

WHY DIFFERENTIATE INSTRUCTION?

- Classrooms are becoming more and more cognitively diverse.
- Students enter middle school at three different levels of reasoning that have significant implications for building mathematical knowledge in middle school.
- When we differentiate rather than track students or treat them all the same, we meet the needs of students at different levels while exposing them to other ways of thinking.
- Very little research has been done about how to differentiate instruction in mathematics classrooms.

WHAT IS DIFFERENTIATED INSTRUCTION?

Proactively tailoring instruction to students' different needs, such as students' readiness and cognitive abilities, interests, and learning profiles and backgrounds (Tomlinson, 2005)

WHY STUDY ALGEBRAIC REASONING?

- Students experience persistent cognitive difficulties that often seem highly intransigent.
- These persistent difficulties have led to a host of recommendations for the teaching and learning of algebra.
- Little attention has been paid to integrating students' rational number knowledge and algebraic reasoning, despite policy statements that improved success in algebra will not occur without improvements in students' rational number knowledge.

THE QUESTIONS

Process of Differentiating Instruction. What are constraints in and affordances for differentiating mathematics instruction with middle school students?

Students' Rational Number Knowledge and Algebraic Reasoning. How do students at three different levels of reasoning use their rational number knowledge to develop algebraic reasoning, and vice versa?

Participants' Experiences of Differentiated Instruction. How does differentiated instruction impact students and teachers, both cognitively and affectively?

Teachers' Learning to Differentiate Instruction. How do teachers develop understanding of and skill at differentiating mathematics instruction for middle school students at three different levels of reasoning?

THE PROJECT

Phase I: After School Design Experiments

Fall 2013 – Fall 2015

Teach cognitively heterogeneous groups of nine middle school students in an iterated series of design experiments after school.

Phase II: Teacher Study Group

Summer 2015 – Summer 2016

Forming a study group of research team members and approximately 15 middle school mathematics teachers whose purpose is to explore differentiating instruction and try out strategies in classrooms. These teachers can come from across the state of Indiana, and we will hold monthly meetings.

Phase III: Classroom Design Experiments

Fall 2016 – Spring 2018

Conduct classroom design experiments with 3-4 study group teachers and their students, and study how teachers learn to differentiate instruction.



FEATURES OF DI ...that we are experimenting with

- **Formative assessment**
- **Mathematics problems with choices**
- **Flexible and intentional small groups**
- **Student work in small groups**
- **Whole classroom discussion about a topic, across problems**



References:

Tomlinson, C. A. (2005). *How to differentiate instruction in mixed-ability classrooms* (2nd ed.). Upper Saddle River, NJ: Pearson.