

# ROUGH DRAFT MATH



REVISING TO  
LEARN

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## foreword

I first learned about rough draft talk at a conference presentation from Mandy Jansen and her colleagues. From this presentation, I situated rough draft talk as an equitable instructional routine allowing students to share thinking in a way that positioned them as mathematically competent by allowing them to share their thinking while their ideas might be still under construction. When I read Jansen's and her colleagues' article "Rough-Draft Talk in Mathematics Classrooms" published in *Mathematics Teaching in the Middle School* (2017), it provided me a deeper understanding of how she connected rough draft talk with equitable instructional practices. I have since used rough draft talk as an instructional practice for the students I teach at my university and the middle school boys I taught in the summers. I wanted my students to have space where their voices are heard, feel a sense of security if they felt participation was risk-taking, and know that they are mathematically competent. Rough draft talk allows me to take risks when I am uncertain about my thinking. I often engage in rough draft talk with students (and colleagues) when I need to voice my thoughts about mathematical ideas. Sometimes I say, "My ideas are not fully conceptualized, but here is what I am thinking." Similarly, by valuing my students' willingness to participate and share their mathematical ideas, having or not having fully developed mathematical ideas are acceptable in our spaces. Rough draft thinking and talk help me position each and every student as being mathematically competent.

I believe that each and every student is mathematically competent and can learn high-level mathematics and that equitable, intentional teaching opens up interactional space for a broad range of teaching and learning

ideas. *Rough Draft Math* can help teachers position students as mathematically competent and support mathematical identity and agency in a number of ways, such as the following:

- promoting mathematical discourse
- establishing and upholding structures such as norms and routines that provide opportunities for all students to engage in that discourse
- shifting students' views of competence from performative to participatory
- developing students' intellectual authority
- positioning students as sensemakers by sharing that intellectual authority
- focusing on mathematical goals and conceptual understanding
- encouraging risk-taking
- building active, nurturing, and collegial communities in which students feel a sense of inclusion and belonging

Promoting and valuing students' participation in mathematical discourse is a way of positioning students as mathematically competent. Mathematical discourse includes but is not limited to students engaged in deep mathematical thinking; sharing their reasoning, creating and revising their thinking; and engaging in collaborations aimed at making sense of and using mathematical ideas. To ensure that each and every student not only understands and can make use of mathematics concepts and relationships but also comes to experience the joy, wonder, and beauty of mathematics, we must position each and every student as mathematically competent. If we consider mathematical competence as being the ways in which students participate in mathematics, then this book provides the framing for mathematical competence as participation through talk, thinking, and connecting with others.

Building mathematical competency requires creating classroom structures—norms and routines—that support students to take risks to engage in discourse and to see themselves as capable and worthy of being heard.

Mathematical discourse includes not only participating in mathematics talk but also having one's ideas be heard. Those who talk and are listened to in mathematical discourse are positioned as mathematically competent. We must provide opportunities for each and every student to talk and to have their ideas heard during mathematics classrooms. Chapter 2 of this book focuses on building a culture of rough draft thinking such that teachers can create classroom structures and norm in which students can make their mathematical ideas public.

I have observed too many mathematics classrooms positioning mathematical competence solely based on quickness and correctness of mathematical solutions, ideas, and thinking, giving the mistaken impression that only some students are “good at math.” This creates an environment where students' mathematical reasoning goes unexamined and unvalued; consequently, little is known about how they make sense of mathematics, how they use their mathematical understanding in developing solutions, and why their solutions do or do not make sense. Correct answers matter but not as indicators of who can do mathematics. Throughout this book, Jansen positions rough draft thinking and talk as instructional practices supportive of engaging in mathematical discourse, which is essential for developing a mathematical identity. Specifically, Chapter 5 discusses rough draft thinking as a rehumanizing approach, valuing connections among students and teachers.

When students share and value their mathematical ideas through mathematical discourse, they move away from mathematics competence as producing correct answers quickly and toward mathematics competence as participatory. Aguirre, Mayfield-Ingram, and Martin (2013) define mathematical identity as “the dispositions and deeply held beliefs that students develop about their ability to participate and perform effectively in mathematical contexts and to use mathematics in powerful ways across the contexts of their lives” (14). The power I find in this definition of mathematical identity is the connection to being participatory and performance. That is, participation and performance are connected to practices and processes for doing mathematics. I believe that students' mathematics identity is closely associated with whether and how they have opportunities to talk, listen, and be heard using their mathematical ideas. Consequently, classroom structures and instructional routines can either create or limit opportunities for positioning students as mathematically competent. Rough draft thinking and talk are intentional, instructional acts supportive of positioning students as mathematically competent and developing positive mathematical identity.

As students author ideas, decide and justify whether particular ideas are reasonable, and press one another for explanations, they take on forms of intellectual authority that support collaborative mathematics teaching and learning. Students, as sense-makers, require opportunities to construct their ideas through reflection, refining, and extending prior ideas, knowledge, and experiences. The ideas in *Rough Draft Math* help us see how to position students as sense-makers because authority is shared between students and teachers. That is, not all mathematical ideas are authored primarily by teachers, and students have the autonomy to author and share their ideas. For many teachers, positioning students as sense-makers can feel like risk-taking because they may not feel like they are controlling the narrative. That is, some teachers may think ideas must be authored by teachers and presented as correct, concise, and clean rather than authored by students as rough, then refined, and revoiced. The stories in this book can help us revise our own thinking about ideas in the mathematics classroom and see that positioning students as sense-makers and sharing authority in mathematics classrooms create the space for students to see themselves and others as mathematically competent while developing conceptual understanding.

The presence of talk in mathematics lessons is necessary but not sufficient to promote deeper learning. Talking and listening are critical first steps toward fostering mathematical discourse, where the teacher must pose purposeful questions, elicit student thinking, and facilitate meaningful discourse (NCTM 2014). Teachers must find a balance between allowing students to express thinking freely while keeping the focus on the mathematical learning goal(s). Mathematical discourse is a multidimensional practice where students and the teacher share ideas, questions, and other mathematical wonderings to build mathematical understanding. Jansen's examples and analysis provide rich opportunities for readers to reflect on the complex practice of facilitating discourse in service of mathematical goals.

For many students, participation in mathematics classrooms is risk-taking. The feeling of risk-taking might be that in many mathematics classrooms, quickness and correctness of mathematical solutions are valued more than providing students opportunities to evolve in the development of their mathematical ideas and recognizing that their ideas are worthy of being heard, even if unfinished. In contrast, rough draft thinking and talk support risk-taking, as well as create the space and a sense of safety for students (and teachers) to evolve in the development of their mathematical ideas.

Building a positive learning community in the mathematics classroom is vital. Rough draft thinking and talk contribute to this sense of community because all people are active participants through the relationships and interdependence developed for authoring and sharing ideas. Students and teachers collaborate to think, persevere, and refine ideas. Communities are intentionally active, nurturing, and collegial such that members feel a sense of inclusion. Through rough draft thinking and talk, teachers and students are building knowledge together rather competing for answers. That is, this book provides us with the framework for developing inclusive spaces for connecting mathematical ideas, knowledge generation, and positioning each and every student as worthy of being heard and seen.

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## a note to readers

My name is Mandy Jansen, and being a math teacher is an important part of who I am. Earlier in my career, I taught junior high mathematics. Now I teach future elementary and middle school teachers to help them develop a deeper understanding of mathematics for teaching, children's thinking about mathematics, and pedagogical approaches for teaching mathematics. I also teach graduate students about conducting research in education. I conduct professional development for practicing teachers throughout the state of Delaware and elsewhere at the secondary level.

Formally, I am Dr. Amanda Jansen, a professor at the University of Delaware in the School of Education with a joint appointment in the Department of Mathematical Sciences. Prior to earning my PhD in Educational Psychology at Michigan State University, I taught in Mesa, Arizona. My undergraduate degree is in mathematics with a secondary teaching certification and a minor in English from the University of Arizona.

I orient myself as an ongoing learner about teaching, and my intention in this book is to share what I have learned from collaborating with classroom teachers. Most of the teachers represented in these chapters are teachers in Delaware with whom I have had ongoing interactions over a period of years. In addition, I met a few of the teachers in these chapters when I presented at the National Council of Supervisors of Mathematics, and we continued to correspond beyond the conference. I have preserved what I have learned so far about rough draft math in this book as an act of curation.



The classroom examples in these chapters are from secondary classrooms and upper elementary classrooms (grades four through twelve). I also provide some elementary mathematics content examples in my excerpts of my own teaching of future elementary school teachers. This book is targeted most directly at grades four through ten, but I have come to believe that every learning experience benefits from a rough draft approach. I hope that teachers of other grade levels, from elementary grades to those who teach adults, might also take something away from this book. (If you want to share responses to this book, please use the hashtag #RoughDraftMath on Twitter. I'm @MandyMathEd.)

All of the teachers in this book are represented by their actual names. The school names are the actual names of the schools where they worked when I gathered the data for this book. All students' names are pseudonyms. If a teacher was included in a chapter, I shared a draft of that chapter with that teacher prior to submitting the book for publication. I incorporated any feedback they shared about the chapter. I am grateful to Michael Reitemeyer, Phil Wandless, Brandy Cooper, Christine Hubbard, Siobahn Suppa, Katrina Lindo, Eli Tinkelman, Stefanie Vascelaro, Molly Brnich, Michael Sanchez, Nicole Crawford, Kathleen Wilson, Tom Stricklin, Suzi Sappington, Tom Becker, Shellee Wong, and Carla Hood for trusting me to publicly present and reflect on their teaching practice in this book. Without them, this book would not have been possible.