Inquiry-based Learning in Mathematics

WHAT DOES RESEARCH SAY ABOUT INQUIRY-BASED LEARNING?

While current research on education reflects disagreement on the best method of teaching mathematics, evidence suggests that if the goal is to foster deep, conceptual understanding of mathematics, students must be provided with opportunities to develop their own ideas of the underlying concepts through exploration (Marshal & Horton, 2011). Moreover, research reveals that a reasonable degree of guidance is often more effective than low guidance (Lazonder & Harmsen, 2016).

WHAT IS GUIDED DISCOVERY?

Guided Discovery is an approach to inquiry-based learning that values both student exploration and direct teaching. The overarching goal of this approach is to foster collaboration and thoughtful interactions with mathematical concepts.

WHAT ARE THE TEACHER'S AND STUDENTS' ROLES IN GUIDED-DISCOVERY?

In this method of instruction, teachers provide students with an ample amount of time to engage in student- centered activities that focus on problem-solving. Teachers take on the role of "coach," using their professional judgement and expertise to decide when it is necessary to provide students with direct instruction and when it is appropriate to give them opportunities for explorations. For instance, if teachers see that students are struggling with a certain concept, teachers may take this as an opportunity for explicit instruction and design a lesson on a need-to-know basis.

WHAT ARE THE CHALLENGES IN IMPLEMENTING GUIDED-DISCOVERY?

Implementing this guided-discovery approach to learning in math can be challenging for educators, as this method requires skills that may be unfamiliar in traditional mathematics classrooms.

Some of these skills include the ability to:
- Embrace uncertainty
- Foster student decision-making by balancing guidance and student independence
- Recognize opportunities for learning
- Maintain flexible thinking
- Tolerate periods of disorganization

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## WHAT ARE THE BENEFITS OF GUIDED-DISCOVERY?

Research suggests that there are many benefits to adopting a guided-discovery approach to teaching mathematics in the classroom.

Some of these benefits include:
- Ability to incorporate a balance between direct instruction and inquiry-based learning
- Leads to higher levels of cognitive thinking and learning
- Encourages development of higher-order skills such as critical thinking, problem-solving, and collaboration
- Collaboration amongst students and educators to learn with and from each other
- Increased ability to think critically and problem-solve
- Students may work at their own pace and demonstrate their learning in different ways
- Ability to incorporate students' interests and accomodate for specific needs

WHAT IS THE JIGSAW METHOD?

This method of guided-discovery was created by Chapman (2011) as a way to flexibly implement inquiry-based learning in mathematics. It takes the form of a jigsaw puzzle and includes all components of a standard inquiry cycle, but is not linear and can be pulled apart and reorganized in a variety of ways with missing parts. This type of inquiry model is beneficial in mathematics, as it allows educators to be flexible and incorporate direct instruction when necessary.
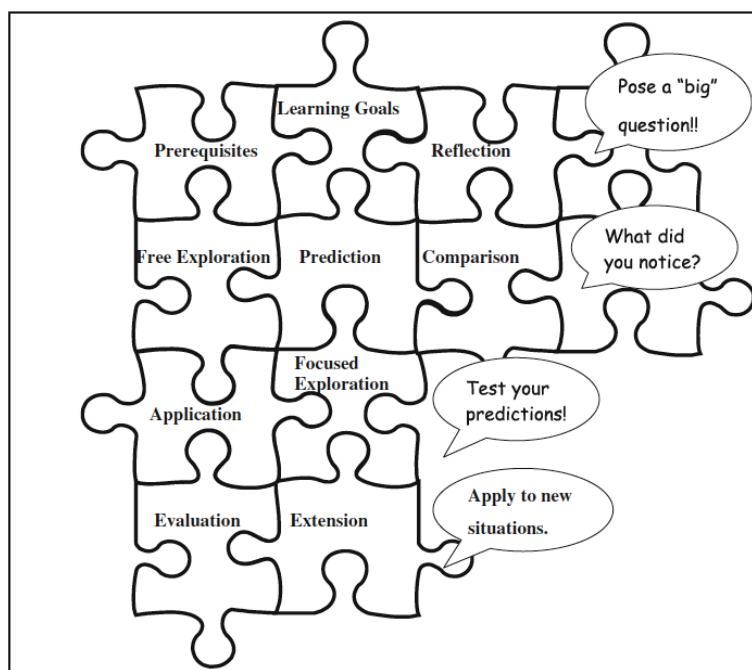
JIGSAW INQUIRY TEACHING MODEL

MAIN TAKE-AWAY

- Inquiry in math may look different than inquiry-based learning in other subjects
- Math generally requires more direct instruction, therefore a guided-discovery approach is fitting
- Guided-discovery can be used to teach all strands of math
- Guided-discovery promotes learning through problem solving and reasoning which leads to deeper mathematical understanding