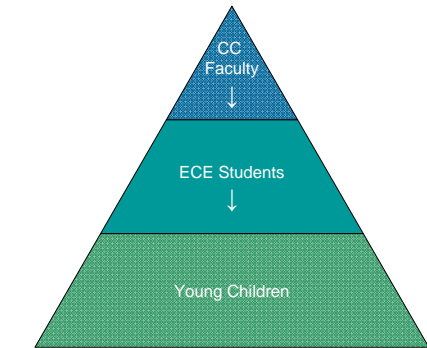


Introduction

- NAEYC & NCTM affirm that "high quality, challenging, and accessible mathematics education for 3- to 6-year old children is a vital foundation for future mathematics learning."<sup>4</sup>
- Early mathematics understanding significantly predicts school achievement in later years.<sup>1,5</sup>
- Early intervention specifically focused on mathematics has broad positive effects on student learning.<sup>2,5</sup>
- In Illinois, early childhood education programs in community colleges are a major teacher preparation force for daycare and Head Start centers across the state.
- In a recent Erikson study, we found that the number of pre-service math methods classes teachers had was significantly related to confidence in their ability to help preschoolers learn mathematics, and the amount of time they report teaching math in the classroom.<sup>3</sup>



The Effect of Early Math Teaching & Learning in Community College ECE Programs

Purpose of Study

- Gather information about early math courses and resources in ECE programs at Chicago-area community colleges.
- Explore community college faculty's views about effectiveness and challenges of teaching early math to ECE students.
- Find out about community college ECE students' attitudes toward and understanding of early math.

Methods

- We collected data from multiple stakeholders to ensure our findings were complete, representative and accurate.
- **Program & Syllabus Review.** Online catalogues of early childhood education programs from ten community college programs were analyzed. Faculty from additional community colleges were invited to submit their syllabi for review.
  - **Interviews.** Chairs of ECE programs at ten community colleges in the Chicago area were interviewed in person and via Skype; all were audio-recorded and transcribed.
  - **Focus Groups.** Fifteen faculty who have taught ECE math methods courses participated in one of two discussions focused on faculty goals for students in math methods and the effect of students' experiences (with children and math) on their success in math methods course. The focus groups were held at Erikson Institute, two graduate assistants took notes during the discussions, and the discussions were audio-recorded and transcribed.
  - **Surveys.** Thirty four students enrolled in math methods courses at two of the City College of Chicago completed a survey at the beginning of the semester. The survey has three parts – watching and responding to a short video of math teaching; rating statements about math in general, early math, and math teaching; information about the respondents' education and experience with young children.

Results

Program & Syllabus Review.

Math requirements for ECE degrees at ten community colleges were examined.

Degree	Gen ed math required	Choose your ed math or science	ECE math required	Elementary math required
AAS	5 out of 10	4 out of 10	7 out of 10	—
AAI	5 out of 6	—	2 out of 6	2 out of 6

Syllabi from twenty math methods courses were reviewed. Of these, ten listed class topics week by week.

Time focused on math content ranged from 3.5 to 6 weeks, with an average of 4.7 weeks.

Interviews

We used an emerging theory qualitative analysis approach to code the interview transcripts for themes.

Topics	Themes
Student Background	<ul style="list-style-type: none"> <li>• Students vary in educational background with some below remedial level and other with college degrees.</li> <li>• Students' reasons for taking ECE courses include: obtaining degree, certificate, credit hours for DCFPS, and an interest in teaching young children</li> <li>• Students may or may not be proficient in English when taking ECE introduction courses.</li> </ul>
Students' Experience with Math	<ul style="list-style-type: none"> <li>• While some students with a positive view of math, many have previous negative experiences with lead to negative ideas and feelings associated with math.</li> <li>• Students may not have the knowledge or understanding of the fundamentals or math concepts, which made them feel uncomfortable.</li> <li>• Students may not choose to earn AAS degree because they do not want to take math courses.</li> </ul>
Students' Experience with Young Children	<ul style="list-style-type: none"> <li>• Students may not know how to teach math appropriate for young children.</li> <li>• Some of them are working in the early childhood field at child care center or family child care, but many are not.</li> <li>• Students may view teaching young children math as only counting, number sense, using work sheets or flash cards.</li> </ul>

This information revealed the concerns and challenges faculty experience when teaching early mathematics in their ECE programs.

Focus Groups.

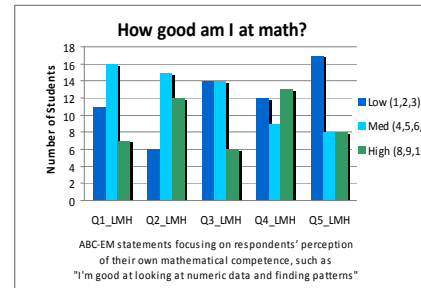
We used an emerging theory qualitative analysis approach to code the focus group transcripts.

Topic	Themes
Goals	<ul style="list-style-type: none"> <li>• Increase students' confidence with mathematics.</li> <li>• Change students' attitudes about math and confidence in their own math abilities.</li> <li>• Teach students how young children learn math, and how to teach the subject to young children.</li> <li>• Demonstrate to students that math is happening every day and everywhere in their lives.</li> </ul>
Logistics	<ul style="list-style-type: none"> <li>• Courses that focus on early mathematics are usually split with science and cognitive development, so there is not much time to dig deeply into mathematical ideas.</li> <li>• Assignments often do not require students to perform direct work with children.</li> <li>• Instructors may provide students with learning opportunities through videos and case studies.</li> </ul>
Resources	<ul style="list-style-type: none"> <li>• Instructors are hopeful the students use information from course, but are not sure how to evaluate the knowledge.</li> <li>• Instructors may not know what big math ideas they should be teaching to their students.</li> <li>• There is uncertainty about how early mathematics connects with later mathematics.</li> </ul>

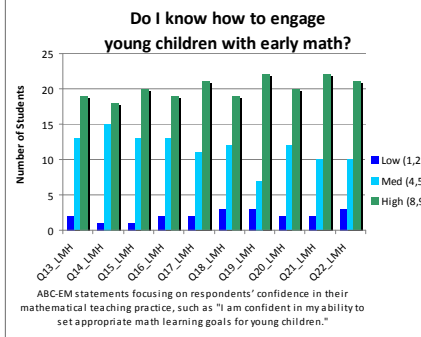
Faculty concerns focused on students' attitudes towards and understanding of foundational mathematics, as well as on their own access to early math resources and their own confidence in tying early math to later math.

**Surveys.** 34 community college students enrolled in a math/science methods course completed our two on-line surveys at the beginning of their course.

The **ABC-EM** survey contains 26 statements relating to respondents' attitudes, beliefs and confidence about mathematics; respondents were asked to rate each statement from 1 ("strongly disagree") to 10 ("strongly agree"). We re-coded ratings of negative statements (e.g. "I am NOT a math person") so that 1 always represents a negative attitude or low confidence; we then grouped responses into "low" (1,2,3), "medium" (4,5,6,7) and "high" (8,9,10).

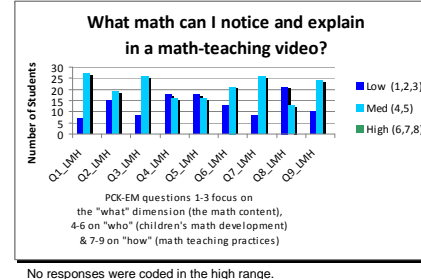


More respondents ranked these statements in the low or medium range than in the high range.



More respondents ranked these statements in the high range than in the medium or low range.

In the **PCK-EM** survey, respondents watch a video of a teacher-led math activity, then answer 9 open-ended questions about it. Their responses are coded on a scale 1 to 7. We then grouped responses into "low" (1,2), "medium" (3,4,5) and "high" (6,7).



No responses were coded in the high range.

Discussion

CC Faculty Perception of Teaching Early Math

- ECE faculty at community colleges feel that there is not enough time devoted to learning about early math.
- ECE faculty are not confident that they or their students develop a deep understanding of foundational math content.
- ECE faculty express a need for professional development support for teaching early math to ECE students, especially the reluctant ones.
- ECE faculty are looking for more effective teaching tactics and activities for teaching early math to ECE students, particularly resources that show what early math learning and teaching look like in early childhood group settings.
- ECE faculty are looking for ways to deepen their own and their students' understanding of foundational mathematics ideas.

CC Faculty Perception of ECE Students

- Students have had negative experiences with math with may lead to negative ideas and feelings about this subject. This impacts how they initially perceive the early mathematics course.
- Negative attitudes and lack of confidence also affect ECE students' choice of degrees, as many will avoid taking general math, if at all possible.
- Compared to language development and literacy, ECE students have little understanding of what quality early math practices look or feel like.

CC Student Beliefs About & Understanding of Early Math

- ECE students are generally not very confident in their own math skills.
- ECE students believe that they know the math appropriate for young children.
- When analyzing the math content, math development and math teaching in a video, ECE students responses were ranked in the low or medium range, suggesting they do not have a solid understanding of foundational math.

Implications

- Professional development for community college faculty could deepen their understanding of foundational mathematics and increase their repertoire of teaching tactics.
- More math-rich and intentional instruction in ECE math methods courses could deepen ECE students understanding of foundational mathematics, increase their confidence, and improve their attitudes.
- The Erikson Early Mathematics Education Project plans to incorporate what we have learned into our development of materials and training to strengthen early mathematics education at the community college level.

Limitations

- The sample size was fairly small in all areas of data collection.
- Our questions in the interviews and focus group may have been biased by our own experience and may not have covered all aspects of this complex situation.
- Both the ABC-EM and PCK-EM surveys are tools that have not yet been fully validated.

References & Glossary

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