Experience First, Formalize Later:

A Research-Based Framework for High-Impact Math Instruction

Mathematics has long been identified as a crucial subject for developing analytical thinking and problem-solving skills. Yet large-scale international assessments, such as the OECD's PISA report, indicate that mathematics remains one of the most challenging and disliked subjects for students worldwide.

A core issue is that math classrooms do not reflect the activities of real mathematics; too many students are memorizing and mimicking, following step-by-step procedures rather than thinking deeply (Liljedahl, 2021; Civil, 2002). Systemic barriers resulting in inequitable access to resources and emotional factors such as math anxiety further exacerbate the challenges of learning mathematics (Schoenfeld, 2022).

Research points to an alternate approach, where mathematics instruction is grounded in inquiry and students participate through investigation and problem-solving, leading to deeper learning (Hiebert & Grouws, 2007).

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The Experience First, Formalize Later (EFFL) model is Math Medic's teacher-created, classroom-tested teaching approach that has students working in small groups on an accessible and carefully sequenced activity designed to build conceptual understanding. This is followed by a whole class debrief where student work is discussed and formalized and the teacher connects students' thinking with the key ideas, definitions, and formulas associated with the lesson.

Why Does EFFL Work? A Look at the Research

- Students use their existing knowledge to work through the task and must problem solve to answer questions that are unfamiliar to them. The process of problem solving leads to the construction of new understanding (Schoen, 2003; Cai & Lester, 2010).
- Learning happens by interacting with others and talking through ideas. This collaboration has been shown to increase students' interest in mathematics as well as their achievement (Olanrewaju, 2019; Gerlach, 1994; Lawrence, 2004).
- Traditional lecture-based instruction that focuses on memorization and repeated exercises has not been shown to be effective — when students passively obtain information, they are less likely to remember it and be able to apply it to new situations (Boaler, 2016; Mangarin & Caballes, 2024).
- Conditions that result in quick, short-term gains in scores (performance, rather than learning) often don't promote retention, whereas desirable difficulty and productive struggle are necessary for meaningful, lasting learning (Bjork & Bjork, 2011).

Learn more here

"My students are engaged, talking about math, and really enjoying being in my classroom."
- Math Department Chair from Wisconsin

Math Medic