the issues and ideas that you have raised.
- g. At the conclusion of the interview, the math faculty member will complete an interview evaluation form indicating that you have passed the interview, or that you have been asked to redo and resubmit some component(s) of your response.
- h. Once you have secured an interview evaluation form with a pass rating, you will submit it to the Department of Education, along with the other required documents for final Subject Matter Preparation certification.

Question Topics for Candidates to Address in the Math SMP Program Culminating Interview

Select **one** question topic about which you will write, present, and discuss a response in a culminating interview. There are three choices listed below.

1. Building on Important Ideas in Math From Middle Grades Through College

Choose a mathematics topic from the following:

- a. Area
- b. Functions
- c. Unknowns (Variables)
- d. Reasoning and Proofs
- e. Probability

(You may select a different topic in consultation with a math faculty member.)

To address the following parts of this question, you should refer to the California Mathematics Framework and Content Standards, math textbooks used in the middle school and high school grades, and texts and other materials from university courses that you have completed in the Math Subject Matter Preparation Program.

- a. Starting with the middle school grades, discuss how this topic gets defined and explained when it is first introduced? What kinds of mathematical explanations and strategies are given to students?
- b. Moving through the middle and high school grades, how are the topic's definition and mathematical explanation(s) refined as middle and high school students revisit the topic? In what mathematical contexts is the topic developed through successive grade levels? What kinds of connections between this topic and other math topics are made as the topic is further developed? Use both narrative and a flow chart to organize your response.
- c. Discuss how the concepts and skills associated with this topic at the middle and high school grades build toward a more advanced understanding in the math curricula at the university. Consider how a university-level mathematician would define and explain this topic?
- d. How does your advanced knowledge of this topic and its connection with other concepts in math influence your ideas about how to teach this topic to a middle school and/or high school audience? Consider if and how your advanced understanding of this topic and your critical examination of the middle and high school math curricula would lead you to teach the idea using alternative definitions or explanations than those often used in middle and high school math courses.

2. Constructing a Student Learning Case Study

As part of your fieldwork assignment(s) select a student with whom you have worked and from whom you can collect information for a student learning case study. There should be a particular mathematics topic (or set of related topics) that is the focus of your interactions with the student. Be prepared to report on the lessons and assignments that

the teacher uses to teach this topic, and to discuss and analyze your tutoring interactions with the selected student.

Over a period of one semester, you should have at least three instructional interactions with the student about the selected math topic. For the learning case study, collect data that includes, but is not limited to:

- a. Taped interactions (audiotape or videotape) between you and the student (Discuss permissions and school policies about taping with the teacher before you do any recording.)
- b. Videotape of the master teacher and target student during selected lessons (optional)
- c. Field notes about your interactions with the student
- d. Field notes and other artifacts to document the class lessons, activities, and textbook assignments used to teach the topic that you are tutoring
- e. Copies of work attempted or completed by the student

In your case study, address these questions that demonstrate your understanding of the mathematics content that the student is learning, your understanding of the student's knowledge of the relevant mathematics content and skills, and your understanding and reflections on strategies for teaching and learning the relevant mathematics content and skills:

- a. Describe the topic that is being taught. Based on the teacher's lessons, textbook, and other assignments, what kinds of mathematical definitions and explanations are used to teach this topic?
- b. What kind of prior conceptual understanding and procedural knowledge do you think is needed for a student to be prepared to understand this topic and understand the definitions and explanations that are part of the lessons, textbook, and assignments?
- c. Describe the mathematical concepts and tasks that the student is addressing in your interactions with him/her.
- d. Provide a description of this student's mathematical achievement level. (Has the student's past performance indicated his/her math achievement level? What is the teacher's assessment of the student?)
- e. Citing evidence from your tape recordings of tutoring interactions, your field notes, and student work samples that you have collected, analyze and discuss the student's developing understanding of the topic, and your strategies for helping the student to acquire the necessary conceptual and procedural understanding. In your response, it is important that you identify what the student knows and understands (both correct conceptions and misconceptions), what the student does not know, as well as what mathematics knowledge you are helping the student to construct, how and why.
- f. Reflect on what you have learned from your experience tutoring this topic. In your response you may draw on your experience with this case study student, as well as other tutoring experiences you have had with this math topic. Include in your response the following:

- i) In what ways were you able to draw on your advanced understanding of the topic to guide your tutoring strategies?
- ii) In what ways has your understanding of this topic changed as a result of your tutoring experiences and reflection on those experiences?
- iii) Are there issues and questions associated with how middle and high school students learn and understand this topic that you are still grappling with?
- iv) How will this experience impact your approach and techniques for teaching math?

3. A Research Study of Mathematics Learning

Select a published research study that explores some aspect of mathematics learning. The following describes how you will replicate one or more parts of the study, and discuss your results and implications for what you have learned.

- a. In consultation with a math faculty member, math-education faculty member, or math graduate student, select a research study that examines some aspect of mathematics learning that you could feasibly replicate with one or more middle or high school level students. (For example, you might select a study that poses the question of whether a certain instructional approach, like the use of manipulatives, will assist in the learning of algebra.)
- b. Once you have identified the study and topic of math education on which you will focus, do some background research (a focused literature review). Briefly summarize studies that investigated the topic and their conclusions. Identify alternative perspectives related to the topic.
- c. In consultation with a math or math-education faculty member or graduate student, design a small study that you will conduct that either attempts to replicate and confirm the findings of the selected study, or attempts to modify some aspect of the study (e.g., different types of learners, learning environment, materials, or some other modification).
- d. Using a standard research study format (e.g., APA style), write up the results of your study. Modified research reporting formats will be accepted with prior approval.
- e. In addition to the research study report, write your reflections that discuss the following:
 - i) What were your own assumptions about the research question posed in your selected study? On what kinds of personal experiences as a math learner or math tutor/teacher were your previous assumptions based? In what ways were any of your assumptions altered as a result of your experience with this research project?
 - ii) In terms of your own understandings of advanced mathematics, how has your understanding about math topics related to the research project been altered as a result of this research experience?
 - iii) As a result of doing this research, what new questions do you have about how middle and high school students learn and understand mathematics?

- iv) As a result of doing this research, what new questions do you have about how university-level students (math majors and non-majors) learn and understand mathematics?