

 **AUDIO**  
4:35 min

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## Monitoring the Problem-Solving Process

Sybilla Beckmann, Ph.D., September 2011

### Topic **IMPROVING MATHEMATICAL PROBLEM SOLVING IN GRADES 4 THROUGH 8**

#### Highlights

- » The goal is to have students think more deeply about mathematics and their own thinking during problem solving.
- » Dr. Beckmann describes the use of lists of questions and prompts to engage and be reflective in the problem-solving process.
- » The first component in lists of prompts is understanding the problem, making sense of the wording of the problem, and restating the problem in students' own words.
- » Another component is prompting students to ask *why* questions and think about the applicability of the steps to what they've done before.
- » Finally, prompts include reflection on the process, checking on answers in different ways, and thinking about how what students have done might connect to other problems.
- » Teachers should prompt students to explain their thinking so that they know they are accountable for explaining why they have used particular steps.
- » The role of problem solving in mathematics is application.


## About the Interviewee


Sybilla Beckmann is Josiah Meigs Distinguished Teaching Professor of Mathematics at the University of Georgia. She has a Ph.D. in mathematics from the University of Pennsylvania and taught at Yale University as a J. W. Gibbs Instructor of Mathematics. Beckmann has done research in arithmetic geometry, but her current main interests are the mathematical education of teachers and mathematics content for students at all levels, but especially for pre-K through the middle grades. Dr. Beckmann developed several mathematics content courses for prospective elementary school teachers at the University of Georgia and wrote a book for such courses, *Mathematics for Elementary Teachers*, published by Addison-Wesley, now in a third edition. She is interested in helping college faculty learn to teach mathematics content courses for elementary and middle grades teachers, and she works with graduate students and postdoctoral fellows toward that end. As part of this effort, Dr. Beckmann directs the Mathematicians Educating Future Teachers (MEFT) component of the University of Georgia Mathematics Department's VIGRE II grant.


Dr. Beckmann was a member of the writing team of the National Council of Teachers of Mathematics' *Curriculum Focal Points for Prekindergarten Through Grade 8 Mathematics*; was a member of the Committee on Early Childhood Mathematics of the National Research Council and co-author of its report, *Mathematics Learning in Early Childhood: Paths Toward Excellence and Equity*; has worked on the development of several state mathematics standards; and was a member of the mathematics writing team for the Common Core State Standards Initiative. Several years ago Dr. Beckmann taught an average 6th-grade mathematics class every day at a local public school in order to better understand school mathematics teaching.


## Full Transcript





 00:04 I am Sybilla Beckmann, Josiah Meigs Distinguished Teaching Professor at the University of Georgia. I was a member of the panel for the Problem Solving Guide as well as a member of the panel for the Response to Intervention Guide.


 **00:19** In the mathematics classroom, we really want students to be more reflective in their problem solving and to think more deeply about what they are doing mathematically than has been often customary for many students.

 **00:34** We want students to be thinking about their thinking and thinking about problem solving. It's very easy for students to simply launch into doing something, to take whatever numbers they see in a problem and just plug them into something, and turn the crank, and out comes an answer. What we want instead is a more thoughtful process—something that is more focused on making sense of problems and of solution methods and something that is more reflective and goes deeper into the problem-solving process.


 **01:10** To help students reflect on problem solving and monitor their progress as they solve problems, many teachers are now using either lists of questions or lists of prompts to help the students engage more deeply in the problem-solving process. There are various different kinds of lists that teachers work with, but I think they all have several things in common.


 **01:36** First of all, they all have a component that involves understanding the problem. You simply can't solve a problem unless you understand what it's asking. Something that asks students to understand the problem, make sense of the wording of the problem, and perhaps even asks the students to restate it in their own words.

 **02:00** Another component that's important is something that helps students ask a lot of *why* questions. Why does this work? Why am I adding here instead of multiplying? Why am I subtracting instead of dividing? They also frequently ask students to think about things that they have done before and think about whether those might be applicable to this new problem-solving situation.

 **02:29** Another component that I think is in all of these helpful lists of prompts or questions is something that asks students to reflect upon what they have done. So this will ask students to look back, to

check their work, to check their answer in a different way than the way they have found their answer, to reflect on what they learned, to think about how they might use what they have done in this problem in other situations or how what they have done here might connect to other situations.

 **03:03** It is important for teachers to prompt students to explain their thinking—if not in every single problem every single time, at least overall students need to know that they are responsible for making sense of what they are doing and that they will be called on to explain why they have taken the steps they have and to reflect on why they are working a problem the way they are working it. These are components that we find in all of these lists of prompts or questions that can help students go more deeply into the problem-solving process and to engage more with the mathematical ideas.

 **03:46** The role of problem solving in mathematics: it's a vehicle for learning mathematics and applying mathematics in many different situations. Usually the problems that we are solving in math class are not burning issues of the day. They aren't problems that are of real-life practical importance. They are instead vehicles for thinking about mathematics, learning new mathematics, and building on what students already know and extending it into new territory that will help them solve even more, deeper and powerful problems. That's, after all, what we are after in education.

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