


**Elevating Voices in Mathematics:
Instructional Strategies for Including
Each and Every Learner
Grades 3-5**


**DNA
MATHEMATICS**

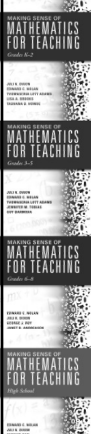
#DNAmath © 2022 Dixon, Nolan, Adams



Let's Get Ready

$8 + 7 - 2 \square _ \square _ \square _ _ = 72$

© 2022 Dixon, Nolan, Adams

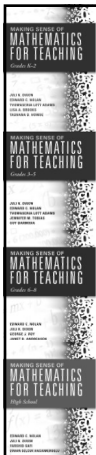


Connecting to Discourse

“Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments”.

(National Council of Teachers of Mathematics, 2014, p. 10)

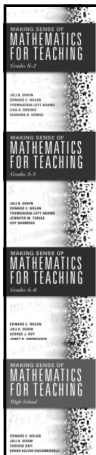
© 2022 Dixon, Nolan, Adams



Check-in

- What's been going well about engaging learners?
- What's still challenging about engaging learners?
- What's an immediate goal for engaging learners?

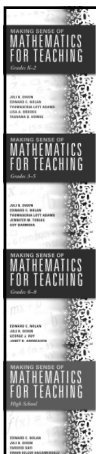
© 2022 Dixon, Nolan, Adams



Session Goals

- Examine strategies for creating norms to promote discourse
- Select tasks that invite each and every learner to actively engage in mathematics
- Be intentional about questioning to encourage student engagement

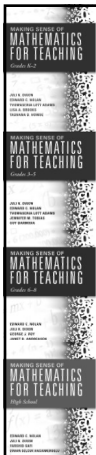
© 2022 Dixon, Nolan, Adams



Mathematical Discourse

Mathematical discourse is the exchange of thought between and among students and teachers in the mathematics classroom.

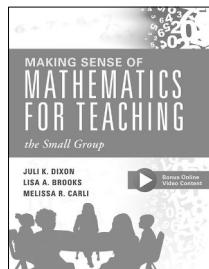
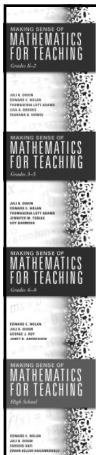
© 2022 Dixon, Nolan, Adams



Mathematical Discourse

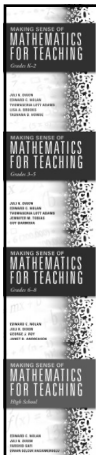
- Communicate with the language of mathematics as a tool/medium of discourse
- Communicate about the discipline of mathematics as a context of discourse
- Communicate in pursuit of an outcome (e.g., understanding, application, description, etc.)

© 2022 Dixon, Nolan, Adams



*Making Sense of Mathematics for Teaching
the Small Group*

© 2022 Dixon, Nolan, Adams

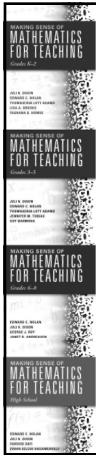


Reflections

How did the teacher set up the lesson to support mathematical discourse?

What did you observe about the ways students engaged in mathematical discourse?

© 2022 Dixon, Nolan, Adams

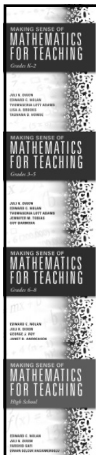


Engaging Students Through Mathematical Discourse

“In addition to explicitly teaching features of language (e.g., specialized mathematical language and syntax of mathematical statements) teachers are responsible for providing students with opportunities to engage in mathematical discourse across different modalities (e.g., speaking and writing)”.

(Smith, 2021)

© 2022 Dixon, Nolan, Adams

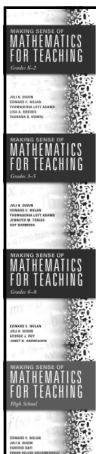


Importance of Mathematical Discourse

“What students see and can collectively make use of in the public space of a classroom can support their engagement and learning in a discussion”.

(Garcia, Shaughnessy & Pynes, 2021)

© 2022 Dixon, Nolan, Adams

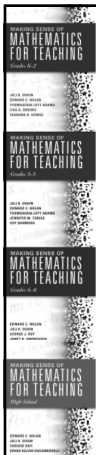


Teachers' Role in Promoting Mathematical Discourse

“...the deliberate actions taken by a teacher to participate in or influence the discourse in mathematics classrooms, and such actions are referred to as the teacher's discourse moves”.

(Krussel, Springer, & Edwards, 2004, p. 307)

© 2022 Dixon, Nolan, Adams

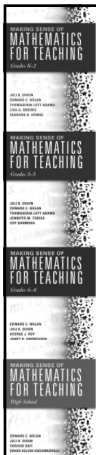


Teachers' Role in Promoting Mathematical Discourse

“Your approach to student talk ... helps determine the type of classroom learning community you and your students develop together”.

(Nolan, Dixon, Roy, & Andreasen, 2016, p. 10)

© 2022 Dixon, Nolan, Adams

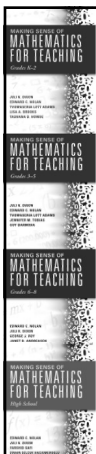


Norms to Promote Mathematical Discourse

“The classroom norms need to support the active thinking of students rather than the thinking of teachers... [we] should always provide students the opportunity to share their strategies and make sense of the thinking of other students in order to be sure they understand mathematics with depth”.

(Nolan, Dixon, Roy, & Andreasen, 2016, pg. 11)

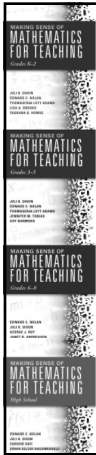
© 2022 Dixon, Nolan, Adams



Session Goals

- Examine strategies for creating norms to promote discourse
- Select tasks that invite each and every learner to actively engage in mathematics
- Be intentional about questioning to encourage student engagement

© 2022 Dixon, Nolan, Adams

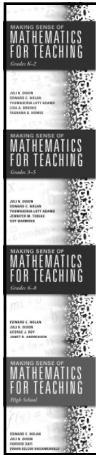


Tasks

"A high cognitive-demand task provides students with opportunities to wrestle with important mathematics by requiring them to make connections to mathematical concepts and to justify solutions and strategies rather than execute known procedures".

(Hallman-Thrasher & Spangler, 2020, p. 446)

© 2022 Dixon, Nolan, Adams

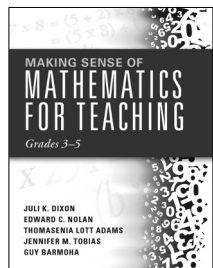
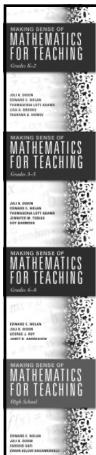


Plan with the TQE Process in Mind



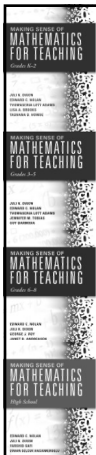
- Select appropriate **T**asks to support identified learning goals.
- Facilitate productive **Q**uestioning to engage students in mathematical practices.
- Collect and use student **E**vidence in the formative assessment process.

© 2022 Dixon, Nolan, Adams



Making Sense of Mathematics for Teaching
Grades 3-5

© 2022 Dixon, Nolan, Adams

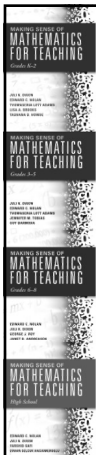


Reflections

What did you notice about the task?

How did this task inform the teacher about what students were learning?

© 2022 Dixon, Nolan, Adams

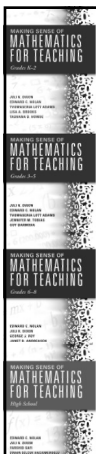


Plan with the TQE Process in Mind



- **Tasks** connect to learning goals and help identify misconceptions.
- **Questions** elicit mathematical understandings and common errors.
- **Evidence** drives scaffolding and guides extensions.

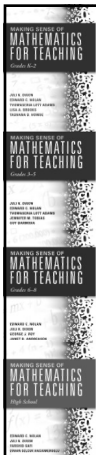
© 2022 Dixon, Nolan, Adams



Selecting Tasks to Engage Learners

- Meaningful mathematics
- Interesting/Intriguing
- Accessible to the learner
- Hands-on
- Open-ended

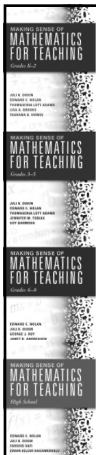
© 2022 Dixon, Nolan, Adams



Session Goals

- Examine strategies for creating norms to promote discourse
- Select tasks that invite each and every learner to actively engage in mathematics
- Be intentional about questioning to encourage student engagement

© 2022 Dixon, Nolan, Adams

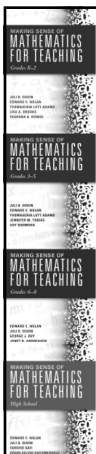


Plan with the TQE Process in Mind



- **Tasks** connect to learning goals and help identify misconceptions.
- **Questions** elicit mathematical understandings and common errors.
- **Evidence** drives scaffolding and guides extensions.

© 2022 Dixon, Nolan, Adams

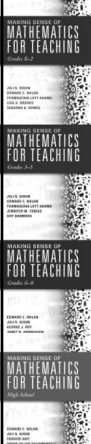


Questioning

"...different types of questions prompt different levels of thinking and elicit different levels of responses from students".

(Boston, Candela, & Dixon, 2019, p. 58)

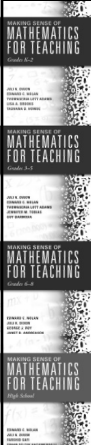
© 2022 Dixon, Nolan, Adams



Questioning

1. Assessing Questions
2. Advancing Questions

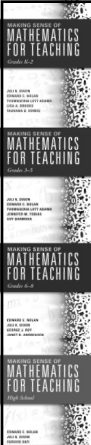
© 2022 Dixon, Nolan, Adams



Assessing Questions

- Examples
- Nonexamples
- Explanations
- A look at how concepts relate
- Probing thoughts
- Whether learner has tried a particular route

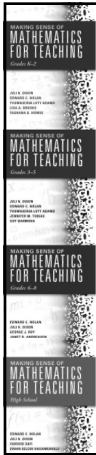
© 2022 Dixon, Nolan, Adams



Advancing Questions

- Clarifying information
- A different case
- A generalization
- Alternate explanations
- Applications of the content

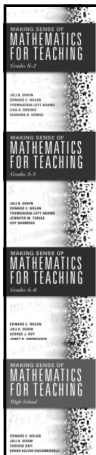
© 2022 Dixon, Nolan, Adams



Honoring Students' Voice

- Plan and prepare for mathematical discourse.
- Be intentional about engaging each and every student.
- Value all each and every student's contribution to mathematical discourse.
- Be a participant in discourse.

© 2022 Dixon, Nolan, Adams

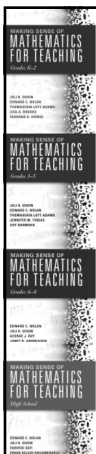


Honoring Students' Voice

"The value of student talk in mathematics lessons cannot be overemphasized. As students describe and evaluate solutions to tasks, share approaches, and make conjectures, learning will occur in ways that are otherwise unlikely to take place."

(Van De Walle, Karp, & Bay-Williams, 2013, p. 42)

© 2022 Dixon, Nolan, Adams



Revisit Session Goals

- Examine strategies for creating norms to promote discourse
- Select tasks that invite each and every learner to actively engage in mathematics
- Be intentional about questioning to encourage student engagement

© 2022 Dixon, Nolan, Adams
