

Introduction: Bringing Together Research and Practice

On my office bulletin board hangs an impassioned note from Heather, a former student. She explains why, in my geometry classroom, she disliked group work and preferred, overall, to work independently. She articulates what did not work for her about the cooperative learning structures I used as a beginning teacher. I have saved her note all these years for several reasons: First, it makes me smile. I am charmed by her earnest teenage passion, expressed in the capitalization of entire words (some of which are multiply underlined) and the sentences closed with profuse exclamation points. I am also glad that she trusted me enough to communicate her concerns. At the same time, Heather raises thoughtful questions that highlight the complexity of collaborative learning.

My favorite part of her note: *I understand that in the teaching world studies show how well kids do by doing group work, but that is on the AVERAGE. . . . My own study shows that I learn better in an environment that I prefer to be in not one I'm stuck in!!*

As Heather aptly observes, research must be squared with experience. Though something may be true “on the average,” none of us lives in the world in general. We must contend the particularity that comes with human diversity. That complexity challenges our faith in that which only *tends* to be true.

I bring to the writing of this book an unusual set of experiences with collaborative learning. Over almost two decades as a classroom teacher, researcher, and teacher educator, I have come to understand group work in secondary mathematics classrooms. Adolescents are typically highly social creatures, and from the time I started teaching, harnessing their desire to interact toward the goal of academic learning seemed sensible. As a student teacher, I was interested in how different classroom arrangements could support students’ participation and learning. I experimented with different configurations for collaborative learning, using everything from familiar small-group work lessons to more experimental learning-center structures that I adapted from elementary teaching methods.

My first full-time teaching position was in a diverse urban high school that brought together students from dozens of cultures. I had a strong sense that I could leverage my students’ rich variety of languages and experiences by giving them opportunities to think through mathematics problems together. I worked largely on instinct, with a few principles about and tools for mathematics teaching to guide me.

My teaching experiments confirmed that, for mathematics to make sense, children’s own thinking needed to be engaged. Daily, I saw students make important connections and arrive at deeper understandings. They needed to put ideas in their own words, understand why formulas or methods worked, and ask questions without a fear of looking dumb. These learning goals required sensitive attention to the social world of the classroom, because my activities would occasionally backfire. One such occasion prompted Heather’s note. The bad days helped me learn, too; for instance, we needed a high degree of trust among us for students’ emergent thinking to be safely aired. I tinkered with rules and routines and ultimately met with mostly positive but inconsistent success in my use of collaborative learning. Nonetheless, these experiences gave me a strong set of intuitions about students working together.

As I trained to become a researcher, I learned about a system for collaborative learning developed by Elizabeth Cohen called complex instruction (CI). Unlike most theories I encountered in graduate school, I did not first learn about CI from a book or article. I came across CI when I saw it put into practice by a team of dedicated teachers who had worked for more than a decade to figure out how it might support their project of detracking their urban high school’s mathematics department.

I spent time watching these teachers’ classes. As in my own urban high school classrooms, the students came from diverse cultural and linguistic backgrounds and were mostly working class. In

several ways, though, the classes stood apart from the dozens of other mathematics lessons I had observed:

- Students were generally happy to be in math class.
- Teachers and students shared a warm connection.
- Students seemed comfortable with themselves and the content, tackling hard problems and discussing their ideas vigorously.
- Teachers posed challenging questions that, in my experience, would cause other classrooms to mutiny.

Students experienced this high level of content mostly positively. (See Horn [2006], just one example of my writing about teachers in this math department.) I think even Heather might have felt satisfied. When asked, more than the usual number reported that mathematics was their favorite subject. I was intrigued. As I was getting to know the school for a research project, I got the chance to teach a section of algebra alongside these teachers. Even though this approach was not typical for conducting research, I leapt at the chance. Thus, the second way I dove into CI was by using it in my own teaching, alongside experienced and generous colleagues.

Only as I wrote up my study did I read Elizabeth Cohen and Rachel Lotan's research to understand CI's theoretical and empirical grounding. I had not set out to study CI, but it happened to be a central pedagogy in the group of teachers I was working with. Since then, Rachel has generously helped me get a handle on CI research, guiding my understanding and answering my questions about the history of CI.

After getting to know CI myself, I faced the challenge of communicating it to teachers who did not have the same immersive introduction to it. In my work as a teacher educator, I have tried to merge the practical and theoretical traditions of CI, bringing to this endeavor expertise in research in mathematics education. I write this book from the perspective of a teacher educator, contributing a synthesis of mathematics education and CI research with the wisdom of expert practitioners. I articulate a subject-specific version of equitable collaborative learning that is deeply rooted in research and practice.

I hope that my experiences as a teacher educator add another layer to this work. As someone who works with both preservice and in-service mathematics teachers, I have come to know the conceptual challenges that collaborative learning poses. This work has given me insight into potential obstacles and some good strategies for pressing past them. As with my learning of the practical and theoretical side of CI, I have had good company in this venture. I have gleaned invaluable wisdom from other teacher educators who focus on bringing CI to secondary mathematics classrooms, particularly Carlos Cabana, Kristina Dance Peterson, Laura Evans, Lisa Jilk, Karen O'Connell, Barbara Shreve, Phil Tucher, and Ruth Tsu. I share some of their voices throughout the text.

Because my research focuses on teachers' learning of ambitious pedagogies (of which CI is one), I have studied teachers' learning of new practices in different teaching contexts. In this capacity, I have watched as teachers try to create this kind of equitable collaborative learning in their classrooms. With the help of research assistants Nicole Bannister, Sarah Sunshine Campbell, Audra Gray, Lauren Persky, and Maxine Alloway, I have interviewed teachers about what is most useful and challenging about implementing these methods. Watching and supporting teachers in different school settings has given me a better handle on some challenges that this learning brings up, both pedagogically and mathematically, thanks to insights from mathematicians Jim King and Ginger Warfield. I am grateful to these teachers for sharing their classrooms and their learning with me and to my collaborators for helping me think carefully about what we observed. Conversations with Laura Evans and Teresa Dunleavy helped me think more deeply about important issues. Generous and thoughtful commentary on earlier drafts of the manuscript came

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This book is my attempt to integrate the variety of experiences that contributed to my understanding of equitable collaborative learning in secondary mathematics classrooms. I hope that this book—arising from my background as a mathematics teacher, researcher, and teacher educator—serves as a useful guide for ambitious practitioners, school coaches, or other teacher educators. It introduces concepts and tools that are theoretically sound, empirically grounded, and practically useful for creating equitable collaborative learning environments in secondary mathematics classrooms.

My holding on to Heather's letter all these years is significant: she has become one of many student test cases that I use to think through any teaching strategy I encounter. As my story reveals, Heather, along with many others, has contributed to my understanding of the complex teaching practice I share with you here. I am grateful for the opportunity to have learned alongside such thoughtful people. I have no doubt that I am not as smart alone as I am together with them. Nonetheless, any errors that remain are my own.