THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

LOS MEDANOS COLLEGE

COURSE INTRODUCTION FOR INSTRUCTORS

Early Learning in Math and Science (ELMS)
Undergraduate Course in Teacher Preparation

TABLE OF CONTENTS

INTRODUCTION

Welcome! *Early Learning in Math and Science (ELMS)* is a model curriculum designed for use by college instructors to prepare pre-service early childhood educators to teach science and math to young children. The course was developed with funding from the National Science Foundation through collaboration between UC Berkeley's Lawrence Hall of Science and Los Medanos Community College in Pittsburg, CA. The development of the course was an iterative process, through which students and instructors at pilot sites provided ongoing feedback and evaluation data used to refine the instructional materials. These materials are detailed, flexible, and well tested and designed so that even instructors unfamiliar with teaching a science and math curriculum course can inspire, excite, and actively engage their students. Although the curriculum is structured in a particular way, each instructor can adapt, pick, and choose from the variety of ideas presented to fit their own format and time frame. The ELMS course open-source resources are available online at elmscourse.org.

"The one thing I learned about myself from taking this class is that even though throughout school science and math were areas I avoided, I don't need to avoid them as a teacher with young children. I learned that I am doing math and science on a daily basis. I have a newfound enjoyment for both science and math."

Jocelyn R., student

KEY ELEMENTS

- Developed as a 3-unit semester class
- Designed for 17 sessions, but can be adapted to your situation (each session totals 2.5 hours)
- Hands-on experiences are central to every class session
- Aimed at both undergraduates and active working professionals
- Focuses on learning experiences appropriate for children ages 2-6
- Applies constructivist pedagogy to fully engage students in the learning process
- Integrates science and mathematics with other early childhood topics
- Provides detailed step-by-step instructor guides for each class session with supporting PowerPoint slides
- Uses *Big Ideas of Early Mathematics* by The Erikson Early Math Collaborative as textbook
- Provides a sample Course Reader, suggested homework, Midterm and Final assignments, examples of course syllabus and calendar and other essential course documents

CHECKLIST: IS THIS COURSE RIGHT FOR YOU?

Instructor Requirements

- ☐ Enthusiasm for early science and math
- ☐ Understanding of constructivist teaching methods
- ☐ Ability to model developmentally appropriate teaching strategies
- ☐ Commitment to collaborative learning practices
- ☐ Appreciation of the value of hands-on experiences for adult learners
- ☐ Openness to learning along with your students

Space and Equipment Requirements

- ☐ Classroom space with tables where students can work in small groups
- ☐ Access to water (A sink in the room is ideal as water is used in several sessions.)
- ☐ Laptop, projector, speakers, access to internet and projection screen
- ☐ Small budget ($100- $150) to purchase materials (Some can likely be borrowed.)

WHY THIS COURSE WAS DEVELOPED

There is a growing emphasis nationwide on the importance of incorporating science and math education into early childhood programs. It is widely recognized that young children should have foundational competence in mathematics and science before they begin kindergarten. The National Institute for Early Education Research recommends that mathematics and science be treated as essential components of a high quality program, not as extras. The relationship between early science and math education and later academic achievement is well documented. Science in early childhood not only builds a basis for future scientific understanding, but also builds important skills and attitudes for learning, such as curiosity, a drive to experiment, a desire to test theories, and to share new ideas. Early math skills are proven to be predictive of later academic achievement.

Despite the clear value of early science and mathematics in preschool education, many college students in early childhood programs are leaving their undergraduate experiences ill-prepared to provide high-quality science and mathematics education to young children. They often find math and science to be intimidating subjects, and undergraduate students who are already uncomfortable with these subjects typically find little support in their pre-service early childhood programs to help them overcome their lack of confidence.

Early childhood faculty may carry these same phobias about math and science content. In many Early Childhood Education departments, it is sometimes a challenge to find a faculty member or other instructor who feels they have enough expertise to teach a science and math curriculum course. *Early Learning in Math and Science* is intentionally designed to help overcome these barriers through an innovative course model built around principles of constructivist learning. The tools and resources provided to teach this course support the instructor in creating an interactive, student-centered environment in which the learning relationship is mutually beneficial to both students and teachers.

STUDENT OUTCOMES/COURSE GOALS:

Students will learn how to…

- make science and math part of daily routines, activities, and interactions in early childhood classrooms.
- create an environment in which children are eager to explore and learn about science and math.
- plan and provide developmentally appropriate early learning experiences in science and math.
- integrate science and math with each other and with other developmental domains.
- involve families in supporting their child's growth in science and math.
- use early childhood science and math standards (instructor can customize to reflect appropriate state guidelines).
- identify as lifelong learners of math and science and expand their own conceptual understandings in these subjects.

DESIGN PRINCIPLES

The course has been designed with the following learner-centered practices and sound educational principles at its core:

- **Learning by Doing**. In order to help students overcome any barriers they have towards science and mathematics, and to help them develop more positive attitudes and dispositions towards these subjects, they need to experience a hands-on, inquiry approach to their own learning. Participating in hands-on activities themselves helps them to feel more comfortable and prepared to present the activities to children. This focus on teachers as investigators and learners, like their young students, is a natural way for them to build their own knowledge of science and mathematics content as well as learn strategies for promoting children's learning in these subjects. Both pre-service and in-service teachers have consistently reported that the experience of engaging in the activities in the same way that children do allows them to focus on their own "meaning making" as learners, and to then step back and analyze the process from an educator's perspective and to build a deeper understanding of the teacher's role.

"I learned SO much through handling and learning from the materials myself! Why can't ALL classes be taught this way?"

Wendy R., student

- **Constructivist Perspective**. A constructivist approach shifts the focus from a passive transfer of knowledge from teacher to student to a model in which students are actively involved in their own process of learning. In this view of learning, students are involved in a creative act, constructing meaning based on their own prior experiences and new information. All students have accumulated a foundation of life experiences and knowledge. They need to connect their new learning to this knowledge/experience base. By tapping into and building on their prior knowledge, an effective instructor can help them make personal connections to course content and topics. Additionally, this pedagogy models the importance of drawing on their own students' prior experiences as a crucial aspect in constructivist teaching.

- **Instructor Modeling.** One of the most meaningful ways to help students successfully translate what they learn in this course to young children is through instructor modeling. When the instructor demonstrates and facilitates the math and science activities much as they would be done with children, the message comes through clearly that what is modeled in the college classroom is what should be evident in students' own teaching. Having your students take on the role of children while you model instructional techniques, helps them better understand concepts from both the perspective of the child as well as that of the teacher. Since our goal as methods instructors is to have pre-service students become successful teachers, teacher educators then, must model these techniques.

- **Integrated Approach**. Because learning experiences that cut across curricular areas are important for children's conceptual development, each class session is structured to incorporate multi-sensory learning along with visual, auditory, and kinesthetic elements. The course is designed to demonstrate how children's growing science and math content knowledge and their developing language and literacy skills support each other. Other developmentally appropriate domains of learning such as social/emotional development and gross and fine motor development are addressed as well. The value of play and creative exploration are stressed throughout the course with many real classroom examples provided to help build learning connections.

- **Community of Learners**. Creating a community of learners is the foundation of effective teaching. *Early Learning in Math and Science* is designed to be a collaborative learning experience in which all students are actively engaged and feel that they are valued members of the community. This approach embraces the idea that we are all learning from each other - students from teacher, teacher from students, and students from students. A rich diversity of backgrounds, perspectives, and experiences help all of us grow. Some practices that help create an inclusive classroom culture are:

- Making students feel welcome by making the effort to learn about their backgrounds and interests. Share yours as well!
- Acknowledging the wealth of experiences that your students bring to the classroom.
- Encouraging students to ask questions by explicitly and repeatedly telling them that questions are welcome and expected.
- Responding thoughtfully to all questions that students ask, even those that may seem simple or silly.
- Offering many opportunities for small group discussion.
- Providing time for reflection and feedback to ensure goals and expectations are being met.

- **Focus on Equity**. Because of the diverse student populations typically served in colleges and universities, planning for non-traditional learners (English Language Learners, first generation college students, re-entry students, and students with varying levels of previous education) is imperative. It is important to remember that learners incorporate information in different ways (visual, auditory, interactive) and at various rates. This course intentionally uses more accessible reading materials and assignments, and focuses more on reflection and application, than on right and wrong answers. Building a classroom community of learners where students support and learn from one another also helps all students to be successful.

- **Easy and low-cost materials**. The course uses everyday familiar items to demonstrate that materials for quality science and math experiences for young children can be simple, inexpensive, and easily accessible. Students see that many of these materials are already found in most early childhood environments, and that others can be acquired at no or at low cost. At the same time, in some cases, specialized materials are needed. An essential feature of the course design is that most of the materials used in class are supplied by the students themselves as part of their homework. As an incentive, it is recommended to award weekly points for bringing assigned items to class. Student-assigned materials are free, recycled, or very inexpensive. Students enjoy this aspect of the coursework. It's fun for them to see the diversity of items and materials their peers provide, and they often become more motivated to find unusual and interesting things to contribute. The additional materials that the instructor needs to supply are specified on the Master Materials List. Many are low-cost, household materials or could be borrowed from a preschool. However, certain items, such as food items, science tools, some classroom supplies, and the recommended children's books, need to be purchased.

"Even though a hands-on class requires more set-up time, it was more than worth it to see the power of direct learning it facilitates. Students were always eager to help clean up, and sending an email reminder a few days before class each week assured students brought the materials we would need."

-Instructor

COURSE CONTENT

The chart below represents the overall course content at a glance.

Math	Science	Early Childhood Topics
▪ Sets and Sorting ▪ Measurement ▪ Number Sense ▪ Counting ▪ Number ▪ Pattern ▪ Data Analysis ▪ Spatial Relationships	▪ Water ▪ Sink and Float ▪ Rocks ▪ Mixtures ▪ Solids and Liquids ▪ Baking Soda and Vinegar ▪ Bubbles ▪ Air and Wind ▪ Trees ▪ Soil ▪ Worms ▪ Seeds ▪ Balls and Ramps ▪ Structures ▪ Invention Center	▪ Preschool Science and Math Foundations (adapt for your state) ▪ Constructivism ▪ Creating a Classroom Science Area ▪ The Value of Sensory Play ▪ Developmentally Appropriate Practice ▪ Constructivist Chemistry ▪ Myths of Early Mathematics ▪ Curriculum Planning in Science ▪ Life Science and Ecology in Early Childhood ▪ Language Development Through Science and Math ▪ Family Involvement ▪ Engineering in Early Childhood ▪ Gender Bias in Science and Math ▪ STEM to STEAM

INSTRUCTIONAL RESOURCES

Complete instructional resources needed to teach *Early Learning in Math and Science* are available online at elmscoure.org to instructors interested in using them in their entirety or in part to enhance other teacher education materials. The curriculum was piloted at colleges where a 17-week semester was in place and provides instructional materials for 17 class sessions (based on 2.5 hours of instructional time per class session). The Session 17 Instructor Guide is intentionally left more open-ended, providing suggestions for wrapping up the course as you choose. Depending on the semester or quarter calendar that your campus uses, you may condense or expand the number of sessions to work for you.

Instructional materials available:

1. **Sample general course documents.** Samples of a course syllabus, course calendar, homework assignments, midterm project, reflective essay assignment, and take-home final are provided. These are all fully editable to customize with accurate and specific information for your course.

2. **Instructor Guides.** 17 instructor guides are provided to support you as much as possible. Some instructors will follow the outlines very closely, while others will use them more as a framework. More information is included, rather than less, so that you can blend it with your own ideas, experience, and style. The first time using these materials, you may need to keep the instructor guides close at hand and refer to them frequently throughout the class. Giving yourself plenty of time to review the instructor guides ahead of time will let you be more thoughtful about any adaptation you wish to make. The following sections are consistent throughout the instructor guides:
    - Student learning goals
    - Session at a Glance with estimated times, flexible as you deem necessary
    - Student Arrival Activity to productively use arrival time
    - Early Childhood Discussion Topic
    - Math Focus
    - Science Focus
    - Looking ahead to next week (Homework and What to Bring to Class)
    - Materials list
    - Printables
    - Literature Connections

3. **PowerPoints.** PowerPoint presentations support each class session. The PowerPoint slides guide each step of the session, closely linked to each section of the instructor guides. In fact, snapshots of each slide are present in the right margin to coincide with the relevant session content. The PowerPoints are fully editable to allow you to adapt for your particular situation. For example, in a few cases, slides are included that address the California Preschool Learning Foundations. Instructors in other states will want to substitute their own state standards or guidelines. If you teach the class in a shorter timeframe, you can reorganize the content as needed. The PowerPoints have very useful photographs of children engaged in many of the specific science and math activities introduced in class. Other features of the PowerPoints include links to video vignettes from the *Big Ideas of Early Mathematics* website, and other relevant on-line video clips. Links to websites are embedded to easily access video clips, but urls are provided on slides in case a link doesn't work.

4. **Exemplar Science Activities.** The weekly hands-on science activities done in class are largely based on a set of 11 science exemplar activity guides that were developed especially for this course. Each guide is designed to be an introduction to a science topic for young children. Exemplars are built around the Engage-Explore-Reflect learning cycle, which demonstrates the scientific inquiry process at a foundational level. The exemplars have a dual purpose:

- They are incorporated into the in-class coursework to give students concrete experiences with each exemplar activity. Content from the exemplar activities is provided in the instructor guides to provide a seamless integration as the instructor models the exemplar activity. With each exemplar, the instructor guides the students through the steps of the learning cycle as they engage, explore, and reflect.
- They are meant as useful take-away teaching guides for use with children ages 3-6. The exemplars are written in a step-by-step format to help teachers feel comfortable guiding the children's explorations. However, the guides are meant to be flexible, like a basic recipe, that each teacher can modify depending on the interests, ages, and developmental level of the students. Teachers can refer to them again and again when working in classrooms with young children.

5. **Erikson Institute's Early Math Collaborative Resources.** The Early Math Collaborative draws on current research to improve math instruction for young children. Their resources are incorporated into this course in the following ways:
   - Textbook: the textbook recommended for the course is *Big Ideas of Early Mathematics: What Teachers of Young Children Need to Know*. This book is based on "Big Ideas," of developmentally appropriate foundational mathematical knowledge and concepts. These ideas are based on the most current research from the fields of cognitive science and mathematics education, and connect to the Common Core State Standards. The reading level is accessible to a variety of experience and learning levels.
   - In-class activities: The textbook includes numerous activity ideas for application in early childhood classrooms, and has inspired many of the hands-on math activities suggested for class sessions.
   - Video clips: The Early Math Collaborative website offers professionally produced video clips showing teachers and children in action to illustrate activities and teaching strategies representing the Big Ideas discussed in the text.

6. **Literature Connections**. Children's books that connect to topics covered in the course are recommended to enhance learning on several levels. These books can be used to complement the hands-on math and science activities and to demonstrate how math and science can be integrated with children's literature. Using children's storybooks in the class continually grounds students in the developmental needs of young children and models the integrated learning approach endorsed in the course. You may choose to read some or all of a particular book depending on time and your assessment of what makes sense. In case you don't have a copy of the storybooks, there are a few images from each book included in the PowerPoint slides. If possible, keep the children's literature collection readily accessible in the classroom for students to look at during break times.

7. **Printables**. Occasionally, worksheets for in-class activities are used (such as a weekly sign-in sheet, sorting sheet for sink/float items). Printable versions of these resources are provided.

8. **Course Reader.** A course reader has been compiled to provide current journal and trade articles that present relevant research and best practices related to early childhood science education. These readings often serve as a springboard for class discussion. Many of the articles are written for classroom teachers with practical classroom applications. If desired, each instructor can customize the Reader.

9. **Master Materials list.** The Master Materials List contains all consumable and non-consumable items the instructor needs to supply for each session. Most materials are easily collected or purchased at a grocery or office store, but a few are a bit more specialized, so some advanced preparation/purchasing is essential.

"I usually throw away the course reader when I'm done with my classes, but I'm definitely going to keep this one! I know I'll want to go back and use it as a resource when I'm teaching."

Alex B., student

CONNECTION TO EARLY CHILDHOOD FRAMEWORKS AND GUIDELINES

Most states have developed, or are in the process of developing, guidelines that define expectations for preschoolers' development and learning in mathematics and science, as well as other domains. Since this course originated in California, some of the instructor guides, PowerPoints, and assignments reference the California Preschool Science and Math Foundations. If not teaching in California, you can adapt course materials as necessary so that your students become familiar with the guidelines, expectations and resources available in their own locale.

Because preschool curriculum frameworks are more relevant to the majority of students in college early education programs than primary grade standards, the course does not address K-12 Common Core and Next Generation Science Standards (NGSS). If connecting to these standards is important in your situation, you can incorporate them where deem appropriate.

ASSESSING STUDENTS

Every instructor has his or her own approach and system for evaluating student work and assigning grades. The suggested homework and other sample assignments provided, as well as grading rubrics and the point system suggested in the course syllabus are available for you to use or adapt as you choose. As you will see, the suggested homework assignments (based on weekly readings), in-class group activities, midterm project, reflective essay assignment, and take-home final all use an *applied* focus, asking students to reflect on course readings and experiences in terms of using them with young children. The suggested assessment opportunities are described below.

1. **Weekly Homework**. Weekly reading assignments from the Course Reader and *Big Ideas of Early Mathematics* textbook usually *follow* the in-class experience. In this way, the students have hands-on, concrete experiences with subject matter *before* reading about the topic so the class experience provides a context for the reading. Homework asks students to reflect on the reading, sometimes identifying key concepts in their own words or offering application ideas for their own work with children. Brief class discussion and reflection on homework assignments are built in to class sessions, allowing students to share perspectives and ideas from their individual work.

2. **Participation**. An effective way to acknowledge student engagement and involvement is with participation points. You may choose to award participation points each week for the students who remember to bring in required materials for the hands-on portion of the class session as an added incentive.

3. **Making Mixtures Group Activity**. This assignment is completed in class. Students work together in small groups to make a mixture, then present about their activity to the rest of the class. The focus is on child-directed explorations of transformations.

4. **Midterm Project**. The midterm project requires students to conduct one of the science exemplar activities with a group of children. In their written report, they are required to give a description of planning, analysis of adaptations with rationale, and evaluation of the learning for children and for themselves.

5. **Reflective Essay**. The purpose of this assignment is for students to reflect on how the course has impacted them personally.

6. **Take-home Final**. The take-home final requires a synthesis of ideas around teaching math and science concepts to young children. Students are required to write their final as an informational newsletter/handout to share with parents. They are given several weeks to work on this culminating assignment, drawing on experiences, readings, and other resources throughout the course to inform their work.

7. **Optional (not graded) - weekly class feedback and reflection.** Offering students a simple feedback sheet at the end of each class to record what they liked most, what ideas they will take away, and what new or remaining questions they have can be another useful tool to monitor student learning. These can be anonymous. You may choose to review the last week's comments at the start of each class, reading comments and answering questions from previous week's session as a way to "close the loop" on the student learning cycle.

PRE-COURSE PREPARATION

To prepare for teaching this course, you will need to:

Well in advance of course start date:

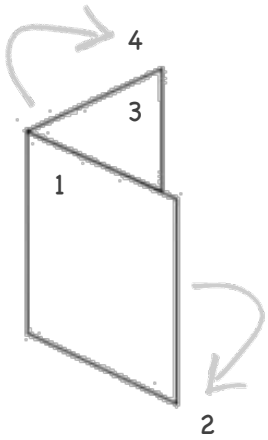
- **Arrange for appropriate classroom space.** Classroom seating that allows students to work in groups is a must. Tables that seat 4-6 students are ideal, but small groups of desks can be clustered together. Extra tables and floor space are helpful. Teaching in the campus Lab School is another option for some instructors.

- **Arrange for classroom technology.** A projector (with speakers) and screen at the front of the room are essential. Internet access is required for video links.

- **Order copies of the textbook**. Submit an order through your college's textbook ordering procedures for the textbook: *Big Ideas of Early Mathematics: What Teachers of Young Children Need to Know* (Practical Resources in ECE) 1st Edition by The Early Math Collaborative - Erikson Institute (Author) ISBN-13: 978-0132946971

- **Place order to have the Course Reader copied for student purchase.** Many campuses offer on-site copy services to prepare student readers. Others may contract with a local vendor. Find out what services are available to submit your copy request**.** Review the suggested Course Reader and make any desired modifications. When ordering copies, you may wish to request page numbering to be added (if available) to make reference to specific articles easier. Request that the Reader be 3-hole punched and held together with a metal brad or other type of fastener. This way, students can put their course readers into their 3-ring binders.

- **Have exemplar activity guides copied.** Provide copy service desk with the master exemplar activity pdfs or hard copies. Each student will need a set of the 11 exemplars. Request that exemplars are copied on 11"x17" paper, and folded into folio format. This can be done by creating a master of page 1 and 4 on 11"x17" paper and a master of page 2 and 3 on the same size paper, then copying front to back. Color is highly recommended. Request the folios to be 3-hole punched so students can put them into their binders. If possible, have the exemplars packaged in sets and either placed at the end of the Course Reader, or purchased by students as a separate resource.



- **Gather and purchase materials -** Use the Master List of Materials to determine which items you already have, which you may need to purchase and which you can arrange to borrow from a preschool or childcare center. If you have a Lab School on campus, they will likely be able to loan some items, such as sensory tubs, water play tools, and Unifix® cubes. Some

instructors find it helpful to assemble table baskets of frequently used supplies to place on table at each class such as tape, scissors, markers, post-its, and magnifying lenses.

Closer to course start date:

- **Promote the course -** At some colleges, there may not be a large demand for "elective" curriculum courses in the early childhood program. Because *Early Learning in Math and Science* is a specialization course, some colleges offer it biennially to allow for pent up demand. Marketing the course availability to beyond the student population to teachers currently working in the field, such as local school districts and the early childhood community, will invite child care professionals, Transitional Kindergarten (in California) and Kindergarten teachers to also enroll for professional growth hours.

- **Customize syllabus, course calendar, and master homework list.** Examples of these documents are provided in Microsoft Word .doc file format so you can easily edit them to reflect your personal information, course policies and required departmental information. Note: Best practice is to provide students with PDF versions of documents in your course for ease and convenience of downloading and printing, and reading in a web browser or mobile device.

- **Review Instructor Guides and customize PowerPoints.** Giving yourself plenty of time to review the Instructor Guides and PowerPoints ahead of time will let you be more thoughtful about any adaptations you wish to make. The PowerPoint presentations are intended to be completely editable and customizable. You may want to add your own presenter notes that you deem relevant from either the Instructor Guide or your own ideas and areas of focus. **Note:** In order to properly view the PowerPoints, you need to download them from the website. Format is pptx.; PowerPoint 2010. To help ensure that a presentation created in newer versions of PowerPoint functions correctly when viewed in PowerPoint versions earlier than 2007, turn on compatibility mode. Compatibility mode helps ensure you can work with an older presentation format (.ppt) in PowerPoint 2007 or later.

- **Familiarize yourself with the Erikson Math textbook and website.** Take some time to explore *Big Ideas of Early Mathematics: What Teachers of Young Children Need to Know* textbook and the Early Math Collaborative website, particularly the Idea Library http://earlymath.erikson.edu/ideas/. The resources on the website (research articles, videos, activity ideas) complement the course textbook and can be very helpful to both instructors and students who want to dive deeper into certain areas of the math content covered in the course.

"The one thing I learned about myself from taking this class is that even though throughout school science and math were areas I avoided, I don't need to avoid them as a teacher with young children. I learned that I am doing math and science on a daily basis. I have a newfound enjoyment for both science and math."

Jocelyn R., student

WE WANT TO HEAR FROM YOU!

Have a question, suggestion, or feedback? We value your comments and any insights you're willing to pass our way about your experiences using the *Early Learning in Math and Science* curriculum and website. We invite you to email elmscourse@lists.berkeley.edu. Please put the words "ELMS course feedback" in the subject line.

AUTHORS

Ellen Blinderman, Director of Early Childhood Programs, Lawrence Hall of Science, UC Berkeley

Ashley Barajas Montano, Early Childhood Science Specialist, Lawrence Hall of Science, UC Berkeley

Pamela Perfumo, Child Development faculty, Los Medanos College, Pittsburg, Ca.

EVALUATOR

Valeria Romero, Lawrence Hall of Science, UC Berkeley

ADVISORS

Caroline Pietrangelo Owens, Project Director for the California Department of Education/Early Childhood Education Faculty Initiative Project, WestEd Center for Child & Family Studies, Ca.

Jancy Rickman, Co-Chair, Department of Biology, Los Medanos College

Debbie Supple, California Instructional Preschool Network Regional Director

Jeanne Virgilio, California Early Childhood Mentor Regional Coordinator and faculty instructor, Los Positas Community College, Livermore, Ca.

ACKNOWLEDGEMENTS

The *Early Learning in Math and Science* course was created from 2014-2017 through a collaboration between UC Berkeley's Lawrence Hall of Science and Los Medanos College, thanks to support from the National Science Foundation (NSF).

We are grateful to the undergraduate students in the Child Development Department at Los Medanos College who participated in pilot testing the course and generously provided their valuable feedback to help develop the curriculum. Special thanks go to faculty members Kathyrn Neilson at Los Medanos College and Geri Quilici at Diablo Valley College for further reviewing and testing course materials and for sharing their experiences so willingly.

Thanks to the staff at the Los Medanos College Child Study Center for their suggestions and other contributions to the refinement of the exemplar activity guides. Thanks also to the children at the Center who participated in activity testing and who enliven many of the photographs in the PowerPoint slides.

We are thankful to the Erikson Institute's Early Math Collaborative team for writing the *Big Ideas of Early Mathematics* book that is so integral to the ELMS course. The math sections of the Instructor Guides and PowerPoints are based extensively on the *Big Ideas* book and are greatly enhanced by this exceptional resource. Erikson instructional materials are the most accessible, practical, and effective tools we have discovered to help both pre-service and more experienced teachers increase content knowledge and confidence in teaching early math in developmentally appropriate ways.

This material is based upon work supported by the National Science Foundation under Grant No. DUE-1244978. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

