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School of Education faculty member awarded grant to study how middle school students learn math

National Science Foundation funds research on how teachers can reach students at different levels

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FOR IMMEDIATE RELEASE

BLOOMINGTON, Ind. -- The National Science Foundation has granted \$646,479 to Amy Hackenberg, assistant professor of mathematics education at the Indiana University School of Education, for a five-year study examining diverse math learning styles among middle school students in order to teach them more effectively. Work has already begun on the project titled "CAREER: Investigating Differentiated Instruction and Relationships Between Rational Number Knowledge and Algebraic Reasoning in Middle School."

Hackenberg, herself a former middle and high school math teacher, said the study is intended to help teachers reach a variety of students in a time when there is much emphasis on math knowledge.

"The research purposes of the project are to try to differentiate instruction in middle school classrooms, which is not a place where differentiated instruction tends to happen," Hackenberg said. She said that as the drive for nationwide standards such as Common Core continues, there is increasing call for differentiated instruction -- teaching that adjusts to reach students learning at different levels within the same classroom.

"I'm also interested in how middle school students develop algebraic reasoning and how that relates to their rational number knowledge," Hackenberg said.

Mathematics education researchers generally define algebraic reasoning as generalizing ways of thinking with numbers and quantities to develop ideas such as equations and functions, typical topics that secondary students learn. Students think about the structure of numbers and quantities in different ways, Hackenberg said.

"Students might think about 35 feet as five equal parts, each of which is 7 feet," she said. "This is three-levels-of-units structure. Some students don't develop that kind of structure until middle school or possibly even beyond." How students structure numbers and quantities has an influence on what and how they generalize their ideas in algebra.

To better learn how middle school students think about math, the first two years of the project involve working directly with students. Each semester Hackenberg and graduate students are teaching a twice-weekly after-school mathematics class for nine weeks.

"These are sessions where I'm working on trying to differentiate instruction for diverse learners in a classroom," she said. "It's a small number of students -- nine at a time -- so I can have roughly three different kinds of thinkers in the classroom, and I get a close-in look at their thinking and interaction."

After the data is collected for those two years, Hackenberg intends to use the data to develop ideas and materials that can be used in classrooms.

"The middle year of the project is to engage in deep analysis of the first two years as well as to start a study group with middle school teachers in the state who want to explore differentiated instruction and experiment with it," she said. "In the last two years of the project, I'll be co-teaching with teachers in their classrooms, trying out some of these ideas and materials."

In the end, Hackenberg expects the project will shed light on an important aspect of instruction at a key point in students' academic development.

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IU School of Education assistant professor Amy Hackenberg works with Bloomington middle school students during one of her twice-weekly after-school math sessions.

Print-Quality Photo

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"It's easy to say that you should differentiate instruction," she said, "but it's really hard to think about what that really looks like at the middle school and high school level in mathematics classrooms."

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