



Course ID.	
Class Name	Extending Children's Mathematics - Year 1 - ECM for Grades 3 - 6
Description	<p>Extending Children's Mathematics (ECM) professional development training will help teachers of math in grades 3rd to 6th methods to fully implement the intent of the Iowa Core in Mathematics and to deepen their own mathematical understanding as well. Teams of three teachers in a building and an administrator are encouraged to participate. This course will be the start of three years of professional development.</p> <p>Know:</p> <ul style="list-style-type: none">• Children's solution strategies for problem solving• How to classify word problems according to their level of cognitive complexity• The connections and alignment to Iowa Core <p>Participants will Understand that:</p> <ul style="list-style-type: none">• Strengthening children's ability to reason about numbers and rational numbers, and building their capacity for algebraic reasoning are vital to the process of applying understanding to problem solving.• Facilitating discussions can provide a window into children's thinking which allows the teacher to design support for each student as their mathematical strategies evolve over time.• Through a focus on students' thinking, teachers improve their ability to engage students in the Standards for Mathematical Practice described in CCSSM <p>Participants will be able to do:</p> <ul style="list-style-type: none">• Analyze story problems and number sentences to determine their mathematical demands to make sure we are supporting the students in their present stage of cognitive development which readies them for the next stage.• Recognize student responses in terms of cognitive development to understand and scaffold their progress to the next level.• Design problems that will develop students' understanding of concepts and skills, giving them the ability to transfer and apply skills to new or similar contexts.
Outcomes	
Competencies	n/a
Target Audience	None
Credits	Drake University Graduate Credit (i) 1.0 1.0 Licensure Renewal (i) 1.0
Course Type	Instructor-led
Prerequisite Notes	
In District?	No - Available to anyone

Location

6/23 8:30–3:30pm

6/24 8:30–3:30pm

Meeting Dates

6/25 8:30–3:30pm

6/26 8:30–3:30pm

9/26 8:30–3:30pm

Facilitator/Presenter

Contact

Contact e-Mail

Contact Phone

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Approver

Extending Children’s Mathematics (ECM) professional development is designed to enhance teachers’ ability to teach math for understanding by increasing teachers’ understanding of students’ mathematical thinking. The content focus is Operations and Algebraic Thinking, Number and Operations in Base Ten, Number and Operations – Fractions, The Number System, and Expressions and Equations as described in the Third through Sixth Grade CCSSM. Through a focus on students’ thinking, teachers improve their ability to engage students in the Standards for Mathematical Practice described in CCSSM. Extending Children’s Mathematics PD develops teachers’ ability to use any curriculum to teach math for understanding. We do not recommend that teachers attend CGI professional development before attending ECM professional development because there is a great deal of overlap in the content of these two courses.

Deep conceptual understanding of core content at each grade is critical for student success in subsequent years. Students with conceptual understanding know more than isolated facts and methods - they understand why a mathematical idea is important and the contexts which it is useful. Teachers take time to understand the Standards for Mathematical Practice that describe the student expertise needed to develop a deep conceptual understanding of mathematics. (NRC, 2001, p. 118; CCSSM, 2010, p. 4, 6-8)

Carpenter, T.P. Fennema, E., Loef Franke, M. , Levi, L., Empson, S. (September, 2000). Cognitively Guided Instruction: A research-based teacher professional development Program for elementary school mathematics. Research Report: National Center for Improving Student Learning and Achievement in Mathematics and Science.

Research

Cognitively Guided Instruction is listed as a promising practice on the Promising Practices Network.
<http://www.promisingpractices.net/program.asp?programid=114>

These additional articles will be used during trainings to support the participants' understanding of the foundational concepts of CGI:

Equal Sharing and the Roots of Fraction Equivalence by Susan B. Empson March, 2001

This article presents examples of children’s invented equal-sharing strategies that lay a foundation for reasoning about equivalence by connecting ideas of multiplication, division, and fractions.

Children’s Understanding of Equality: A Foundation for Algebra by Karen Falkner, Linda Levi, and Thomas Carpenter Teaching Children Mathematics, December 1999

Although teachers frequently use the equals sign with their students, it is interesting to explore what children understand about equality and the equals sign. Children must understand that equality is a relationship that expresses the idea that two mathematical expressions hold the same value.

Fostering Relational Thinking while Negotiating the Meaning of the Equals Sign by Marta Molina and Rebecca C. Ambrose September, 2006
Integral to children's work in algebra is an understanding of the equals sign. But, children tend to perceive the equals sign as a stimulus for an answer and react negatively to number sentences that challenge their conceptions of the equals sign.

Learning-Disabled Students Make Sense of Mathematics by Jean L. Behrend
This article summarizes a study in which Learning Disabled students were assessed and encouraged in their natural problem-solving strategies.

Counting Collections by Julie Kern Schwerdtfieger and Angela Chan
Counting collections provides children with rich opportunities to practice oral counting, develop efficient counting strategies, group objects in strategic ways, record numbers, and represent their thinking.

Multicultural Mathematics and Alternative Algorithms by Randolph Philipp
This article summarizes the variety of algorithms different cultures use and the use of student invented algorithms.

Alternative Algorithms: Increasing Options, Reducing Errors by Tamela Randolph, 2001
School based mathematics focuses on computation and estimation, the tasks of developing number sense, place value understanding, and strategies for computing with algorithms remains important to teachers. Alternative algorithms present opportunities for critical thinking and for increased communication and an atmosphere of high expectations.

Making the Most of Story Problems by Victoria R. Jacobs and Rebecca C. Ambrose Dec. 2008/Jan. 2009
Story problems can be powerful tools for engaging young children in mathematics and many students enjoy making sense of these situations. It is critical to honor children's approach to story problems so they construct strategies that make sense to them. School Improvement Rationale This professional development is in response to district needs to improve student achievement in mathematical problem solving.

All districts have a goal to improve achievement in mathematics and through this professional development, teachers will practice using evidence of students' thinking to plan upcoming instruction targeted at advancing students' understanding of key mathematical concepts.

Through implementation of ECM, teacher teams will be expected to collaborate around student response to instruction. Grade Range Elementary
Impact on Teaching and Learning Studies have consistently demonstrated that ECM students show significant gains in problem solving. These gains reflect the emphasis on problem solving in ECM classes. It has been found that learning to understand the development of children's mathematical thinking could lead to fundamental changes in teachers' beliefs and practices and that these changes were reflected in students' learning. Problem Solving tasks will be used as a formative assessment to inform instruction and enhance student conceptual understanding of mathematics.

School Improvement
Rationale

Grade Range

None

Impact on Teaching and
Learning

Studies have consistently demonstrated that CGI/ECM students show significant gains in problem solving. These gains reflect the emphasis on problem solving in CGI /ECM classes. It has been found that learning to understand the development of children's mathematical thinking could lead to fundamental changes in teachers' beliefs and practices and that these changes were reflected in students' learning. Problem Solving tasks will be used as a formative assessment to inform instruction and enhance student conceptual understanding of mathematics.

Theory

Theory has been provided by the instructor during the large group meetings, and by readings from the texts Children's Mathematics: Monthly team meetings will be time for teachers to examine student work and provide opportunity to reflect on the theory presented

Demonstrations

During team meetings, participants will model for one another their thinking about students' solution strategies, and the problems and number choices that would help students to advance their understandings.

Opportunities for Practice
and Feedback Options

Throughout the school year participants will practice in their classrooms with feedback from peers at monthly team meetings. Collaboration will occur during team meetings on a monthly basis throughout the school year.

Teams will collaborate as they develop and design math problems for student learning. They will assess and analyze the student's response in terms of cognitive development. Plan for Implementation Each teacher will complete a CGI implementation as recommended by instructors. During scheduled monthly meetings, teams will address and share their implementation, particularly any barriers to implementation and reflecting upon successes.

Collaboration	It is expected that all participants will collaborate during the days of training and during the monthly meetings.
Plan for Implementation	Teachers will begin to implement and will be expected to implement at least 3 times per month with collaboration on one problem.
Formative Assessment of Adult Learners	This will be done throughout the full days of training with the instructors walking the room and having group conversations.
Schedule of Implementation Checkpoint	Daily
System Support (In District Only)	Districts will provide the time to meet monthly and attend the full day trainings.
Class Materials	Extending Children's Mathematics Book All other materials will be supplied by the instructors
Evaluation of Learning	See rubric for details.
Evaluation of Learning (Refer to Rubric)	Yes
Class Requirements	Attend all 3 days of summer training and the first follow-up day. Implement 3 problems per month Attend and participate monthly meetings in August, September, and October. Agenda of Time Summer credit (1 credit)
Assignments	<ul style="list-style-type: none"> • Summer training and one follow-up date in September: <ul style="list-style-type: none"> ○ Contact hours from training: $5 \times 6.5 = 32.5$ • Monthly Implementation <ul style="list-style-type: none"> ○ Aug and Sept: 2 months at 3 per month at 6 hours • Monthly Collaboration Meetings <ul style="list-style-type: none"> ○ Aug and Sept: 2 hours for 2 months for 4 hour • Monthly Planning for Implementation <ul style="list-style-type: none"> ○ Aug and Sept: $\frac{1}{2}$ planning for 6 problems for 3 <p>Gives a total of 45.5 hours</p>
Iowa Teaching Standards	ITS 1 - Academic Performance ITS 2 - Content Knowledge ITS 3 - Content Planning Instruction ITS 4 - Delivery of Instruction ITS 5 - Monitor/Assess Learning ITS 7 - Professional Growth
Iowa Leadership Standards	

Evaluation Rubric for:

Extending Children's Mathematics (Year 1 Problem Solving Collaboration) Criteria

Criterion 1: Implement and reflect on the use of ECM problems in classrooms as evidenced by reflection log

Criterion 2:
Self-Reflection

Criterion 3:
Write problems based on needs of students as evidenced by the monthly team meeting summary.

Criterion 4: Participate in monthly meetings as evidenced by the team meeting summary.

Criterion 5:
Attendance/Participation
(This criterion is not included in the scoring but must be completed to receive credit.)

4 – Proficient
Demonstrates good understanding and skill

Implement ECM problems in at least 3 times per month and write a reflection on the implementation

Scores self on Individual Reflection Rubric at end of quarters 1 and 3.

Submits problems which demonstrate the ability to select problem types and number choices which meet student needs.

Participate in monthly team meetings by being fully engaged and prepared with appropriate student work for discussion.

Reflects 15 collaborative hours per credit of course

3 – Adequate
Demonstrates satisfactory understanding and skill

Implement ECM problems in at least 2 times per month and write a reflection on the implementation.

This Criterion either met or not met.

2 – Limited Demonstrates some understanding and skill

Implement ECM problems at least 1 time per month and write a reflection on the implementation.

Scores self on Individual Reflection Rubric at the end of the year.

Submits problems which demonstrate a limited ability to select problem types and/or number choices based on student needs.

Participate in monthly team meetings by being engaged and usually, but not always prepared with student work.

This Criterion either met or not met.

1 – Poor Demonstrates little or no understanding or skill

Implement ECM problems inconsistently during each month and write a reflection on the implementation.

This Criterion either met or not met.

0- Not completed or not able to be scored

Does not implement or reflect on ECM problems in scheduled math classes.

Does not participate in self reflection or peer observation
Does not submit problems.

Participate in monthly meetings, but not prepared to discuss student work or have it available.

Does not reflect 15 collaborative hours per credit of course

A - total of **16** points earned

B - total of **13-15** points earned

C – total of **10-12** points earned

D – total of **8-10** points earned

F - total of **<8** points earned