

Section 1 Introduction

Overview of Project: The purpose of our project was to develop and pilot an assessment of elementary teacher candidates' conceptual knowledge in mathematics and science. After reviewing the Connecticut Frameworks, national standards, and the literature on elementary teachers' content knowledge, we ultimately identified three science content strands (life, physical, and earth/space) and three conceptual areas in mathematics (mathematical reasoning, problem solving, and patterning). Next, we developed an item bank from which we selected 23 open-ended science items, 14 open-ended, and 10 multiple choice mathematics items. We administered these items in December 2002 to our incoming elementary teacher candidates in a pilot study.

Rubrics were developed and revised in consultation with our consultant and upon the advice of the State Department of Education Title II Project Coordinator. Assessments were scored by pairs of raters. Assessment items were revised or eliminated based on item analysis and construct validity. For example, we reviewed items to reconsider whether or not they assessed teachers' conceptual knowledge. Additional items were developed for the item bank to assure a sufficient number of items in each conceptual area.

A list of proposed deliverables:

- 1) A concise summary of the most critical content area competencies necessary for the successful teaching of elementary mathematics and science and definition of teachers' conceptual knowledge (see Appendix A1).
- 2) An item bank of open-ended performance assessment items intended to evaluate the conceptual understanding of elementary candidates in the areas of mathematics and science (see Section 2.V, 2.VI).
- 3) Rubrics accompanying the performance assessment items (see Section 2.III, 2.IV).
- 4) Results of a pilot study of the performance assessment items (see Appendix C).
- 5) Summary report (i.e., Final Report, this document and Summary Report, Appendix C).

The members of the workgroup and their institutional roles.

<p>Principal Investigator Judi Randi Assistant Professor of Education, UNH</p> <p>Co Principal Investigator Math Team Leader John Ciochine Practitioner-in-Residence, Education Department, UNH</p> <p>Math Item Developers/Scorers Shirley Wakin, Education Department Chair Professor of Mathematics and Education, UNH</p> <p>James Uebelacker Professor of Mathematics, UNH</p> <p>Roger Fiondella UNH Arts & Science Faculty/Education Faculty</p> <p>Math Item Reviewers Donna Leake, Ph.D. Principal, Norton ES, Cheshire</p> <p>Mari Muri Mathematics Consultant, CSDE</p> <p>Technical Consultant Adrienne Kanach</p> <p>State Dept. of Education, Title II Manager Georgette Nemr</p>	<p>Science Item Developers</p> <p>Phyllis Gwatkin Director of Student Teaching, UNH Faculty, UNH Biology Department</p> <p>Kathie Moskovitz Teacher, Kings Highway School, Westport</p> <p>Science Item Developers/Scorers</p> <p>Sherry Mitchell Teacher, Bailey Middle School, West Haven UNH Adjunct Faculty</p> <p>Susan Dryzgula Teacher, J. Harrison School, North Branford UNH Adjunct Faculty</p> <p>Science Item Reviewer Donna Leake, Ph.D. Principal, Norton ES, Cheshire</p> <p>Science Item Reviewer/Scorer Nick Maiorino Director of Interns, Education Department, UNH</p> <p>Assessment Consultant Louise Soares Professor of Education, UNH</p>
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The ways in which your workgroup collaborated:

As our workgroup composition illustrates, our team included faculty from the UNH Arts and Sciences mathematics and science departments. We also included K-12 educators (two first grade teachers and one middle school teacher as well as an elementary school principal). To build capacity, members of our team included faculty teaching the mathematics and science strategies courses and the Director of Interns who coordinates the science strategy courses at UNH. We also included education faculty who do not teach

mathematics and science courses but who have expertise in assessment. Objectivity was enhanced by including one K-12 teacher without any affiliation with UNH. With the assistance of the K-12 principal, who served as an item reviewer, we were able to “pre-pilot” our items with additional inservice teachers who volunteered their time to review our items.

Milestones of the project.

(See Appendix A2 for Minutes)

Milestones	Activity	Product/Learning
September, 2002	Introductory meeting (planning and review of the process) Workgroup members attend Title II conferences	Because of the nature of our project (mathematics and science) much of our work would need to be accomplished in small, subgroup meetings. Discussions with Arts and Science faculty and practitioners resulted in understanding how conceptual knowledge of the discipline is integrally connected with pedagogical content knowledge
October, 2002	Mathematics and Science subgroups define their tasks and identify areas of knowledge elementary teachers need to know. Subgroups share their work in a whole team meeting. Workgroup members attend Title II Conference	A working draft defining teachers’ conceptual knowledge necessary to teach mathematics and science at the elementary level. This working draft guided our work, which was a recursive process. That is, as we developed the items and rubrics, and as we analyzed data, we returned to our working draft and further refined the construct of “conceptual understanding” (see Appendix A1 for final version; Appendix A3 for earlier drafts).
November 2002	Subgroups develop assessment items and share their work in a whole team meeting. Workgroup Members attend Title II conference	Preliminary Item Pool (see Section 2 draft documents); Items aligned with areas of knowledge assessed at the elementary level.
December 2002	Assessment items are reviewed by consultants and “pre-piloted” by K-12 inservice teachers. Items are revised, eliminated, or reserved for another form (possible post test), as appropriate. Demographic survey developed (see Appendix C) Presentation at State Title II Conference	Pilot assessment (23 open-ended items) in science Pilot assessment (14 open-ended and 10 multiple choice items) in mathematics Demographic Survey (mathematics and science) (See Appendix C)
January 2003	Development of rubrics in subgroups Consultations with assessment experts Analysis of demographic data	Drafts are rubrics are included in Appendix B to illustrate the evolution of the rubric development. Initially, we had designed different rubrics in each subject area. Further, in science, we had designed three

		scales to separate the constructs (i.e., conceptual understanding, factual knowledge, and scientific inquiry).
February- March 2003	Rubric development continues Consultation with TBA and assessment experts on our team Mathematics assessment scoring Meeting with CSDE to clarify our task	Based on discussions with the CSDE Title II Project Director, we redesigned our rubrics, using only one scale. In addition, the mathematics and science scales were aligned so that essentially the same scale was used in both subject areas.
April 2003	Rubrics finalized and illustrated/anchor sets developed Science scoring, including training of scorers Additional item development for expanded item pool	The rubrics are included in Section 2 and the scoring process is described in Section 3 Task Development
May 2003	Data Analysis by item, by concept, and aggregated results in each subject area Additional item development	Items were regrouped by concept for data analysis, based on discussions with CSDE and a review of the literature (see Appendix B and Section 2 Assessment Development)
June 2003	Preparation of student reports Reception for participants/team members Preparation of evaluation report	See Section III and Appendix C for data analysis and results See Appendix B for

Place supporting documentation in Appendix A. Documentation should include, but is not limited to:

- Minutes from meetings (Appendix A2).
- Any documentation about workgroup discussions such as email/position papers, notes, etc. (Appendix A3)
- Any deliverables other than your assessment task (Appendix A1: Competencies; Appendix C: Results).